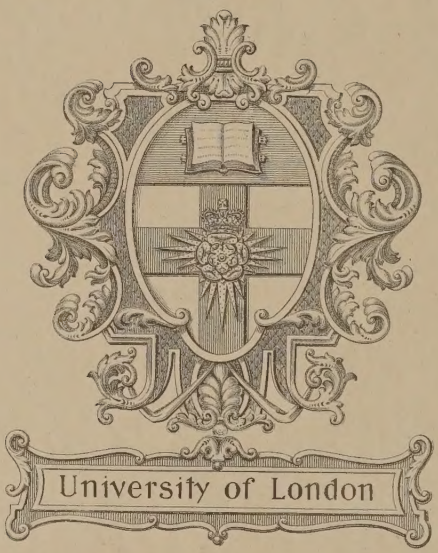
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REPORTS

FROM

COMMISSIONERS:

SIXTEEN VOLUMES.

—(9.—Part II.)—

MINES.

COMMISSION (MINUTES OF EVIDENCE AND APPENDIX).

Session

4 *February* —— 29 *July* 1864.

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1864.

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N.B.—*THE* Figures *at the* beginning of the line, *correspond with the* N° *at the foot of each* Report; *and the* Figures *at the* end of the line, *refer to the* MS. Paging *of the Volumes arranged for The House of Commons.*

MINES:

[3389.] MINUTES of EVIDENCE taken before the COMMISSIONERS appointed to inquire into the Condition of all MINES to which the Provisions of the Act 23 & 24 Vict. c. 151, do not apply; together with APPENDIX (B.) - - - - - - p. 1

MINUTES OF EVIDENCE

TAKEN BEFORE

THE COMMISSIONERS

APPOINTED TO INQUIRE INTO THE

CONDITION OF ALL MINES IN GREAT BRITAIN

TO WHICH THE PROVISIONS OF THE ACT 23 & 24 VICT. CAP. 151.
DO NOT APPLY,

WITH REFERENCE TO THE

HEALTH AND SAFETY OF PERSONS EMPLOYED IN SUCH MINES.

Presented to both Houses of Parliament by Command of Her Majesty.

RETU[illegible] CLUB
PALL MALL

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PRINTED BY GEORGE EDWARD EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.
FOR HER MAJESTY'S STATIONERY OFFICE.

1864.

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[3389 II]

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MINUTES OF EVIDENCE

TAKEN BEFORE THE

COMMISSIONERS appointed to inquire into the CONDITION of all MINES in GREAT BRITAIN to which the Provisions of the Act 23rd and 24th Victoria, Chapter 151, do not apply, with reference to the HEALTH and SAFETY of PERSONS EMPLOYED in such MINES.

[*For Questions, Nos.* 1 *to* 719, *see Epitome, p* .258.]

REFORM CLUB PALL MALL

LISKEARD.

Tuesday, 15th April 1862.

PRESENT:

The Rt. Hon. Lord KINNAIRD, K.T.
The Hon A. FULKE EGERTON, M.P.
NICHOLAS KENDALL, Esq., M.P.
H. AUSTIN BRUCE, Esq., M.P.
JOHN ST. AUBYN, Esq., M.P.
P. H. HOLLAND, Esq.
RICHARD DAVEY, Esq., M.P.

The Rt. Hon. Lord KINNAIRD, K.T., in the Chair.

Mr. CHRISTOPHER THORPE examined.

720. (*Chairman.*) You are captain of the Wheal Mary Great Consols Mine at St. Neot ?—Yes.

721. Will you state to the Commissioners how many shafts there are in that mine, and the description of the shafts ?—We have four shafts, and we are working on one lode ; but it is a whole mine, and is being worked on other lodes north of the present lode which we are working ; but all the workings down to the 50 fathoms are connected with the old workings.

722. What is the deepest portion of the old part of the mine ?—Eighty fathoms ; but it has not been opened out for ten years below the 50 fathoms.

723. The 50 fathoms is the lowest which you are working at present ?—Yes, below the adit.

724. I suppose there are winzes besides the shaft ?—Yes.

725. Do you use any machine for supplying air ?—Underground, when it is required, we use the small machines.

726. Worked by a boy ?—By boys.

727. Is the mine particularly wet ?—Not particularly wet.

728. What is the height and breadth of the levels which you are now working ?—Seven feet high by four feet wide.

729. I suppose that in the old mine some of the levels are not of that size ?—Some are, perhaps, five feet by two, or perhaps six feet by two or three feet.

730. But you find an advantage in working with the larger size, the seven feet by four ?—The ventilation is better, and there is more room to work.

731. Is it an advantage to the working a mine, independently of the ventilation, to have the levels of the greater size ?—Yes.

732. Is seven feet four the general rule ?—It is what they are generally made now.

733. How many men are there employed working underground ?—The mine, at the present time, is stopped ; it is not working at all now ; it has been stopped since Christmas ; but in less than three months I presume that it will go to work again.

734. How many men had you ?—About 60 underground.

735. And how many women had you employed at the same time ?—It depended upon the production of the ore. Ours is a poor mine, and sometimes we had more and sometimes less ; ten or a dozen sometimes.

736. You had a changing house ?—Yes.

737. Was it at the boiler, or was it separate?—The changing house was separate from the boiler.

738. Was it heated by any flues ?—There is a fire and a flue.

739. What have become of the miners whom you employed ; are they employed in other mines?—They are scattered about; some are in the Carradon district, and some in the neighbourhood.

740. Did they reside in the neighbourhood ?—A good many resided in the neighbourhood.

741. And they have other employment now ?—Yes.

742. In working the new part of this mine was the ventilation good ?—Yes, generally, very good.

743. How was it obtained ; was it from the old shafts ?—The downcast air is from the new shaft ; the upcast is from two of the old shafts. One of the old shafts is on higher ground, and that causes the up cast.

744. I suppose that the men came up and went down by ladders ?—Yes.

745. Have you ever had to do with other mines ?—Not in Cornwall.

746. In what part ?—I have come out of Derbyshire.

747. Have you ever met with bad air in the ends where men have been working ?—Sometimes, if driven too far from a winze, the air gets bad ; it is dead.

748. When that is the case, do the candles show it, or how is it ascertained ?—The candles begin to show it.

749. Do the men report when that is the case ?—Yes.

750. What steps are then taken ?—The machine is put in at once, and after that one of the winzes is put through.

751. But till the winzes get through what is done?—The machines and air pipes are put in.

752. Are the air pipes attached to the machine ?—The pipes are put in where the air is good, and the air is forced in from there by pipes.

753. Are the air pipes made of wood ?—Yes, generally.

754. Do you know what has been the heat in any of those close ends where you have been obliged to put in the air pipes ?—That depends upon the depth.

755. (*Mr. Kendall.*) What description of mine is the Wheal Mary?—Copper and tin ; at one part of the set tin has been got, and copper out of the other part, and tin as well, but not the tin in large quantities.

746. For how long have you had the management of that mine ?—I have been there four years.

757. Prior to that, were you at all used to Cornish mining ?—No. Captain Thomas Richards was the manager, but he has left ; he is now at Hingston Down mine.

758. Did you effect any sales of copper as an agent whilst you were at the Wheal Mary mine ?—Yes.

LISKEARD.

Mr. C. Thorpe.

15 April 1862.

759. To what amount?—About 2,000*l.* a year or 2,200*l.*

760. And how much of tin?—We did not return any tin at all when I was there.

761. You say that you had adits, and that your levels were about seven feet by four; were the lodes large, or did you drive the levels of that size wholly for ventilation?—For ventilation; and it is not more expense to carry a large level than it is to carry a small one. If you get into a close place it requires more powder, and sometimes more drawing away.

762. Is the nature of the ground there hard or not?—It is chiefly hard.

763. What is the expense per fathom?—5*l.* to 7*l.*

764. What is the nature of the ground?—Slate.

765. You have described the shafts as being one down cast and the other up cast; how do you ascertain which is which?—By the draught; the draught goes down.

766. Is it always the same?—Yes; it always goes down from one shaft.

767. There is no variation from that?—Not once in 12 months.

768. Before you came to Cornwall, were you an agent in a Derbyshire mine?—No; I had been in connexion with a mineral agent there.

769. Have you been a working miner at all?—No.

770. You are not a practical man in that way?—No.

771. (*Mr. Austin Bruce.*) How long have you been in this part of the country?—Four years.

772. How long have you been conducting a mine?—Only the four years. I was not sent down to manage the mine.

773. What mines were you conducting in Derbyshire?—Not any. I was merely connected with a mineral agent in Chesterfield who had the management of several mineral estates.

774. What mines were you acquainted with there?—The Wingerworth mines.

775. What mines were they?—Coal mines; the Clay Cross.

776. Do you perceive any difference between the miners here and the miners there, as to health?—I think that the coal miners are the most healthy.

777. To what do you attribute that?—The air is generally better there.

778. Why is the air better?—Because you cannot give the ventilation to these mines which you can to the others; there is not the air forced into the mines here as there.

779. There are no artificial means?—There are no artificial means.

780. Can you, without artificial means, by a proper use of natural means obtain sufficient air to enable men to work under healthy conditions?—Yes, I think so, if you get more shafts, and put plenty of winzes. As soon as you are in an end in the copper mines, if the air is not very good in the end, if you put a winze through to another level, you then have good air at once.

781. According to you, there is no reason why the Cornish miners should not be as healthy as the coal miners in Derbyshire?—Nearly so. It is rather different in the mineral; there is a difference in the rock. I think myself that they get a portion of the rock on the lungs, as well as the bad air.

782. How do they get the rock on the lungs?—Wherever you are working there is sure to be a dust. Take, for instance, any large town where there are many grinders; those grinders never live long, for the very reason that they get dust on the chest.

783. (*Chairman.*) And you have seen dust in any of these mines?—You cannot help it, when you are working.

784. (*Mr. Austin Bruce.*) Are any means taken by the use of water to allay the dust?—In some holes they use water, and others are dry.

785. Have you driven any ends in where the dust has been bad?—No; not where you could particularly perceive it.

786. Are you speaking from what you know, or from what you have heard?—I am speaking what I think about it.

787. But is it what you think from actual observation in the mines, or what you have heard from others?—It is from my observation.

788. You have seen miners working in a dusty atmosphere below; is that it?—No. When you are driving an end, perhaps some of the ends are up, so that you cannot get any water into them, and the dust falls out, and then you are sure to get some dust on your chest.

789. Have you not dust in driving headings in coal mines?—Yes; but the dust is lighter there; it is not so heavy as here.

790. Was your mine a very deep one?—No; the lowest working is now 70 fathoms.

791. The heat was not great?—About 72 degrees.

792. What was the heat of the coal mines in Derbyshire?—That depends upon circumstances; where there is a strong current of air it would perhaps be fifty or sixty degrees, or something like that.

793. What is the extreme heat?—I do not know. If you get near a fire there is a pretty considerable heat at times there; if you get near the furnaces.

794. You say that you can drive the large levels as cheaply as the small ones?—Yes.

795. That is up to a certain point, I suppose?—If you get up seven feet or so, I think that that will do very well. I think that you can drive a level seven feet by four as easily as you could drive one six feet by three.

796. Without more cost?—Without more cost.

797. Did you use much powder in your mines?—Yes.

798. What means did you take to get rid of the smoke after the explosion?—There were no means, except by the machine, or by the natural draught.

799. How long did it take for the smoke to disappear?—For instance, where there is a pretty good draught it is gone away at once; but in an end where there is putting by the machine it takes some time to get it out of the level.

803. How soon did you usually go in after an explosion?—Sometimes half an hour, sometimes a quarter of an hour, and sometimes ten minutes afterwards; it depended upon circumstances.

801. Do you work in an atmosphere impregnated with smoke?—Sometimes; not always.

802. Did you ever observe that the miners were the worse for that?—I do not think that the powder is very good. I should not like to be there long myself.

803. Is there more powder used in these mines than in the coal mines?—They do not use much in the coal mines, unless sometimes they are driving through a rock, to drive one of the headings.

804. You said that you employed about sixty men?—Yes.

805. What was the age of the elder ones amongst those men?—About 50; some were nearly 60, I think.

806. Take fifty miners and fifty colliers, would there be older men at work, as a general rule, among the miners or among the colliers?—I should say among the colliers.

807. Have you ever known men taken ill at their work, and leaving their work, in consequence of working; for instance after a blast of powder?—Never, but one, at our mine, was obliged to leave; but it was not with the bad air that he got his chest bad.

808. (*Chairman.*) What was it with?—He got cold; he got his clothes wet, and was in his clothes a long time, and got wet on his chest, and then he could not stand the smoke afterwards.

809. How did he catch cold; was it after he came to the surface?—Yes. I asked him where he got it, and he said that it was at a mine they called Carn Vivian, a short distance away from us; they had not got a proper changing house there, and they had no fire.

810. It was not at your mine?—No.

811. What was that man's name?—William Gaize.

812. Is he alive now?—Yes, and is working on the mine now. When he could not stand, they put him to the engine.

813. His breathing is still affected ?—Yes ; a little sulphur or anything of that sort would affect him at once.

814. And he could not go under ground ?—No ; I do not think that he could.

815. But he got his cold at another mine, before he came to you ?—Yes.

816. (*Mr. Kendal.*) I understand that you came from a coal district down into this district ?—Yes.

817. With regard to the dust, and so on, did you yourself ever see any dust in a mine while a man was boring ?—Yes.

818. What sort of dust ; was it from the slate or from the copper ?—From the slate, and sometimes from the copper as well.

819. Did you bore dry frequently ?—Not often. At the bottom of the level they put it in this direction (*describing the same*), and they can keep the water in that way, and they draw out the dirt with a kind of spoon.

820. You have yourself seen the dust from the slate whilst the men have been boring ?—Yes.

821. (*Chairman.*) And from the copper ?—It is not often from the copper.

822. (*Mr. Kendall.*) Did you ever yourself feel any sensation of dust in your mouth from the boring, if you have been near ?—No ; it is not perceptible so that you could feel it in your mouth.

823. Did you ever hear any man complain of dust being in his mouth from boring ?—No ; but I believe myself that a good deal of it is from that.

824. How did you manage about setting the ground ?—At so much per fathom.

825. Did you do it yourself ?—Captain Richards used to assist me in doing that.

826. I suppose your experience was hardly enough to enable you to do it yourself ?—I could do it very well ; but he was there, and he did it.

827. Did you ever see any boring of copper in which there was any dust ?—You could not see much dust in the copper ; it is not very often that you bore into the copper.

828. You do not think, in your experience, that they bore into the copper ?—No ; unless the lode is very large.

The witness withdrew.

Mr. JAMES BARKELL examined.

Mr. J. Barkell.

829. (*Chairman.*) You are captain of the South Phœnix Mine ?—Yes.

830. How long have you been connected with that mine ?—I have been there five years the beginning of last March ; but I believe that the mine has been in operation since 1850.

831. Were you ever captain at any other mine before ?—Yes.

832. What other mine ?—The Caylan Mine, in Montgomeryshire, North Wales.

833. Have you ever worked as a miner ?—Yes.

834. What description of mine is the South Phœnix ; is it copper or tin ?—Both tin and copper.

835. What was the mine in which you worked in Wales ?—Lead.

836. How many men do you employ underground at the South Phœnix Mine ?—Twenty.

837. How many shafts have you ?—Only one.

838. What length of levels have you ?—I suppose that our longest drive from the shaft is about 160 fathoms. I am not certain ; you can see pretty nearly upon the plan.

839. What is the greatest depth ?—One hundred and sixty-six fathoms on the under-lie from the surface. Our shaft is diagonal ; we have no perpendicular. We have two air machines working a small shaft.

840. At the surface ?—Yes.

841. How are they worked ?—By a steam machine.

842. (*Mr. Holland.*) Is that a large duck machine ?—They are twisting machines of 20 inches diameter ; those two air machines send in about 400 cubic feet of air in a minute.

843. (*Chairman.*) Do you find that this provides sufficient ventilation ?—Yes.

844. (*Mr. Holland.*) For how many men ?—We have never any complaint of air.

845. (*Chairman.*) Is the air good at those levels ?—Very good indeed.

846. Do the candles burn there ?—Yes ; we never have any complaint.

847. The men have never complained ?—No.

848. Are the engines constantly going ?—They are always working.

849. How do the men ascend ; by ladders ?—By ladders.

850. What is the inclination of the ladders ?—The former part of that shaft was sunk down at an angle of 45 degrees. There are different angles in the shaft.

851. Is this shaft divided ?—Yes ; we have a whim working there, and the shaft is divided.

852. With wood ?—Yes.

853. When the men come to the surface have they a place to change ?—Yes.

853. Where is that ?—They change in the boiler-house.

854. There is no other place to change ?—No.

856. Is there any danger from the boiler-house blowing up ?—We have no appearance of it ; we do not know ; the men have never expressed a fear, and I have no fear in going to the boilers. We have proper safety valves.

857. Is your engine ever inspected ?—Yes, frequently.

858. At any stated periods ?—No ; the engineer comes once, perhaps, in two or three months.

859. Are most of the same men working with you now that worked with you when you first went there ?—Some of them are.

860. Have any been obliged to leave on account of ill health ?—No.

861. You do not know of any men who have suffered from working ?—No, not at all. If they have left it has been because the price which they have had for the ground has not been satisfactory. I have men there who have been working ever since I have been there.

862. And you do not think that the men suffer at all ?—No.

863. Have you any experience of mines elsewhere in this county ?—I have been underground in several of the mines in the county besides the South Phœnix.

864. Have you found in other mines that the ventilation was bad ?—I have found in other mines a natural ventilation ; but ours is an artificial one, as we are obliged to pump our own air.

865. But where it is natural ventilation do you think that that is as efficient as the artificial ventilation ?—I believe that one is as good as the other. If we had 150 men working upon the supply of air which we are giving them we should be short, whereas if there was a natural ventilation it might not be so.

866. A natural ventilation would be provided by having two shafts ; do you think that it would be sufficient if you had two shafts ?—Yes ; it would depend upon the extent of the workings. Two shafts would not be better than one in our place. If the workings were extended a great distance east or west from those shafts they would have to supply them with air by artificial means, as we have.

867. In driving one of these ends is there any dust created ?—We have one end which is driving a good bit from the shaft, but there is no dust, because there is water issuing from it ; but the other is dry, and in cutting it no borer dust arises from that, but only from the bore.

868. Is that in granite or in killas ?—It is all in granite.

869. Do you suppose that it is granite dust which is created by the boring ?—Yes ; it is the dust from the granite rock ; but the dust would not be there after the hole was as big as that you could put your finger in it ; they would then put water, and the dust would be stopped.

870. Have they the means of supplying water

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there ?—The levels are generally kept in, and the water follows them.

871. In blasting is the powder smoke a long time in getting away?—A few minutes ; ten minutes at the outside.

872. That is in this mine where the artificial ventilation is ?—Yes.

873. Would it take longer in other mines, do you suppose, where there was no artificial ventilation ?—No ; I should say about the same time ; it depends upon the strength of the natural ventilation.

874. (*Mr. Kendall.*) As I understand you, you worked in Wales in a lead mine ?—Yes.

875. And you have worked your way up to agency, having been a miner first of all ?—Yes.

876. Did you ever work in the copper mines in Wales ?—No.

877. Was your first connection with a copper mine here ?—No ; I worked as a boy at fourpence a-day in Friendship Mine, about four miles from Tavistock.

878. You have been a practical man from your youth up ?—Yes.

879. When you came to this mine, were you a miner first, or an agent first ?—I was in Spain four years before I went to Wales.

880. After you came from Wales did you come here as an agent direct ?—Yes.

881. What returns have you now from this mine ?—We have none now; we sold one parcel of ore from there in the month of November, and that has been broken little by little, for, I suppose, ten years. We are selling nothing now, and are raising nothing now in the shape of ore ; we are driving to make discoveries.

882. This rapid underlay shaft is in the course of the lode ?—It is on the course of the lode for a certain distance. You see a difference in the angle. It is in the course of the lode as far as 126 fathoms, and a slide came down there, and then the shaft was put down at a certain angle, irrespective of the lode.

883. With regard to the power of your ventilating machine, you say that the air is perfectly good. I see a winze from the 126 fathoms down to the 142 fathoms, but not connected ?—It is not connected.

884. Have any men, since you have been there, ever worked in that winze ?—No.

885. There is no connection there ?—No; there is no communication. That has not been worked since I have been there. We have a communication, as you see in the working plan, between the 100 fathoms and the 126 fathoms. The 80 fathoms is south, and there is a cross course, and then the 126 fathoms is driven the same distance west, and there we have a communication with the 100 fathoms, by a rise ; it is a perpendicular cross course, and can only be shown in that plan by a black speck.

886. What does the 126 fathoms connect with this way (*pointing to the plan*) ?—There is no communication with anything else.

887. As far as your information goes, do you think that before this communication took place the men could work safely there with the machine ?—We have never had any complaints.

888. No men have ever been there ?—Not in that winze, but they have in that level ; and I should say that the air was as good in that winze as in that level. That winze has been full of water, and I have pumped it out twice since I have been in the mine, and have had no difficulty in getting down.

889. Where are the twenty men working now ?—There are four driving at the 166 fathoms ; there are four driving at the 154 fathoms ; six are driving south at the 100 fathoms, in the cross course ; and six are driving south, at the 126 fathoms, in the cross course.

890. And that ventilation answers perfectly ?—Yes.

891. Is the dust which you spoke of entirely from the granite? You have no ore there that you can speak of ?—We have ore, but it is not sufficient to pay the labour of working it, and therefore it is not worked.

892. In your experience as a miner with regard to boring in holes, did you ever see much dust flow from the metal ?—There is always a dust in a dry rock in boring, that I have seen.

893. I am talking of the metal; the lead or copper. From your experience, suppose that a man had a veil over his face, do you think that the dust would fall upon his lip ?—I do not think that he would keep the veil there long.

894. Do you think that the veil would collect the dust there ?—From my experience, it is not necessary to have a veil over a man's face.

895. He would have no dust there ?—He would not have any.

896. (*Mr. Holland.*) Is there ever dust enough in the mine to make a man cough ?—I have never seen it.

897. I think you said that the machine sent you about 400 feet of air a minute for 20 men ?—About that.

898. Is the 166 fathoms level cool ?—Very cool ; the water is so cold that you could scarcely suffer your feet in it.

899. How is the air ?—The air is cold.

900. How long does the powder smoke hang about there ?—Perhaps ten minutes or a quarter of an hour after the blast.

901. And then you can see quite well ?—Yes.

902. (*Mr. Davey.*) What size do you carry your levels ?—Seven feet high, and four feet wide.

903. I see that you have not communicated any winzes from one level to the other ?—We have one communication from the 126 fathoms to the 100 athoms.

904. It is not shown on the section ?—It is not shown on the cross section, but it is shown in the working plan.

905. Are you working at all upon the lode, or only upon the cross cut ?—We are working upon the lode; the 154 fathoms and the 166 fathoms.

906. What size is the lode ?—At the 154 fathoms it is five feet wide ; at the 166 fathoms we do not know the size of it.

907. What is it composed of ?—Of quartz, capels, and mundic, and spots of copper ore.

908. Is there still that rapid underlay ?—Not at the 166 fathoms ; it does not underlay more than about two feet in a fathom at the 166 fathoms.

909. (*Mr. Holland.*) When was this ventilating machine put down ?—One machine was there before I came on the mine five years ago ; the other has been put there since.

910. You put the second one down after the want of it was felt, I suppose ?—The mine was only 126 fathoms deep when I went there, and we have sunk 40 fathoms since, so that we have put down this other air machine to supply the air to the bottom levels.

911. Was it put down as soon as the bottom levels were begun ?—It was put down before, in the course of sinking the shaft.

912. You never tried whether it would do without the ventilation ?—No ; we found it necessary.

913. (*Mr. Fulke Egerton.*) What is the expense of this artificial ventilation; is it an expensive apparatus? —No ; it is merely a 20-inch square cylinder. I should say 6*l.* or 8*l.*

914. £6 or 8*l.* to erect ?—Yes ; the cylinder would cost that, and it would depend upon how far you had got the shaft. We have a perpendicular shaft to put those air machines in of about 20 fathoms from the diagonal shaft.

915. The men go down the mines by ladders?—Yes.

916. Do you find that they suffer much from the labour of coming up or going down ?—No ; it is a very easy footway, in consequence of its being so flat.

917. What is the cost of the working of this ventilation per month ?—That I am not prepared to answer ; it is a little more friction upon our engine. I do not know how much more coals it would cost to work it, but I should say that it would not be much; perhaps a ton of coals in a month.

918. What is the price of coal ?—Eighteen shillings and sixpence per ton is our contract.

919. That is laid down at the mouth of the pit ?—At the engine-house.

920. What is the power of the engine?—About

28-horse power, I should say. On Saturdays we take off the air machine, and connect it again on Monday mornings. I cannot state what the difference of coal would be ; that is the only difference, except that the engine works lighter if the air machine is not attached to it.

921. You do not consider it an expensive apparatus ?—It is very inexpensive.

922. You say that the cylinder cost 8*l.* ?—Yes; I should think that that would pay for it.

923. And then there is the cost of the gearing, the connecting rods, and so on, which is not much, I presume ?—No. The leather has been there for five years, and is never altered. It takes a little grease and oil occasionally.

924. Would you put the whole expense of the apparatus at from 10*l.* to 12*l.* ?—The apparatus, I think, would not cost so much ; the cost of erection would depend upon the situation, how far it was put down from the shaft.

924. (*Mr. Austin Bruce.*) What proportion of the ventilation do you believe to be artificial, and what proportion natural ?—It is all artificial. I do not suppose that we could sink one shaft 30 fathoms under adit without supplying the air by artificial means.

926. Are you a Cornish man ?—No.

927. A Devonshire man ?—A Devonshire man.

928. Are you of a family of miners ?—Yes ; my father was a miner, and I have had nine brothers, all miners.

929. Are they now miners ?—Yes, excepting one, who is dead.

930. Where are they miners ?—One is in Australia.

931. Are the others in this country ?—Three are in Devonshire ; one is an agent at Yarnar Mine, near Bovey Tracey ; two are in Tavistock, and two are at the Lakes of Canada (Lake Superior, I believe), in the mines there ; one is in Australia, and one died of the cholera.

932. Are any of them working as miners in this country ?—The two in Tavistock are working miners.

933. How long were you a working miner ?—From 10 years of age until 21, I suppose.

934. And then you got into a position of trust ; you ceased to follow manual labour ?—Yes ; I went to Spain when I was 21 years old.

935. Are your two working brothers older or younger than you ?—One is older and one is younger.

937. Are they as healthy as you are ?—I believe so.

937. What mines are they working in ?—I cannot tell you ; one was working at Devonborough, and the other at Sortridge ; but where they are working now I cannot say.

938. How long were you in a lead mine in Wales ?—Yes ; for three years at Caylon in Montgomeryshire.

939. Did you observe any difference in the mining population there and in Devonshire and Cornwall, as far as regards health ?—We had all natural ventilation there; the levels were driven in the sides of the mountains; we have no workings under the base of the hill.

940. You have not answered my question ?—Their health was good ; I do not know that they suffered anything.

941. I asked you whether you observed any difference between their health and the health of the Devonshire and Cornish miners ?—Not at all.

942. Do you consider the Cornish miners to be a healthy race ?—I cannot speak of the Cornish miners; only those that I know. I know about the miners in this district ; they are healthy.

943. Do you think that they are as long lived as those who work upon the surface of the ground ?—I cannot say that ; I do not know that they are.

944. Are they as healthy in appearance ?—Yes.

945. Do you think that they continue to be able to work as long as men who work above ground ?—I cannot say.

946. Have you had many men leaving you on account of consumption or from failing health ?—I never had one who left since I have been an agent.

947. How many hours a day would the men work in the deepest part of your shaft ?—The same as they would in the shallows; eight hours.

948 At the end of that time, in what state were they when they left the pit ?—They were fit to work another eight hours, and they have done it frequently. If there is anything amiss with one of their colleagues, and he does not come, they take a bit of something to eat, and go down and work another eight or nine hours.

949. That is the state in your pit. Have you been in the neighbouring shafts ?—I have been underground in several mines, and I believe that that is the state in most mines in which I have been.

950. You have been, I suppose, a good deal in the company of the working miners ?—Yes.

951. Have you ever heard from them any complaint as to their health being affected by the nature of their work ?—No.

952. Are no coughs attributed to it ?—Not that I know of.

953. Have you a doctor connected with your shaft—?We have a doctor at the mine, and our men pay to the doctor.

954. How is he paid ?—We charge for doctor and club 1*s.* 6*d.* a month ; the doctor has 9*d.*, and for the 9*d.* he renders medical attendance to the man and his family.

955. What is the name of your doctor?—John Jago.

955*a*. Where does he live ?—At Liskeard.

956. (*Chairman.*) Does the doctor only attend in case of accident, or does he attend in case of illness?—He attends in all cases when he is sent for. If anything is the matter with any of the family they send for the doctor.

957. Does the 9*d.* a month include the wife's confinement and all ?—No.

958. Only illness ?—Sickness in the family. There is a club, and we take 1*s.* 6*d.* out of the men's monthly gettings for the club and doctor.

959. (*Mr. Holland.*) They pay 1*s.* 6*d.* a month and they get 4*s.* 6*d.* a week when ill ?—Yes, with medical attendance.

960. They pay 9*s.* a year to the club ?—Yes.

961. And they get 4*s.* 6*d.* a week when ill ?—Yes.

962. Then you reckon upon their being ill a fortnight in a year ?—We do not make any such calculations.

963. (*Chairman.*) Am I to understand that the 4*s.* 6*d.* is allowed to them for any casual illness not connected with working in the mine ?—If a man was sick from any other cause, if he had not been working in our mine more than a week, he would have 4*s.* 6*d.* a week and medical attendance as long as the mine worked.

964. (*Mr. Austin Bruce.*) Do you pay him out of the fund, or are you responsible to him for 4*s.* 6*d.* a week ?—It would be charged in the cost of the mine. I do not keep the books. I do not know how the funds of the doctor and club would stand, but I know that I should charge that money.

965. (*Mr. Kendall.*) As I understand, it is this ; that supposing the fund of the club is not rich enough to pay, still the miner gets his money ?—Yes; the company would pay it.

966. Is there generally a balance in hand in favour of the fund ?—I am happy to say that we have never had a test ; we have been very fortunate in our club; we have not had much sickness in it.

967. (*Chairman.*) Supposing the mine to stop, that 9*d.* which the men have subscribed would belong to the shareholders of the mine; it would not be redistributed to the men ?—There would be nothing refunded to the men.

968. (*Mr. Kendall.*) As I understand you, you have had nine brothers who have been miners, and you have worked your way up as a miner ?—Yes.

969, And you have all your brothers living now, except one who died of the cholera ?—Yes.

970. Some are working men now, and some are agents ?—Yes.

971. What is the age of the oldest and of the youngest ?—The oldest I should say was about 48, and the youngest 25.

972. What is the man who is 48 ; is he used up, or is he able to work still ?—He is not used up: he is one of the men working underground.

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973. And is he healthy and strong ?—Yes.

974. When did you see him last ?—About two months since.

975. Is he working on tribute or on tut work ?—He is working at tutwork; he had a boy working with him.

976. Are you at all aware of his average gettings in the last 12 months ?—No.

977. Is either of your brothers weak ?—Not that I know of.

978. (*Chairman*). You say that there is a payment of 4*s.* 6*d.* a-week, whether the men be injured, or whether they be ill ?—Yes.

979. How long do you continue to pay them, supposing that it is a long illness; is there any limit ?—There is no limit.

980. You would pay a man for years if he continued ill ?—Yes.

981. Is it usual to have no limit ?—I never knew any limit in mines. Of course if his illness was brought on through his own seeking the money would not be paid to him at all; if it was brought on through wrestling, or any such things, we should not pay him; but if it was a natural sickness we should pay him.

The witness withdrew.

Mr. W. Richards.

Mr. WILLIAM RICHARDS examined.

982. (*Chairman.*) With which mine are you connected ?—West Sharp Tor.

983. You are captain of that mine ?—Yes.

984. How long have you been engaged at that mine ?—A little over twelve years.

985. Were you employed in any other mine before this one ?—Not as an agent.

986. Have you worked as a miner ? — Yes, at several mines.

987. At what age did you begin to work ?—Between eight and nine.

988. And you have worked your way up to your present position ?—Yes.

989. Have you worked in any other mines in Cornwall ?—Yes.

990. Were all the mines in which you have worked in Cornwall ?—No; two were in Devonshire.

991. Is your present mine a copper or a tin mine ? —It is copper.

992. And it has been working twelve years ?—A little over twelve years.

993. Did it only begin working when you came, or was it an old mine resumed ?—It was a young mine just commenced when I went there.

994. What is the depth of the shaft ? — It is 162 fathoms, partially worked. (*The witness exhibited a section of the mine to the Commissioners.*)

995. You have two shafts ?—Yes.

996. And the deepest is 162 fathoms ?—Yes.

997. What is the greatest length of a level from one shaft ?—About 120 fathoms.

998. Is it working at the present time ?—Not at present; it is in abeyance for a time.

999. That is connected with the two shafts ?—It communicates with them.

1000. What is the greatest length of level at which men are now working ?—The 162 fathoms; all our force is concentrated to those points for the present.

1001. What number of men have you ?—We have eighteen miners at present. There are three in the ends, but there is a cross cut; there are two men at each.

1002. But they change ?—Yes.

1003. Have you any means of ascertaining what the heat is there ?— We have no means at present, but it is very good; the heat is only the ordinary temperature; it is close to an engine shaft.

1004. The ventilation is good there ?—Yes, it is close to the engine shaft.

1005. And that is divided into two parts ?—Yes.

1006. And the ladders are at one part ?—Yes. The engine-rod is shown as far as this (*pointing to the section*), and below that there are rods, and the division would be about here (*pointing out the same*).

1007. What is the extreme length of the end at the bottom from the shaft ?—About five fathoms; it is shown off a little bit there beyond the actual length.

1008. You say that you have worked from the commencement of this mine ?—Yes.

1009, When you were driving this level, marked here No. 70, had you any means of ventilation before you reached the other shaft ?—Yes.

1010. Artificial or natural means ?—It was a waterfall; a spring of water which used to issue from a portion of the shaft about here (*pointing to the section*), and then we concentrated it into a cistern, and forced on the air by the fall of the water in zink pipes conducted through the level.

1011. So that no inconvenience was felt by the men working there ?—Not at all.

1012. How far did you drive this level before you applied this artificial means ?—Just eight or nine fathoms. We applied it at once, because we could avail ourselves of it at once.

1013. Of what size was the zinc pipe ?—Five inches diameter.

1014. And you found that perfectly sufficient ?—Yes.

1015. What was the cost of that ?—It was only the cost of the pipe; it was 2*s.* 4*d.* per fathom.

1016. When you drove the ninety fathoms, did you apply the same means ?—That was communicated previously to commencing that, and therefore we availed ourselves of the same apparatus.

1017. In driving the 110 and 125 did you use the same means ?—Yes. These points were dispensed with, and we therefore applied it to those deeper parts.

1018. You only worked one of these at a time ?—Just so.

1019. Do the men ascend by ladders ?—Yes.

1020. Do they suffer by ascending from ladders ?—I should think very little indeed.

1021. How long does it take them now to ascend ? —Between five and ten minutes. There is only 60 fathoms. The 100 fathoms is at an angle of 43 degrees, and therefore it is rather an acute angle, and is therefore easy.

1022. When the men ascend to the top, have you a changing house ?—We have a changing place.

1023. Where is that ?—It is in the boiler-house, by the side of the boiler.

1024. Would it not be better if there was a changing house as well ?—I think so; but the probability is, that the men would prefer the present place. I am of that opinion because the temperature is warmer.

1025. Have you ever seen any changing houses which are heated ?—I have.

1026. Do you think that is an advantage ?—In some cases.

1027. I suppose that that is the case when there are a great number of men ?—Yes; when the men are numerous I think it probable that they would prefer a little more room. We have only six men at a time.

1028. You have worked in other mines ?—I have.

1029. Large mines ?—One very large mine, the Devon Great Consols, in Devonshire.

1033. Have you worked in any large mines in Cornwall ?—Not in any very large mine in Cornwall.

1031. (*Mr. Kendall.*) Are most of the men whom you have working now young men, or are some of them old men ? — Some of them are young, and some old, that is to say, moderately old; perhaps the oldest man would be 45, and there are some as young as 22; from 22 to 45 would be, perhaps, about the average.

1032. You have worked in a great many mines; what is your experience with respect to the miners; when do they begin to fail in their strength ?—In my experience I have not seen sufficient to answer that question exactly.

1033. You have worked as a tributer yourself, have you not ?—I have.

1034. And you have worked as a tut-workman ?—I have.

1035. I suppose you picked out your comrades when you used to work ?—I have always done so.

1036 At what age do you generally look shy at a man as a comrade ?—I should have no objection, if I was young, to work again to-morrow, to take a man of 40 years of age.

1037. Would you go beyond that ?—Yes, in some cases. In very many instances, I might say, it would depend upon the mine in which he was going to be employed.

1038. With regard to dust, I suppose you have bored in copper, and in tin, and in granite, and in killas or slate ?—I have.

1039. Did you, in your experience, ever see the dust arising in the boring ?—I have witnessed a little occasionally.

1039 *a.* In which ?—In all kinds.

1040. In boring for copper, have you witnessed any dust of any moment ?—I have a little.

1041. To what extent have you seen it ?—I may say a very little ; it would be just by taking in the back of the end.

1042. Where you are obliged to reach up ?—Yes ; close to what we call squaring in the back.

1043. Do you think that there is so much dust that the men breathe that dust ?—I think it is probable that they inhale a little.

1044. Did you ever hear any man complain of it as being injurious ?—No complaint is ever made. I never made any complaint at the time, and I never heard my comrades make any complaint at the time.

1045. Still, there might be injury without complaint ?—I think it is possible that there may be a little injury done, but very little, I should say.

1046. (*Mr. Davey.*) Did you ever feel any inconvenience result from this dust ?—To say that I never felt any inconvenience, I think perhaps that would be wrong, but very little in my experience.

1047. How often, in the course of a week or a month, might it occur that the men would be working in the end so as to produce that dust ?—Probably four times a month, when there would be just a little inconvenience.

1048. But in any other part of the end there would not be dust ?— There is water applied to check it.

1049. What is the produce of the mine where you are ?—Copper. The mine which I have just been speaking of is the Devon Great Consols. At the present time we get a little copper occasionally ; that is the object ; we have raised just a few tons.

1050. (*Mr. Kendall.*) How much have you sold ?—None.

1051. And you have been working 12 years ?—Yes.

1052. You are still in hopes ?—Yes.

1053. (*Mr. Davey.*) What sized lode is the 162 fathoms generally ?—Thirty-two feet wide.

1054. What is it composed of ?— Iron, quartz, a little copper, a little mundic, and a little fluid of lime, and so on.

1355. Of what width do you carry the levels ?—Seven feet high and five feet wide.

1056. (*Chairman.*) Have you had any accidents occur from blasting ?—We have only had one during the 12 years.

1057. How did it occur ?—It was through the carelessness of the man ; it was a premature explosion.

1058. Was it from his going back too soon ?—It was from the carelessness of inserting into the hole the tamping before he had properly cleaned out the hole, and taken out the few grains of powder on the side of the hole; what we call the swab-stick.

1059. What kind of fuse do you use ?—The best in the country ; from Bickford and Company.

1060. Is the smoke a long while clearing away after the charge has been fired ?—No ; a very little time elapses before we can go at the work again.

1061. I suppose that the men are anxious to see the result, and sometimes go in before the smoke has cleared away ?—Yes, there are such occasions ; sometimes they are very anxious, but in the majority of cases they wait a proper time.

1062. Are the borers made of steel ?—We use steel.

1063. (*Mr. Austin Bruce.*) Did you begin as a working miner ?—Yes.

1064. How long were you a working miner?—Fifteen years.

1065. Did you ever suffer yourself ?—I cannot say that I have suffered anything very direct. I do not know. I may have partaken probably of a little injury from bad ventilation. I do not know. I cannot say that I ever did ; it is possible that I may have done so.

1066. We have heard something of a cough which the miners are said to have ; have you ever had it ?—I do not know whether I may have had what they term the miner's cough. I think not myself.

1067. Have you observed any of your fellow workmen suffering from it ?—I think not, in my experience.

1068. Have you known many of them obliged to give up their work under ground early in life ?—I have some few; very few.

1069. Do you know to what cause that was owing ?—I cannot say that I can attribute it to any particular cause.

1070. How long have you ceased to work yourself ?—A little over 12 years.

1071. Do you believe that if you had continued working underground you would have been as healthy a man as you are now ?—That would have depended entirely upon circumstances. I am sure I do not know how I might have been placed.

1072. You mean by that, that it would have depended upon whether you worked in a well ventilated mine or in a badly ventilated mine ?—Yes.

1073. Have you ever worked in an ill ventilated mine ?—I never have.

1074. Have you ever been working in a mine parts of which were ill ventilated ?—Never.

1075. Have you ever had any experience of workmen who were working in badly ventilated mines ?—No; nothing of the kind has ever come under my notice.

1076. What is the deepest mine that you ever worked in ?—The one which I am now engaged in is the deepest mine that I have been connected with ; but I have been underground in deeper mines.

1077. Have you ever suffered at all from ascending and descending by ladders ?—Not myself, that I am aware of.

1078. Have you ever seen others suffer from it ?—Not to the best of my belief.

1079. Do you believe that after a hard day's work a man can mount 300 fathoms, and be no worse for it ?—I should think it was possible that he would be the worse for it.

1080. But you have not yourself seen any instances of it ?—No ; no case has come under my notice of any particular complaint.

(*The witness explained the working plan of the mine to the Commissioners.*)

The witness withdrew.

Mr. THOMAS TREVELYAN examined.

Mr. T. Trevelyan.

1081. (*Chairman.*) I believe that you are the captain of Herodsfoot Mine ?—I am.

1082. Will you state how many hands you employ altogether at that mine ?—We have 70 men under ground, and about 50 labourers at the surface ; men, women, and children.

1083. What number of shafts have you in the mine ?—We have four shafts.

1084. What is the deepest ?—150 fathoms from the surface.

1085. What is the length of any ends from either of these shafts at which you are now working ?—From our two main shafts there is about a distance of 300 fathoms.

1086. You have not a plan of your mine with you ?—I have not. There are about 300 fathoms from the two extreme shafts ; the other two shafts are intermediate ones.

1087. What means of ventilation have you ?—We have extraordinary ventilation just at this time; very good indeed.

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1088. Natural ventilation ?—Quite so ; we have nothing else in the mine.

1089. Are there any winzes ?—We have not winzes, particularly ; our lode is a north and south course, and we are working one part of the lode south ; we are driving all our levels south ; we are driving five levels south, and we have been fortunate enough to take away all the ground for the last five years, consequently the air traverses down through the different levels; it goes down, and goes back through the north levels, and up the shaft.

1090. Do you know what is the greatest heat ?—I have never tried the barometer, but it is very good.

1091. So that such a thing as that a candle will not burn never happens ?—No.

1092. And there are no complaints from the men of bad air ?—No, not at all.

1093. How do the men ascend and descend; is it by ladders ?—Yes; they climb.

1094. Are those ladders perpendicular, or are they on a slope ?—Our sumpt shaft is perpendicular to the 70 fathoms, and then we sink from the 70 fathoms to the 150.

1095. The men come up different shafts ?—Yes; they come up the south shaft where our levels are now. We are now sinking perpendicular, and that is a new shaft, and that shaft is down to the 80 fathoms.

1096. Do the men prefer coming up one shaft more than the other ?—The men at the bottom levels come up the sumpt shaft, and those working near the south shaft, where the shaft is down to 80 fathoms, come up that way ; it is a matter of choice ; they may go either way.

1097. Is it not very fatiguing to come up the ladders ?—Of course it is fatiguing.

1098. When they arrive at the top are they usually blown ?—No ; they generally manage to take their time; they do not force themselves to that extreme; there is no such compulsion.

1099. Do none of the young men ever try to race up ?—No. It is certainly fatiguing and hard work to climb ladders. I have experienced it myself almost daily, but we were not bound to exert ourselves to such an extent as to exhaust ourselves.

1100. The men never complain of suffering from bad air ?—No.

1101. Do they ever catch cold in coming up ?—Not that I am aware of.

1102. You have a changing-house ?—Yes.

1103. Is that at the boiler, or is it separate ?—We have a house distinct from the boiler-house, which was built distinctly for them to change in ; it is optional on their part ; sometimes they prefer the boiler; we do not interfere with them. The quality of the boiler is very good, and consequently they venture to go there. When it is very warm they might go to another place.

1104. You say that "they venture to go there;" is there any danger ?—There must be danger connected with it where there is steam, but we do not suppose that there is any great danger.

1105. But there is danger of the boiler bursting ?—Of course there is no certainty at any time where there is high-pressure steam.

1106. Have you ever known a boiler burst ?—Yes.

1107. In these works ?—Yes.

1108. Was there any loss of life occasioned ?—A man was retreating from that boiler-house; the engine was not working; we do not work it by night; we work it in the day. The steam was got up in the morning, and some men were changing there, and the engine-man had not commenced working, and he had got the steam rather higher than it ought to be. The men had left the place, and this poor man had left also, as they thought, but the steam was buzzing up rather fast, and he wanted to go back ; his comrades did not want him to rush back while the steam was rather high, but he went back, and in retreating again the boiler burst ; the engine was not working.

1109. If there had been more men working in the boiler-house at the time, the loss of life might have been serious ?—Of course it would have been ; a boiler cannot burst without doing damage if men are there.

1110. Then you think that it would always be safer to have a separate changing-house ?—Yes; we have one now ; but the men will go to the boiler-house again.

1111. Is the changing-house which you have heated at all ?—No.

1112. It is not a drying place ?—We have no fire put into that house ; ours is a very dry mine; we have no water; the men are always dry, and by putting their clothes upon the boiler, and changing there, we find it quite sufficient.

1113. I suppose that when men come up very hot, and in cold weather, it would be an advantage that the changing-house should be warmed or comfortable ?—They are very close; where they come up the footway they are there immediately.

1114. The footways are close to the changing house ?—Yes.

1115. You have more than one changing-house ?—Yes; we have another in the south part of the mine where the men connected with the shaft change ; we keep a fire there night and day, because the men working in the shaft require to dry their clothes.

1116. They get their clothes wet ?—Yes. A house is especially set apart for themselves.

1117. I suppose that you have worked in other mines?—Yes; I have been a miner thirty years.

1118. Have you been down other mines since you have left off working in them ?—Yes.

1119. I suppose there are other mines in which you find that the ventilation is not so good as in your own mine?—Yes. I have seen mines which are not so well ventilated, and it is impossible to keep all mines perfectly ventilated at every point.

1120. You mean that when they are driving an end away from the shaft the ventilation must be bad ?—Yes. Sometimes objects are to be accomplished, and points to be proved, before we can bring down the ventilation which we might desire ; I cannot say that at all times perfect ventilation exists in every mine.

1121. In any mine in which you have worked or which you have seen are there any artificial means used ?—I have seen artificial means.

1122. Did they seem to you to answer ?—They seemed to answer very well. I suppose that the air is not so good as the natural air. I question that, and it is not believed that it is so good ; but still it is a great assistance.

1123. What are the artificial means which you have seen ?—Sometimes the air is forced with fans, with waterfalls, and sometimes it is done by fans worked by boys forcing it in, causing a rush of wind, and it is conveyed in by a close pipe.

1124. I suppose that that ventilation is not brought direct from the surface, but is taken from any shaft or opening, and is forced in ?—Yes.

1125. Have you ever seen a machine at the surface ?—Yes; a kind of fan there, to pour air down the shaft.

1126. In driving the sbaft, do they take any means of dividing the level ?—We have never done so; I have never seen a level divided.

1127. Something like what is called in the coal mnies brattice work?—No. We divide, of course, our engine-shaft, but not purposely for the air.

1128. One part is for bringing up the material and the other for going down ?—Yes.

1129. Does dividing a shaft make a current of air ?—Yes ; when it is divided it does assist.

1130. Would it not be possible to have a temporary division in the level in which you were working, so as to form a current ?—I cannot tell. When the air traverses in to a certain distance, it does not always come in from the shaft ; the air might come in from the top levels, and circulate right through the levels.

1131. You have never tried the dividing of a level to form a current ?—No.

1132. Have you ever known the men complain of ladders ?—No, never.

1133. Do you know in Cornwall what is called the miner's disease ?—Yes ; I have heard so many statements respecting miners hardly living at all that I have taken the ages of all our men, which I am quite

willing to submit to you. I have put down all their names and ages, and struck an average. I have been in the mine eleven years.

1134. In this same mine?—Yes. I have the name and age of every man taken down, from the youngest to the oldest, and we have only had two deaths in eleven years, (*producing a paper*).

1135. Are these both surface and underground men?—No; there are no surface men there; those are all underground men.

1136. I see that fifty-four is the greatest age?—Yes, there are two of the age of fifty-four; the youngest is eighteen.

1137. Are there any boys?—I have none less than eighteen, and only two at that age.

1138. Is that because you do not allow them to go down, or because you think that they cannot work sufficiently?—I prefer men.

1139. As more efficient workers?—Yes.

1140. Are there any of these men that you are aware of who complain of shortness of breath?—Not one; I do not know an individual among the lot who does so. There are seventy men, who average from fifty-four down to eighteen, the average being thirty-two and two months.

1141. During the eleven years, how many accidents have there been?—Two.

1142. What did they occur from?—The first was a young man killed by a piece of ground turning out at the bank of the stope. I only passed the stope five minutes before he was killed. It was a projecting rock, and I had no sooner gone over the stope than it proved that those two rocks were what we call a-head; they were fast together by the head, so that the weight came over, and came down upon the young man, and killed him instantaneously. The other death occurred through a man slipping in descending, and he was killed.

1143. There is always a chance of falling away from the ladder?—Yes, and sometimes a short distance might kill a man, depending upon whether he pitches upon his head or otherwise.

1144. The steps of the ladder are made of iron, are they not?—All iron.

1145. Is there any periodical inspection of the ladders?—We keep a man to examine all the timber-work daily; he is kept purposely for that.

1146. You have never had any accident from men being careless in blasting?—Never.

1147. Have you certain rules laid down for them?—We have rules, and I take upon myself at all times to give them advice to be cautious, and mind what they are using, and we have been very fortunate, and have never had an accident in blasting.

1148. But do you think that unless the men are properly advised and looked after they become careless in blasting?—They are tolerably considerate and thoughtful men; they know what powder does; and knowing the results of powder, they know that they are dealing with a very important ingredient.

1149. In this mine you have never had any foul air to contend with?—No.

1150. Have you worked in other mines?—Yes.

1151. In Cornwall?—Yes; I was from Camborne originally. I worked in Dolcoath 25 years ago, 200 fathoms deep, before they took up the lifts; they have put them down again now.

1152. Have you ever seen a man engine?—Never; I have never been in those mines where they use a man engine.

1153. Are there any mines in Cornwall that you know of where the men are taken up in skips?—I have never seen it; I know the names of the mines, and that is all.

1154. I believe that there are such mines?—I have heard so.

1155. Do you not think that it would be an advantage for the men to be conveyed up by some means, instead of having to climb?—We must admit that it is a great assistance, and a very comfortable passage, instead of climbing.

1156. Do you suppose that there is any difficulty or objection to carrying out properly these means?—There are great difficulties to contend with, if we go into the general question. We cannot put man-engines and shafts for every mine, just where people may imagine. They are plausible things to talk about, but difficulties will occur.

1157. How many women are employed at your mine?—We have six little girls, just for picking, and that is all.

1158. You have none for breaking?—No; we keep men for that.

1159. Is it men who have given up working underground who take that work?—No; we have not an old miner on the floors; they generally come from the class of agricultural labourers, and finding that we give, probably, a little higher pay than they would get as agricultural labourers, they come to us, in order to benefit themselves.

1160. You give higher pay than the agricultural labourers receive in the neighbourhood?—Yes.

1161. What is the pay of a surface man, generally?—2*s.* a-day.

1162. What do the pit workmen earn generally?—Our man strike on an average about 3*l.* 12*s.* 0*d.* per month.

1163. And, of course, the tribute men you cannot found an average upon?—No; but we have no tributers in our mine.

1164. Is it all done by tutwork?—Yes.

1165. The taking out of the ore?—Yes; we take out all the ore on tut-work.

1166. In your opinion is that a more satisfactory way of working than as tributers?—I am better pleased with it. Perhaps, under some circumstances, tribute would be better than tut-work, in some mines; but having north and south lode, and only one lode in our mine, and being tolerably rich in silver, lead, and so on, we think it better to have it under our own control, and to have no tributers mixed up with it.

1167. (*Mr. Kendall.*) Your mine has been a profitable mine for some time, has it not?—We have been paying a fair profit for the last four or five years.

1168. You have been the head agent there for a long time, have you not?—I have been an agent there eleven years, but not the head agent. I have been manager of the mine for the last three years.

1169. Have you found the adventurers always ready to follow out any of your suggestions for the benefit of the miners?—At all times.

1170. Then if you thought that a dry was necessary, and suggested it, you have no doubt that they would carry it out at once?—Yes. I have built a house, but a fire has not been put in.

1171. But they would not mind the expense of a fire?—I think not; or if the men asked for it I would put it there.

1172. It is a very rare thing to take away so much of the lode as you do?—Yes, very rare; but we have taken away almost the whole of it for the last seven years.

1173. You have better ventilation there than in most mines?—Yes; owing to that.

1174. Take your own mine, and take other mines, do you think that your miners, as a body, are more healthy than in other mines?—I am hardly justified, perhaps, in contrasting my own men with other parties' men; perhaps it would not be fair for me to pass any remarks upon others; it would be illiberal.

1175. You are satisfied that your men are up to the average?—I am very well satisfied with my own men.

1176. With regard to the club, what do you allow them per month, when they are ill?—1*s.* a-day, hurt pay; 30*s.* per month.

1177. If they are consumptive, or anything of that kind, and have been with you a long time, what do you allow them?—We have no private fund for sickness.

1178. You confine it to accidents entirely?—What we term hurt-pay.

1179. Do you give them anything in the way of

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wine, or what they require ?—Yes ; our late manager was very well for that. When a man had a bone broken, perhaps his arm, or any thing of that sort, he was always allowed a little animal food, and something extra, to restore him again.

1180. What do you deduct per month for the doctor and club ?—One shilling and sixpence.

1181. Is not that the usual run throughout the whole of the county ?—I think so. We have been paying poor rates in Lanreath for the last eleven years, and not one of our men has had relief from that parish. I can say that with propriety. I told the farmer so the other day. We are rated at 140*l.* a year.

1182. You are rated upon the lord's dues ?—Yes ; of course that would fluctuate.

1183. Do they rate you up to the full ?—Sometimes we go down, and sometimes we go up ; we take it on the average ; it would be higher sometimes, and sometimes perhaps it would be low ; but we entered into a fair arrangement. I do not know that we ought to pay any poor rate, because we pay individually.

1184. (*Mr. Holland.*) You have no boys working in your mine ?—Not underground, under 18.

1185. Is it usual for boys under 18 to work in the mines ?—Yes ; many boys in the county work at a less age than that.

1186. The absence of any boys in the mine of course makes the average age higher than usual ?—Then we have not very many old men. If we had many old men it would help out the youth.

1187. Have you the ages of those working above ground ?—No. They never have been down the mine, and I thought it immaterial to bring the ages of the surface labourers. I thought that it would be most satisfactory to you to see the ages of the underground men, as much had been said about their not living long.

1188. You said that only two had been killed in your mine in 11 years ?—That is the time that I have been there. This month will make my 11 years as agent.

1189. Have you employed about the same number during that time ?—About that.

1190. (*Mr. Davey.*) You said that you attributed the goodness of the air in your levels to the stopeing of the ground ?—That was a considerable improvement.

1191. Do you stope from the back ?—Yes ; and drive levels.

1192. What is the price ?—About 2*l.* per fathom.

1193. Do you never use powder ?—Yes, sometimes. We should sometimes have a little to relieve the hard part, and we should then blast the hard part. Sometimes our lodes are six feet wide, and mixed up with the stuff which we send up to the surface ; it is sometimes perhaps eight feet wide, and sometimes it drops down to two feet, and sometimes to one.

1194. Taking the lode ; it is not very rich ?—No ; it is tradgy.

1195. Have you ever worked in any other lead mine ?—No ; but I have been agent in another lead mine.

1196. Are you aware that lead mines generally have worse air than tin or copper mines ?—No; I am not aware of that. I know all the lead mines in the district.

1197. (*Mr. St. Aubyn.*) Is it not very unusual for a mine to be so dry as yours ? You said that you had no water ?—I did not mean to say that we had no water ; but I say that the places where the men are working are dry.

1198. You look after your men a great deal, by your account ; you take care of their health ?—I do not wish to boast of doing anything. I do the best I can do for the men, of course.

1199. In fact, they are well looked after ? — I think so.

1200. You say that the average age is 32 and two months ; are you aware of any other mine in your neighbourhood where the average of the miners' ages has been taken ?—No ; I have never seen or heard anything about it.

1201. You can only form a guess as to whether your average is better or worse than in other mines ? —I did not know our average before I took down the names and ages. I do not know at all about other mines. I do not know the individuals who work in other mines. I have seen the mines, but I do not know the men.

1202. You consider your mine to be a very healthy one ?—I do ; I am perfectly satisfied of that.

1203. (*Mr. Austin Bruce.*) Do you believe that every mine throughout the district is as well ventilated as yours ?—I think that the mines in this district are very well ventilated, as far as I have seen of them, and I have seen the majority of them.

1204. Yours is a silver-lead mine ?—Yes.

1205. Have you ever worked in copper mines ?—Yes.

1206. In the copper mines in which you have worked has the ventilation always been as good as in the mine which you now manage ?—Yes, I think very good.

1207. Have you ever heard the workmen complain of working in close ends with insufficient air ?—Yes, I have heard that.

1208. Have you ever seen workmen who were so working ?—Yes.

1209. Have you ever seen them at all the worse for it ?—I have heard them complain that their place was a close air place, and so on, and that when they shot the smoke would be rather unpleasant, and so on. As I stated just now, it is a matter of course, sometimes, and you cannot prevent it. When you want to accomplish an object you cannot always command the ventilation which you are fortunate enough to gain, provided that you have a mine where you can work well, and can carry out your objects.

1210. You cannot get good natural ventilation in a close end ?—You cannot, sometimes.

1211. But you can always introduce artificial ventilation ?—Perhaps you might.

1212. Have you ever seen the close end into which you could not not have introduced sufficient ventilation if you had been told to do it ?—I do not think that I have ever seen an end but what you could carry artificial air into, provided that you could be furnished with the means.

1213. It is a question of expense ?—It is a question of expense, sometimes.

1214. You have lived all your life in this district, have you not ?—Not in this district.

1215. In this county ?—In this county.

1216. Do you mean to say that during that time you have never come across sets of men working in close ends who appeared to be suffering from their work ?—No.

1217. Have you never seen men working in high temperatures who were obliged to work short hours ? —Yes, I have seen that.

1218. And in those cases were the men none the worse for it ?—Of course it must be hard work, and it must tell upon their bodies when they are working in very hot places and in very deep mines.

1219. Have you never known any ill consequences arise from working in those places ?—I have no manner of doubt about it, but none have come under my personal observation. I have not the least doubt that such is the fact.

1220. What is the exact depth of your shaft ?—One hundred and fifty fathoms.

1221. How long would it take, without forcing, for a man to get from the top to the bottom of the ladder ?—About half an hour.

1222. If it was twice as deep he would take rather more than twice as long ?—Of course he would.

1223. And there are many shafts twice as deep as yours, are there not ?—I suppose there are very few in Cornwall 300 fathoms deep.

1224. Have you ever worked in any mine in which

you think that the men would have been able to work longer if they had had man engines instead of ladders to mount at the end of the day?—I do not know that I have; I do not know that any thing of that kind has crossed my mind, but I have no doubt that where a man engine is applied it is a great relief to the men working in those mines.

1225. When you say "a great relief" do you mean a great saving of strength and health?—I should think so.

1226. Do you think that there is any difference generally between the health of men working in lead mines and the health of men working in copper or tin mines?—I am not aware that there is.

1227. Neither in your opinion is better or worse than the other?—No.

1228. What is the average of wages which an industrious man earns in a mine such as yours?—About 3*l.* 12*s.* 0*d.* per month in the 12 months is the average of our men's earnings in the mine; that is, the underground men.

1229. You have none but grown men in your mine?—We have two or three about 18; not less than 18; young men; they are then coming to manhood.

1230. Do you mean that the earnings of your men average 18*s.* a week?—Yes; at the mine to which I belong.

1231. Is not that an unusually high average?—I do not think that it is, for the eastern part of the county. I think the wages are rather better here than they are in the western part.

1232. To what do you attribute that?—It is owing, perhaps to the people being more plentiful there, and everything acting upon that basis. Where there is a large supply of course things are cheaper.

1233. Do you not think that in a perfectly well-ventilated mine like yours a man is able to work harder, and therefore to earn better wages?—I think so; the better the ventilation the better it is for the man and the employer.

1234. (*Chairman.*) With regard to climbing the ladders, do you think that a man may injure himself maferially by climbing the ladder too fast?—Yes, I think so.

1235. And therefore that the constantly having to climb ladders may affect his health?—Yes; it may, in the long run, of course. All constitutions are not alike, and with a weak constitution anything like extra labour or extraordinary exertions will tell upon it in course of time; there is no question of that.

1236. So that, independently of the ventilation, a man might suffer from climbing the ladder?—Yes; I could not say that a man could climb the shaft without feeling that he was climbing up hill.

1237. (*Mr. Kendall.*) Do you fancy that the ventilation of the mine at all affects the wages, one way or the other, in this district. I hold that your mine is perhaps one of the best ventilated mines in the county of Cornwall. Do you think that that has any effect upon the wages, either one way or the other?—I cannot tell, but we have always been able to allow our men the wages. It is a folly to have a mine, and to have men, unless you can pay them.

1238. Are the wages you pay higher than the wages in the district?—I cannot tell; I do not scrutinize the accounts; I cannot speak positively. I cannot speculate upon the other mines in the district, or upon the average wages.

1239. You never suffer from a want of men?—No; I am glad to employ them; I am sorry to find that the times are looking so bad among the mines. Miners are very scarce.

1240. You have not discharged any men, have you?—No.

1241. You keep up your number?—Yes. I should expect that about seven-tenths of those men that we have employed have worked there for eleven years.

1242. (*Mr. Austin Bruce.*) Have they been men employed at tutwork, or how have they been employed?—They have been all set.

1243. A man working in a good atmosphere and in a healthy state of body I presume would gain more than a man working in a bad atmosphere?—Of course he would.

1244. In a well-ventilated mine it would appear to you that a man must earn more than in a badly ventilated pit?—I think he can.

1245. (*Mr. Kendall.*) And he would earn more, would he not, for the adventurer?—Yes; it is better for the adventurer too.

1246. (*Mr. Holland.*) A man would earn in that case more for himself as well as for the adventurer?—Yes; and a man can work more cheerfully, and a man can work better.

1247. Does he receive more pay?—If he takes a bargain, and he has his tut, and if he exerts himself.

1248. (*Chairman.*) Does a man in taking a set generally consider whether the mine is well-ventilated or not?—I do not know; but it is his business to see whether he can take a bargain before he takes it and works it.

1249. But would he consider beforehand whether the mine was well ventilated or not?—I should suppose he would consider whether it was a good place or not.

1250. (*Mr. St. Aubyn.*) You stated before that you were not acquainted with the rate of wages in any one mine but your own in your own neighbourhood?—No.

1251. Do you know whether the wages are more or less than 3*l.* 12*s.* a month?—No.

1252. (*Mr. Kendall.*) I suppose that there are few men whom you meet with who consider more carefully what is for and against them than miners?—A miner understands the whole thing as well as his agent.

1253. You are obliged to have your wits about you to consider what operates against the men and what operates against you?—Yes; it is only fair that we should be the men who should behave justly to our labourers.

1254. But they are to a certain extent well able to take care of themselves?—Yes, they are quite competent for that.

1255. You think that they are sharp enough?—Yes.

1256. (*Chairman.*) What is the highest rate of wages any of your men earn?—The shaft men are what we call the first pair men, and they generally carry off about 4*l.* 5*s* or 4*l.* 6*s.* per month.

1257. What do the less skilful class receive?—Perhaps one pair that might leave now might be there again and not leave for six months.

1258. Does a bargain last for six months?—No; only for a month. We generally give the full extent at the setting day. The full extent is quite sufficient for the whole month, to give them a fair month's earnings.

1259. May they go on for another month at the some rate?—No.

1260. When you put the setting up, is it done by a sort of Dutch auction, that is to say, by bidding upwards?—We always measure the bargain, and fix our new process for the morrow.

1261. Is it set at the price you fix upon it?—Yes.

1262. If you offer it to a man who has been working, and he refuses it, is it then open to another to offer for it?—Yes.

1263. A man, I suppose, sometimes makes an offer, and they try to get more?—It has been so. I have seen that in the west, more than I have seen it here; but I do not remember any pair party cutting down any party in our mine at all. They do not seem inclined to do that kind of thing.

1264. Can you state to the Commissioners the lowest rate at which the men work for any set?—Perhaps a man might work a month for 50*s.*; he might do so; and sometimes as agents we advance a trifle to him, rather than send the man home; that is to say, we would rather lend him a few shillings, and when he does well take it back again. For example, a man with a large family. We do not like to be hard hearted to him.

1265. That is money to assist him?—Yes.

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1266. That would be in a case, I suppose, where a man had made a bad bargain; for example, when the end has turned out harder to work than he expected? —Yes.

1267. So that sometimes a man in taking a set or bargain finds that he does not earn 50*s.* a month?—They might work for 1*l.*, probably. The bargain might turn out badly, and a man might not earn 1*l.*; it is possible.

1268. In that case would you advance the man money?—It is optional whether we will do so or not; we are not bound to do so; but some men are more humane than others; some men would, and some would not.

1269. Otherwise a man might not earn 1*l.* a month?—That is so.

1270. And that depending upon the nature of the ground?—Yes.

1271. (*Mr. Austin Bruce.*) How do you manage about your schools?—We have a school in our village close to the mine; it is a national school, and that is the only day school; our mine is close to the village.

1272. Have you found the miners anxious to send their children to school?—I believe that they do send them to the national school.

1273. At what age do they send them there, and how long do they keep them there?—Those who are more immediately connected with the mine, and who live in the village, perhaps send their children from the age of about five or six until they are eight or nine. Some of our men are scattered about, and are perhaps two miles off; but really I cannot answer the question perfectly.

1274. Do you mean that they take their children from school at the age of nine or ten?—Sometimes they remain at home, to assist at home, if they are little girls; but if they tre little boys they go perhaps with a farmer sometimes. They are not employed in the mine, for indeed we could not employ the whole of them.

1275. Have you any schools in which to teach the art of mining, and the art of ventilation?—No.

1276. You trust to an intelligent workman picking up experience in the mines?—Of course there are no better teachers than the men who have been working. We can always tell where the air is coming from, and find out which way we can send a current of air to the men when they are working; we find that out by experience.

1277. (*Chairman.*) You have used the words "send a current of air." How do you send a current of air?—If we found that the air was coming out of a certain level, and we wanted to put it in further, if there was any winze or hole that the air would go down, we would put in a door so as to prevent it, and send the current right on. We manage to get all the air that we can.

1278. You do put in doors?—Yes, sometimes, to prevent it going back again.

1279. You do not employ, I believe, any boys at the surface?—Yes; we employ several; we employ perhaps 20 boys.

1280. And women?—Only six little girls.

1281. Are the boys employed in picking?—In jigging and wheeling, and sundry other work, and many processes that we have in bringing the ore to a marketable state.

1282. Do they work under cover?—Most of them work under cover.

1283. What wages do those boys earn?—From 8*d.*, 9*d.*, 10*d.*, up to 1*s.*, and sometimes 1*s.* 3*d.*; just depending upon their size.

1284. What do the girls earn?—About 8*d.*, 9*d.*, or 10*d.*, which is the highest.

1285. (*Mr. Austin Bruce.*) Do you consider that you have an ample supply of men who are capable of conducting the ventilation of those mines?—Quite ample.

1286. (*Mr. Kendall.*) I suppose they find out in a second the state of the air by the burning of the candle?—They can find that out in a moment by the burning of the candle.

1287. And the moment that is observed you begin to consider how you can get the air to that place?—Yes.

1288. And do you seldom or ever fail to effect that object?—Never. We can always account for all those things.

1289. (*Chairman.*) Are you speaking now of your experience of other mines, or of your own mines where you have no difficulty?—The same remark applies to most mines that I have seen.

1290. That is, that there is no difficulty in supplying a sufficient quantity of air without resorting to artificial means?—Your are obliged sometimes to have recourse to artificial means at certain places with certain objects; but generally speaking we get sufficient air for the mines.

1291. (*Mr. Kendall.*) You worked in Dolcoath in the olden times when it was very deep?—Yes.

1292. What was your age then?—About 20.

1293. To what depth did you then go down?—200 fathoms. I worked down to 200 fathoms under the adit, which was above 40 fathoms from the surface.

1294. Do you recollect how far you went down in any end before you connected it by winzes?—As well as I recollect, that level was in from the shaft about 14 to 15 fathoms.

1295. Did you work there with artificial ventilation?—No; it was all natural ventilation.

1296. At 200 fathoms you were 14 fathoms off the shaft; there were no winzes, and you there had tolerably good air?—Yes; it was very warm, but the air was good.

1297. Did you ever burn more than one candle?—Yes; two men would have two candles.

1298. They were wanted for the purposes of giving light?—Yes.

1299. And none of them went out?—Not at all; there was very good air.

1300. (*Mr. Holland.*) Have you any means of telling when the air is bad, or when it is not so bad as to make the candle burn dim?—That is the first indication that we have.

1301. As long as the candle burns you consider that the air is good?—Of course it is good; but a man can live where a candle will not burn.

1302. You consider the air to be sufficiently good when a candle burns well?—Yes; that is the true indication.

1303. Any smaller degree of badness in the air than that passes unnoticed?—No.

1304. That is your test?—Yes; if we find the candle burn well they are satisfied.

1305. (*Chairman.*) And, on the other hand, when the candle does not burn well does the man report it?—Yes; at once. He would say that the air was bad, and he would complain to us immediately.

1306. How would that affect the work which he had contracted to do? Should you make any allowance to him?—We are as much interested to work out the bargain as he is; we have our returns to make, and we must do it for our proprietors' sake, and for our own; we should therefore go at once, and make an improvement where it was required. We are interested just as well as the man is.

1307. Then if a man were not able to work would there be a deduction made from his allowance for the set?—It is not our policy ever to keep him at a stand still. If he could not accomplish the amount of work that he ought to accomplish if he had good air, of course he would suffer a loss, and of course he has a strong motive to report that the air is bad.

1308. Still there is also a motive for him to get through the work?—Yes; but if the air is dead against him, or he has no air, he cannot carry a light.

1309. Although the air is bad, yet as he would not be earning anything if he were to stop work, he might persevere in working, although the air was bad?—Yes; that is the case, sometimes; and perhaps he per-

severes a little. We persevere sometimes, and by persevering we often do a thing, and consummate it as we would wish.

1310. But you cannot always do as you would wish ?—No; and the miner understands that; and when we are doing our best, if it is impossible to do anything more, he bows to that.

1311. And then he works on to the best of his ability in the bad air ?—Yes; if there was an object to be accomplished. Sometimes we want to communicate with another level, and we might be sinking and rising, and if a man thought then that he might soon accomplish perfect ventilation, he might persevere.

1312. Even at the risk of injuring his health ?—Yes, even at the risk of doing that; but perhaps he does not take that into consideration; that is, for a day or two.

1313. I thought you stated that it might take a month to accomplish it, and yet that a man would try to work in the bad air ?—Yes; and I do not deny that they sometimes do work in air that is not good for a month or two; the air may not be good.

1314. Do they ever work longer than that in the bad air ?—I cannot say but what they have in some cases; in some cases they might work in that way for three months.

1315. Have they ever, within your knowledge, worked as long as six months ?—They might, but I cannot tell; I cannot say that they do not sometimes, to accomplish an object. Sometimes we rise and sink, and the air might be bad; but we labour in order to perfectly ventilate the whole mine.

1316. But the men who work in bad air sacrifice their health to a certain extent, do they not ?—Of course they know that the air is bad; but there may be some little additional pay that they might like to labour to accomplish, and there may be in some cases an inducement held out.

1317. They would be induced by additional pay to work in bad air ?—If a man is working, and making a little sacrifice, he is worthy to be remunerated by a little extra pay.

1318. (*Mr. Kendall.*) Does it ever enter into the calculation of those who set the ground to give the men a little extra money to work in bad air, in order to save the expense of forcing in better air ?—I do not think it does; not if they could put in the air.

1319. But there are some cases, as I understand you, in which you think there is very imperfect ventilation; for instance, before they can get their communication, and where they cannot have the means of forcing in the air, and in those cases the men work for some hours to the detriment of their own health ?—I think that that has been so many times, even after air has been brought in artificially, but not in sufficient quantity; notwithstanding everything that has been done, the men will persevere for a month or two, and I believe the men have been rather more remunerated for that place.

1320. (*Chairman.*) You are of opinion, I suppose, that you ought to use all the artificial means that you can to introduce fresh air ?—Of course; and I believe that that is usually done.

1321. (*Mr. Kendall.*) Do you think that the persons who are engaged in mines are more careful of the miner's health, with regard to ventilation, than they used to be ?—Yes, in every sense.

1322. The men, I suppose, are more sensible, and understand the necessity for it, and the adventurers also fully appreciate the importance of it ?—Yes.

1323. Still, do you think there is room for improvement ?—I cannot say that, for I believe that as much is done as can be done; and it is for the interest of the proprietors, the masters, and agents themselves. Any agent must know, that if he can ventilate his mine he will get it into good working order, and then it is best for them all.

1324. You do not know of any artificial means being used from the surface to force down the air; they use nothing but fans ?—No; I do not know of any place where it is artificially thrown down from the surface. They have fans at certain places which I have seen, until a communication has been made.

1325. Until that communication is made, it is only by fans at the nearest openings or winzes ?—Just so.

The witness withdrew.

Mr. JAMES SECCOMBE examined.

Mr. J. Seccombe.

1326. (*Chairman.*) I believe you have charge of two mines ?—Yes.

1327. East Caradon is one ?—Yes.

1328. And Marke Valley another ?—Yes; and there is a new mine adjoining; West Rose Down.

1329. Then there are three mines ?—Yes.

1330. Of which of them have you brought a plan ?—Of East Caradon and Marke Valley; the other is a young mine.

1331. What is the deepest level of East Caradon ?—Seventy fathoms; that is, below the adit; so that it might be called 90 fathoms from the surface.

1332. How many men are employed ?—We have had about 80 men under ground.

1333. And how many above ground, including women and all ?—Including girls and boys, we may have 50.

1334. Have you any boys employed underground ?—I cannot say that we have what we call boys; we may have just two or three hardy lads, from the age of 17 to 18, that work with their people; working in the place of men.

1335. Any others ?—No.

1336. How do they reach the surface; is it by ladders ?—Yes.

1337. When they come to the surface to the change-house, is it the boiler-house that is used, or is there a separate change-house ?—At present we are changing at the boiler-house at East Caradon.

1338. Is that boiler-house far from the footway ?—We have a boiler-house now, at, it may be, 20 or 30 fathoms; what used to be our principal shaft before the operations of the mine increased; then our boiler-house was almost close to the shaft.

1139. Are you sinking another shaft ?—Yes; we are sinking one now, or trying to get a communication through, as I may term it, entirely for ventilation and better accommodation for the footway.

1340. Are you working at both ends of that shaft, both from above and below, or are you driving the shaft merely from the surface ?—It is the upper shaft now; we are bringing forth the shaft now; our level is from the midway level between 50 and 35.

1341. Where the men are working down below, is the air good where they are working ?—It is not so good as we could wish, and not so good as I expect it will be when we get this second shaft. Now we have winzes; but that is not like coming down from the surface.

1342. How long have you been working at this shaft ?—We have been now, I suppose, the greater part of 12 months about this shaft, and we have got from the surface down to eight or nine fathoms below the 20 fathom level; perhaps from 40 to 50 fathoms from the surface.

1343. How long have you been working up ?—We have not began that yet; it will take us this month to get in on to the top of the place to begin to rise.

1344. How long do you think it will take you to rise up ?—Perhaps three months.

1345. During that time the air, I presume, cannot be good ?—During that time we are not so well ventilated as we shall be afterwards. I do not know that the men complain of want of air. I know that

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when we get a second shaft our smoke and dust and things of that sort have gone off much faster.

1346. Is it dry working up?—It is dry pretty nearly where the men are working.

1347. Is there any dust created by the working?—In a dry place you will generally have a little dust come.

1348. Do the men now ascend by ladders?—Yes.

1349. Are you driving the new shaft with the view of making another footway?—Yes.

1350. Are the men also to ascend by ladders?—Yes; we are not deep enough for anything else yet. We can put our ladders in a very slanting direction, and so make it easy for our men to climb up.

1351. Are they at the present time perpendicular?—No; but they are pretty nearly so.

1352. Do the men, when they come to the surface, appear exhausted by their exertion?—Yes, sometimes, if they hurry up.

1353. Sometimes they race up, do they not?—Sometimes it does happen that they come up very fast; but that will occur more among the young men and the boys. The older men have had more experience, and they take it more steadily.

1354. The men are fined, are they not, if they come up before the time?—If they are up pretty much before the time.

1355. Do they ever wait in the shaft before they come up?—Sometimes they come, and sit down in the plat, where there is a dry place.

1356. Why have those men left their work before the time?—We find that men in the beginning of the month do so sometimes; they do not do it so much towards the latter end of the month; they take things then very steadily, when it comes to the latter end of the time. When the month is just up they work harder sometimes, and we find the men are inclined to stay down an hour or two longer than the time. Some are very indifferent towards the time when they ought to come to the surface.

1357. Have they any means of judging of the time, except by the candles?—They can tell very nearly by the candles; but some of them carry down a watch too.

1358. In the other mine, the Marke Valley, what is the depth there, is it deeper than the one we have been speaking of?—The deepest level is 100 fathoms below the adit; that is nearly 130 from the surface.

1359. How many shafts are there there?—We have got three or four shafts in the mine; but with this fresh part we should have three shafts connected as deep as 80 fathoms from the surface; but the two principal shafts now are both within five or six fathoms of the depth of each other, but the level is not communicated below 80.

1360. In the deepest part of that mine there is only one shaft at present in connexion with it?—No; I might say below the 110 fathoms, so that there would be nearly 20 fathoms; one shaft is nearly 20 fathoms deeper than the other; but there is a level driven at the 90, which has many winzes through from the one to the other, causing a thorough draught all through.

1361. At the bottom, where the men are working, is it hot?—It might be termed warm, or rather hot, in our 100 one pair, but not in any other pair; that is what we call the sumpt pair.

1362. Are there any special means used for ventilation there?—No more than we have already done. We intend it, as soon as we cross-cut the lode. We shall get on where we have a winze from 80 to 90. It is intended to do it.

1363. But in the meantime, and until you accomplish that, are there any special means employed for ventilation?—They will have the water fall from the 80 down to the 90 perpendicularly, and that throws the water through some pipes, to keep this level cool and fresh; that is the 100, and that will be required before the winze is communicated from the 90 to the 100.

1364. Then that is artificially ventilated by means of water?—Yes.

1365. It is perfectly ventilated?—Yes.

1366. Is there any place in either of those two mines where candles will not burn?—Not now, that I know of. We have one level that we have suspended for 12 months, our 80 west. That is done on account of a change of weather at the surface; not otherwise; and that we suspend before we get other levels up.

1367. You suspended the working in that level on account of the air not being good?—Yes, 12 months ago, because when there are uncertain winds and not clear weather at the surface there would be an occasional change when the candles would not burn so well, and we have suspended it, before we get other levels up to drive the air on by winzes.

1368. The natural ventilation of the shaft is affected by the weather?—Only on rare occasions. I am not aware that I know of it in any other place besides that.

1369. How far was the end from the shaft when you stopped the working?—I should think perhaps 70 or 80 fathoms; not quite so much as that, perhaps; say about 63 fathoms.

1370. While the men were working there, and before you ceased working, were they entirely without ventilation?—Yes, they were.

1371. Therefore it was not for their advantage to go on working then?—No; it was not so well for the men. I think that the better air you can get for the miners, the more labour they can perform; and, in fact, it is more healthy too, when the place is well ventilated.

1372. In driving your levels, what is the height and what is the breadth?—We set our levels to be carried seven feet high; we may be as narrow as four feet and a half or five feet; we generally set six feet; but I have no level that I have set less than five feet wide.

1373. But I presume it is worth your while, in order to work profitably, to have a good width and height?—I should say that it was generally profitable.

1374. Does that add very much to the expense?—I do not think it does. There are certain instances where a level would be very fair, although narrow; but where there is a level to be carried, I would say have them of a good breadth for tribute working, sometimes they are worked more narrow. I think that four feet and a half is narrow enough.

1375. In working there, are the deads immediately conveyed away, or left in the level?—Sometimes we have particular sorts of work at the plats.

1376. In your opinion, does the leaving of the deads impede the ventilation?—Yes, if they are left very long; but we manage to get them out as often as can be.

1377. Have you ever divided a level for the purpose of ventilation?—No.

1378. Have you ever tried the effect of dividing a level, for the purpose of forming a current?—No; we put in iron or wooden pipes, or zinc pipes, to throw the air in, and then turn the draught by placing a trap-door across the level, and so not to let the air escape before it goes into this run of pipes; there is just room enough for the mouth of the pipe underneath.

1379. You use these pipes for the purpose of conveying air?—Yes, if they are wanted.

1380. Did you say that they were of zinc?—They are sometimes of zinc, sometimes of iron, and sometimes of wood.

1381. Iron pipes would be expensive, would they not?—I have used 100 fathoms in Marke Valley, for after putting in zinc I found that where the water came it soon knocked holes into the pipes, and I found that the iron pipes were cheaper.

1382. At present, in Marke Valley, part of the ventilation is carried on by wooden pipes?—Yes; but the principal part of our works does not require any but the ventilation from the shafts and winzes from level to level.

1383. It is only while you are driving an end that you want those pipes ?—Yes ; but as soon as we get the winze through to the next level, that will do away with the necessity for them.

1384. What is the difference in the cost between iron and zinc pipes ?—Perhaps six or seven shillings a-fathom.

1385. And what is the price of the wooden pipes ?—They would be cheaper than either of the others.

1386. Would not wooden pipes answer as well as zinc pipes ?—I do not think wooden pipes would do ; I think that they deaden the air a little sometimes, for a long distance.

1387. Will you be good enough to state how you take up the ore ?—By kibbles.

1388. There is another mode, is there not ; by skips ?—Yes. We do not use them at present, but it is not unlikely that we shall use them in course of time.

1389. The skip is closed, is it not ?—Yes.

1390. Is that the more profitable mode of working ?—When we have got the skips and the guides in, the ore is drawn through the shaft best.

1391. Is there any danger in the use of kibbles from the stuff falling out ?—If they are drawing very fast, they might hitch one into the other ; but the men generally manage to have the winze stopped when they are passing through the shaft, otherwise it would be attended with danger, and stones might, by chance, get into the other shaft.

1392. Have you ever known such a thing as that occur ?—I have known stones come in.

1393. Therefore the skip would appear to be the safest ?—The skip is rather the safest. While the chain and everything is all correct, there is not the same liability to hitch or entangle as the kibbles would.

1394. How many men have you working in the Marke Valley Mine ?—About 120.

1395. Do they all work under ground ?—Yes.

1396. Are they both tribute-men and tut-men ?—We have no tributors underground ; they are all tut-men.

1397. Are both the mines copper mines ?—Yes.

1398. You have no tribute-men underground ?—No; not underground.

1939. How is the ore set to the tut-men ?—At so much per fathom, for six feet long and six feet high ; thirty-six feet.

1400. Do you consider that that is a better way of working than by tribute ?—In places I do ; but it depends upon the nature of the lodes. If they were very small lodes and bunchy, then perhaps tribute might be of the greatest advantage.

1401. Where there is a good lode, which should you say was the better plan ?—Then I should prefer stoping ; but there are exceptions; many agents do not say so.

1402. It would be necessary, I suppose, that the agents should be thoroughly conversant with the value of the lode ?—Yes.

1403. And also as to the amount of work that they ought to turn out ?—Yes ; the tributors would require that.

1404. Under the system of tribute, I understand that the man is a part speculator in the work ?—Yes, he may be called so; but you do not get many men to work until they see a lode that will turn them out so many tons to a fathom.

1405. But it varies very much ; sometimes a man may make a good speculation, and sometimes a bad one ?—Yes; sometimes a bad one.

1406. With regard to tut-work, the pay is less fluctuating, is it not ?—Yes; they have not got to calculate so much, but I think if there were different modes in the setting of tribute we should get more men that would know well enough about tribute, only that the tribute pay is not so quick as the tut-work pay, but my late brother and another person whom I knew considered it a very good plan that they should give the tributor a fixed standard, and then they could pay him as quick as they could at tut-work bargain, for when they got a sample they would know then the quantity likely to be produced, and what portion they must pay him for his produce.

1407. And that system you think would be better for the men ?—Yes. I think that they should not have the standard to speculate with at all, but only the quality of the lode, and the easiness or hardness of the ground, and so they would know how quick a certain piece of ground could be worked out; but that must depend upon the country.

1408. And upon the agent?—Yes ; the captain and the men.

1409. In many cases the tribute men, I believe, are often without pay for some time ?—Yes ; and they are allowed subsist, perhaps a couple of pounds, just to provide them with a little living before the balance comes. Sometimes they are working for five or six months before they settle up, and a great many of them do not like that.

1410. What wages can your men earn by tut-work ?—That depends somewhat upon the power of the men, and their judgment ; some would not earn perhaps more than 3*l.*, while others would earn about 3*l.* 10*s.* or 4*l.*; and we find rather more difference than that in some.

1411. What is the lowest that they would earn ?—Sometimes we might find them not get more than 2*l.*, while others might get 5*l.*

1412. I suppose that depends, not upon the men individually, but upon the pair ?—Yes; it depends upon the pair altogether.

1413. What do you allow them to get ?—Perhaps 3*l.* 10*s.*, the better men ; the shaft men about 4*l.*

1414. That is for sinking down a shaft ?—Yes, or driving our bottom level ; they have a little more trouble than others with the water.

1415. And therefore they earn more money, which they draw ?—Yes; they are worth about 10*s.* a month more.

1416. Is it the result of your experience that the men prefer shaft work to working in the ends ?—I cannot tell you ; I do not think so. I myself have been brought up in that way as a boy from about eleven years of age. I worked underground until I was grown a man some years afterwards. Some young men think that they gain a certain advantage, or that they are superior men to others,when they get to work in a shaft; others prefer a dry place, and never go into the shaft at all to work.

1417. As you have worked so long underground, have you ever suffered any ill-health from working underground ?—I have worked in places where I find it very bad for that when I was a boy.

1418. You suffered from want of ventilation ?—Yes.

1419. Have you known of other cases in which men have suffered in their health materially from the same cause ?—I think that there has been a great improvement in latter years to what there was when I began at first. We did not think then of carrying down a mouthful of any thing to eat with us, even if we stopped down for 10 or 12 hours, nor to drink; and sometimes, when there were two in a pair or four in a pair, they stayed down longer, but now we find that almost all the men carry down with them a little water to drink, and a bit of something to eat.

1420. What do they carry the water down in ?—Sometimes they have a little keg tied round their waist, and sometimes they carry a bottle.

1421. I suppose that in a hot end the water becomes very warm ?—Yes ; and the men perspire a good deal in working, but I think the water is a benefit to them, and that they are better calculated than what they used to be to take care of themselves.

1422. What should you call a hot end; at what temperature ?—From 60 degrees to 70 degrees would be pretty hot with them, but not so hot as they get it in the western part of the county. I have never been down more than 200 fathoms deep.

1423. In the course of your experience during the last few years, have you found that any of the men have been obliged to leave their work underground,

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and take to surface work, on account of having contracted some disease?—I do not know that we have had many men that have suffered injuries; they have laid by some of them but not entirely I think from the bad air; I do not know it. On recollection, I remember that we had a man of the name of Lawrie, who worked with us, but he was becoming an old man, and we did not know what mine he had been injured in. I think that ours was his last place of work. He was asthmatical.

1424. Do you think the men do suffer who have been working underground?—Yes, if they work in close places, which are not well ventilated, they must.

1425. Do you think it more frequently happens that they do work in close places in young mines or in old mines?—It depends upon whether they are very far off the draughts.

1426. Suppose the case of a new mine, where they are driving to reach a shaft?—Sometimes, in young mines, we only get one shaft to go through the lode, and I do not think that that is hardly at the same depth as if there was a second shaft down. I think that when a work becomes more extensive, and will warrant it, a second shaft should be got down for ventilation.

1427. Until that work was finished, would there be any artificial means of supplying air?—If it were very bad, we might throw it down from the surface, and that is done pretty generally so.

1428. Have you ever seen any means resorted to for throwing down air from the surface?—At the adit level we might turn down a stream of water; and this shaft that I spoke of here that we sunk is so far without ventilation that on times we found inconvenience from the air, and I got a run of iron pipes put in nearly all the way, and just as that was done the air was considered good enough.

1429. By what means do you ascertain whether the air is good enough?—I cannot tell you; but in summer time it is affected.

1430. But how do you judge of the state of the air?—We can judge well enough only by the burning of the candle. If we get into a close place the candle does not burn so freely.

1431. Does the miner then give notice?—He says that he has a trouble to keep his candle alight; that the air is bad; and he is then perhaps removed.

1432. I suppose there are cases when you are anxious to form a connection in which the men persevere in working and in bad air?—That might happen at times, if the air was not very good, nearly upon the point of holing, and they would try to get through it all.

1233. Do you pay the men higher wages under those circumstances?—I do not know that we have.

1434. I suppose that if the men do not complete their bargain they must work on in bad air, or they would lose?—That I cannot tell you; not particularly; they are not bound to work if the air is bad.

1435. They would not forfeit what they had already done?—No.

1436. So that when a miner finds that he is breathing bad air he can report it to the captain, and then he would not lose?—One of the agents of the mine would go and see for himself, because if the ground had got harder since the man had taken his bargain he would be glad to get that for his excuse, and not work.

1437. If he found that he had made a bad bargain he would be apt to ascribe it to the effect of the air?—Yes.

1438. How would you test the condition of the air?—We should go and examine it for ourselves by our own candle, and see how we could breathe in it; and if the candle burnt very well, I have never known any danger occur.

1439. But suppose the candle did not burn very well?—Then we should think that there was something amiss.

1440. Have you any other mode of testing the state of the air?—No.

1441. Suppose that the candle burnt feebly?—Then we should say that the air was not very good.

1442. Would a man, under such circumstances, be relieved from his bargain?—That would depend upon whether we thought it was sufficient to injure him or not.

1443. Do you find that by changing the position of the candle in a level it makes a difference in the burning of the candle?—I have known instances where, just on cutting a hollow place, immediately the candle would not burn against it when it would burn anywhere else; that is perhaps for a few hours.

1444. When you pay the men (the pairs) do you pay them the full sum in notes?—If they are a pair together, like eight or nine men, we might pay them nearly half the money in notes, the remainder, or nearly all the remainder, in sovereigns, and some silver generally goes out. Then, if we have got three or four or five or six of the surface men, if they have got to receive 2*l.* or 3*l.*, or 3*l.* 10*s.*, we should manage in this way: the pit pairs would take so many sovereigns, so many half sovereigns, and the remainder in silver; and as I know exactly what I want when I am going into the bank, I take so many notes and so many sovereigns down. With regard to the other pairs, everybody that has got to receive so much, say a sovereign, will be paid in sovereigns, and every one that has got to receive half a sovereign will have it, and everybody below that sum will have to take change.

1445. If the men wanted change for their notes would you give them change?—If they were to say we would like to be paid in sovereigns altogether, or in notes, we should do it for them.

1446. But suppose they did not get the change from you, how would they change their notes?—They generally go to have something to drink upon the settling day, if there is no money to be received at all on the pay day.

1447. Do they obtain change for their notes at the public house?—Yes; they go and pay what they have on the settling day as well as anything else.

1448. Is it general among them on the settling day to go to the public house?—That is where most of them go, after taking their month's bargain, to have a little beer.

1449. Generally speaking, the settling is in the morning, is it not?—No; it is generally about one or two o'clock.

1450. Do the men work after that?—No.

1451. (*Mr. Kendall.*) What age are you?—About fifty-four.

1452. You have been talking about being asthmatical; do you think that was caused by working in your early days underground?—I can hardly say that. I recollect that Mr. Pierce, the surgeon, used to attend us when I was about 17 or 18 years of age, and he told me not to work in the place that I did, on account of the bad air; but I always had a cough as a young man.

1453. Before you went mining?—I went mining when I was about 11 years of age.

1454. But had you a cough before you went underground to work?—I cannot recollect that.

1455. Does the asthma affect you in ascending or descending?—Yes, in ascending, but not in descending.

1456. Do you go underground now?—Very little; not within the last six or eight months.

1457. How many agents have you under you?—Five agents.

1458. Your brother was a man of great experience, and he died early; how much older was he than you are?—I am older than he was, about two years and a quarter.

1459. How long has he been dead?—Three or four years.

1460. Was he your only brother?—Yes; he took influenza.

1461. Was he constitutionally delicate, like you?—No; he had no cough at all.

1462. From what complaint did he die?—I cannot tell.

1463. Was it from over-working in the mines?—He worked very hard; but I think not the mines altogether; he had a pretty good many speculations.

1464. And he exerted himself very much, did he not?—Yes. I have been accustomed to do that myself for some years. I go down two mines in a day now very often.

1465. What depth have you been down into these two mines?—150 fathoms.

1466. You come up, I suppose, very warm?—Yes.

1467. Then you would change your clothes, and ride across a cold country, and then go down another mine, and then you wonder that you are ill?—Yes.

1468. Is it not true that you are, as a body, very careless about these matters, especially when young?—Yes. I went to work underground at about 11 years of age, and I worked hard to do my task by such a time, and I used to get up, and climb, and try to see if I could not get up as fast as others; but I know now that it is very wrong.

1469. I suppose you had some object in view?—Yes; it was to try to see how quick I could get to the surface.

1470. In your opinion, are the miners now-a-days more careless or more careful than they used to be?—They are more careful. There are many hardships that we used to have to go through in those days that we do not have to bear now. For instance, we very seldom see a wheelbarrow now; the stuff is all taken out by tram waggons. I have wheeled many a time when my fingers have been ready to go right out, when I was not able to hold anything, and the weight was supported by a sling round my neck; that was before they introduced the tramway underground.

1471. With regard to the drys; have you got a dry at Caradon?—No. We have got new engine houses there. I wanted to erect another before I got a dry there. We have ordered a new engine, and we are going to try wrought-iron beams. Mr. West, the engineer, has taken the contract.

1472. What is the advantage of the wrought-iron beam?—The object is to prevent any breakage.

1473. Do you intend to have a dry?—Yes.

1474. Is your mine a wet mine?—No; I cannot say that it is. The men have almost all dry places to work in.

1475. What do the men do with their clothes?—They hang them up all round the fire doors.

1476. You are of opinion that you ought to have a dry there?—Yes; and it is very likely that we shall have one as we get further on. I may say that we intend to have a dry.

1477. Ought you not to have a dry?—I think that our men now can change very comfortably, and we have never had an accident, although we cannot say that the thing might not occur, and therefore it is thought to have a dry. We have a stack put off a certain distance from the boiler-house, to put a dry there. In going down through this mine I have to consider whether we shall have a place between the boiler-house and the stack for the sake of a dry.

1478. What does a good dry cost?—Not much.

1479. About how much?—Not above 100*l.* for a mine of the size of ours.

1480. What would it cost to keep it at work?—Perhaps not 10*l.* a month.

1481. I suppose there is no harm in saying that you could afford that?—We can, at East Caradon.

1482. That is the best mine in the country, is it not?—I think so. There is one thing, and that is that we have many things to do at the same time, and we cannot go and find masons enough to do as much as we like. I have great difficulty in that. I have just completed an engine-house, a carpenter's shop, and a smith's shop.

1483. With regard to dust, is it not a fact that the miners are injured by the dust that comes from the ore in working it? Have you worked by tribute a good deal?—Yes.

1484. And at tut-work?—Yes.

1485. You have had great experience, such as few men, compared with yourself, have had?—Yes.

1486. Did you ever see an instance, or more than one, of the dust coming from the lode, in the working, so as to be injurious to the men?—I would not say that the dust might not be injurious.

1487. There is dust, is there not?—Yes, where you work upon a very mundicky lode.

1488. Where you are working upon a mundicky lode there is a very strong smell, is there not?—Yes; upon the punching of the hole there would be a strong smell; but that might be prevented by keeping a mop around the borer; that would keep away the dust, and deaden it.

1489. Have you seen instances where the men have been negligent, and where there has been a good deal of dust from the ore which would be injurious to them?—I do not know whether there would be much from the copper ore; the mundic smells very much, if it is left to dry, and the dust is not damped.

1490. Where there is a good deal of mundic you think that a good deal of dust is caused?—I do not know that there would be more dust, but there would be more smell with it.

1491. But I am speaking of dust?—I think that, generally speaking, the men can prevent the dust from being injurious; they might at times throw a little water upon it, if they get into a very dusty place. Upon punching a hole with the bore at the commencement, and making an impression, the dust flies about, and if they kept a damp mop round it it could not come.

1492. Have you seen instances in which the dust does fly about?—Yes but with care the people might prevent it.

1493. The dust is of such a kind that a person would inhale it by breathing it?—Yes.

1494. Unless you took care, you would inhale that dust?—Yes, some of it, there is no question about it.

1495. (*Mr. Holland*) Does it sometimes colour the expectoration?—Yes; it is apt to do that, sometimes, but I think that the smoke from the candles has just as much to do with that.

1496. Is the dust from the mundic ever in sufficient quantity to colour the expectoration?—I do not know whether it has done it, but I should think that the smoke from the candle does it.

1497. And not the other?—I do not know that it does; but the smoke from the candle will find its way into the throat, and colour the expectoration.

1498. And the powder smoke?—Yes.

1499. Is that frequently in large quantities?—Sometimes we have a great deal of smoke; but the more we can get the mine ventilated the better. In some places, make what blast we would, in a few minutes the place would be pretty clear to go into, but not in other places. If not ventilated, the smoke would lie here, and remain there a long time, and the men would be working in it.

1500. Do the men often go back too soon after firing a shot?—Sometimes they do; sometimes they are very anxious to know what they have done, and they would run forward to see, and come back almost directly, just to see, and then come back and stop. They need not do that; but then they are very anxious to know.

1501. How long is it common for the powder smoke to hang about?—That depends entirely upon the draughts. Sometimes it might remain there for an hour, and at other times it would not remain for five minutes.

1502. What is the ordinary time?—Perhaps five or ten minutes.

1503. Is half an hour an uncommon period?—I should say that it was very uncommon; that is, where a draught is pretty close; that is, to be injurious. Of course they might see a little of it.

1504. (*Mr. Kendall.*) Did you ever know the men

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go in, and beat the smoke out of their jackets ?—Yes; I have known that to be done.

1505. Have you ever done that yourself ?—I cannot say that I have.

1506. Can you say that you have not done it ?—No. But there is a great deal of difference in men. I recollect, when I was lad of 18 or 19, working up in a rise, and I was down one day with a man who was nearly 60 years of age, and he went up in it; but it appeared to take no effect upon him, while I could not live in the place, it would so bring my cough on.

1507. (*Mr. Holland.*) I think you stated that the miners were less unhealthy than they were some years ago ?—Yes. I think that they take a great deal more care now in the underground operations. For example, in carrying water down with them ; if any dust gets into their throats it is likely to wash it down ; and they do not remain in so long with an empty stomach.

1508. And are they more careful with regard to the powder smoke ?—I do not know; but I think most men can stand it better than I can.

1509. Are the men more careful in avoiding the poor air than they used to be ?—I do not think they are ; but I do not know that there are such bad air places as there used to be thirty or forty years ago.

1510. (*Mr. Kendall.*) In East Caradon, have you got bad ends, which sometimes contain poor air ?—I do not know that we have any that may be called very bad. Our fifty might be taken to be rather close, but not injurious.

1511. Does the candle burn well there ?—I cannot say that it does.

1512. Have you taken any means of forcing any air into it ?—We have got a winze through from thirty-five down to fifty, and then we manage to carry the draught back over the stopes to bring it as near, in order to play round the end, as we can, and then we have winzes from there to sixty.

1513 How far is the fifty end from the winze ?—I cannot tell you how far it is from the winze; it is brought on by the stopes ; I think we must be thirty or thirty-five fathoms, perhaps ; I think we have got that ground on the stope. I think that is the worst end. We carry it round the draught as well as we can.

1514. (*Mr. Holland.*) Caradon is a young mine, is it not ?—Yes ; East Caradon is.

1515. From whence did the miners come; from the west ?—A great many of them came from the west ; some of them came from the easternmost part of the county, and all round.

1516. Many of the men may have contracted disease before they came to work in your mine ?—Yes ; many of the men have been miners before; the older men, and we cannot say where they have worked.

1517. (*Chairman.*) Are there any men, to your knowledge, now working underground, who are suffering from difficulty in breathing ?—I do not know that there are.

1518. When you engage a new miner, do you enquire into the state of his health ?—Not as to the breath ; but recently, or within the last few years, I have not liked to employ a man who has been blind of one eye. There is one working on the surface. I would not let the man go to work down underground again ; that was the first that gave me notice of his eye. He had received a blow in it; and I thought that that sort of man ought not to go down underground to work again, for if anything happened to the other eye he would be dark altogether.

1519. Had this man lost his eye in your mine ?—Not in ours. He had lost his eye in some mine or other.

1520. How does a man lose his eyesight in a mine ?—Sometimes, when he is breaking up the rock, a bit of stuff might fly into his eye, or a piece of steel or iron ; and if a man should have his two eyes injured it would be very hard to have them both affected at once.

1521. Have there been any accidents from blasting ?—Yes ; there is one man that we have been paying to, I should think, for ten or a dozen years. He is a young man, and he receives one shilling a-day from the fund. It is called the fund ; but I do not call it their fund at all, because every man, when he comes to know the charge, will look to the balance he has to take up. He sees what is to be deducted. It is nothing but a form. There is the doctor and the club, and it is deducted, and he sees the balance The men always look to the money that they have to carry away from the mine.

1522. But there are other deductions, are there not; for example, for candles and powder?—Yes ; for sharpening tools, and short weight. Those are deductions, and when the bargain is measured, his ground is made up to see what charge is made, and all those deductions come in.

1523. A man knows, of course, the amount he will have to pay for candles ?—Yes ; he pays so much a pound for candles, and so much for safety-fuzes, paper, and glass.

1524. Do you contract for the candles ?—Yes; with the merchant.

1525. Are the candles generally good, do you think ?—Yes. But if we find that they are of bad quality we do not give an order for them to the same merchant.

1526. Is it a common complaint on the part of the miners that the candles are bad ?—If we had bad smelling grease, and soft candles that did not last, the men would complain directly.

1527. Then you ascertain from the men the quality of the candles ?—They might pass without our noticing them, if a new cargo came in ; but as soon as the men came to use them they would find it out if they were bad, and come and inform us.

1528. Have the men complained of the smell of the candles ?—Yes ; and if they have we have always tried to remedy it ; but I do not know that that has occurred, I will not say that it has not, for years, about the smell of the candles.

1529. Have you ever known the men use their jackets in order to promote circulation in the air ?—I have known them take off their jackets, and I have done it for myself, and have come in. I wanted to see a certain end, and I could not see it very well.

1530. I meant to promote ventilation on account of the heat, and for the purpose of cooling themselves ?—No, I do not know that.

1531. Do the women on the surface work under cover ?—I believe that ours are very nearly all under cover. We have, perhaps, half a dozen pairs at East Caradon, that are not quite provided yet ; but as to all our women employed in cobbing, bucking, and rolling, we have sheds to contain the whole.

1532. Is any room provided for them to get their dinner or tea in ?—We have no room for that, on purpose.

1533. But is it not desirable that there should be such accommodation provided ?—I cannot tell you.

1534. It is provided, is it not, in some mines ?—It may be ; but whether they have far to go I do not know. The women send in their tea-kettles and get them boiled, and they get some cups.

1535. (*Mr. Austin Bruce*). You have worked in many mines, have you not ?—Yes ; I have been in a good many.

1536. Have you observed much difference between them ?—There is a difference, certainly.

1537. I mean with regard to ventilation ?—I believe the air is generally carried on upon the principle of getting winzes for communication as quickly as they can.

1538. Have you found much difference, as to the effectiveness of the ventilation, between one and another mine ?—I do not know of any that I recollect just for the present that is not carried out on as good a plan as it can be, in getting winzes through, or by throwing in air by a machine.

1539. You have stated that the men take more care of themselves than they did formerly ?—I think they do. They now have something to drink and to

eat during their work, and that I think, myself, is a good plan. My experience shows me that that is better for the men than to go for eight or nine or ten hours without anything.

1540. Do you think that the men are now enabled to continue at their labour a greater number of years than they were formerly ?—I cannot tell you.

1541. If taking greater care of themselves is an advantage to them, I suppose that will contribute to their health, and enable them to work for a longer period of their lives ?—Yes; that is, if they take all the other care of themselves that they possibly can.

1542. Have you ever been in collieries ?—No.

1543. Do many of the Cornish people go over to the Welsh collieries ?—I believe some of them do.

1544. Do you happen to know any of them ?—I am not aware that I do know any of them who are there now.

1545. Have you seen men who have been over there, and worked in the Welsh collieries, and have then returned ?—I do not know that I can recollect any.

1546. How far are your men mostly from their houses ?—Some might be a quarter of a mile off, others half a mile.

1547. Are any of them as far off as two or three or four miles ?—I think you will find very few of them who are as much as three miles away. Perhaps there might be a certain man or two who would go the fourth mile; but you would find now, in Liskeard, many men who like a town, and who, when they come home, and have a leisure time, like to have some place to go to and sit down, and have a pint of beer and smoke their pipe. Those men would sooner travel three miles to their work than go into a country place and live within half a mile of their work. But some men like to be as near to their work as they can; and sometimes in the country they have a good garden.

1548. You set no men to labour underground under 17 years of age ?—Yes; some as early, I should think, as eight or nine; but then they would be employed to pick up little stones.

1550. What wages do they receive ?—I think the wages for what they call tributory advance might come down as low as fourpence a-day; but it is a very rare occurrence to find one so low as that; it varies from sixpence to sevenpence and eightpence, and on to a 1*s*. That would be for women and girls.

1551. I think you stated that you had about 80 men working below ground ?—Yes; at East Caradon.

1552. How many of those 80 would be above 40 years of age ?—I should think several of them.

1553. Have you got any return of their ages ?—No.

1554. Have you known of any instances of men working after the age of 60 ?—I believe I have; but it is rather a rare occurrence.

1555. Are there any men working underground in your mine above the age of 60 ?—I do not think that we have any underground who are so old as 60; but I cannot tell with certainty, for I do not know.

1556. Are they generally a temperate race of men? —Some of them are very temperate and industrious; but some of them, on the other hand, are just the other way; the young men particularly; you will find that they are not so temperate as you could wish them to be.

1557. Are their houses pretty neat and comfortable ?—I cannot tell you; but I should not think that they were so comfortable as they would like to have them. Men marry and get their families at an early age, and then they find that they have something to do to get comfortable houses. Sometimes it happens that a man has three or four children before he gets any of them to go to work. I remember very well the saying of an old man that I knew, which was this—"that after a man has got half-a-dozen children, it does not matter how many more he gets, as some of them will go out to get their own living."

1558. Is fuel dear with you ?—I cannot tell you much about that; perhaps they may have to give 1*s*. a cwt.

1559. About 1*l*. a ton ?—Yes, and sometimes a little more, may be 1*s*. 1*d*. or 1*s*. 2*d*.

1560. You stated, a short time ago, that you were going to put in an engine with wrought-iron beams; have you found any of the cast-iron beams break ?—Yes; we had one break at Mark Valley; one side of it; not the whole of the beam.

1561. Did any accident happen in consequence ?—No.

1562. Have you heard of any other instances of the kind ?—None have come under my notice. But I must be excused when I say that, for I am speaking of the Cornish mines and the Devonshire mines. I have heard a great deal about the Hartley Colliery misfortune.

1563. You wish to avoid the breaking of the chains ? —Yes.

1564. I suppose that where the miners have large families they are apt to take lodgers into their houses ?—I cannot tell you much about that; but I think I have heard that it has been done.

1565. (*Mr. Holland.*) What number of bed-rooms have they in their houses ?—Some of them, I believe, have not more than one bed-room, and some two; but I do not know very much of their ways. I believe there are many cases in which there is a man and his wife and some little children, and they have not more than one bed-room. I believe that it is a very rare occurrence to take a lodger in that case.

1566. (*Chairman.*) Have you ever heard that men who have injured their feet while working, have suffered from the water they are obliged to stand in ? —No; I never knew anything of the sort.

1567. (*Mr. Fulke Egerton.*) Do the men usually work in shoes ?—Yes. I recollect one man that we had, of the name of Vincent, who used to say that standing in water would not agree with him.

1568. (*Mr. Kendall.*) Supposing you had a wound in your foot, would not the copper water do it much harm ?—I cannot tell you; but I have had many bruises in my feet, and pieces of skin knocked off, and I never found that.

1569. Take the case of a dozen miners, who were found to be in ill-health, should you think that their illness was to be attributed to bad ventilation, or to colds which they had caught from their own carelessness ?—I cannot tell you. I think that there are some cases that arise from one cause and some from another.

1570. Do you think that bad ventilation has more to do with it than anything else ?—I think that very bad ventilation would have to do with it.

1571. Is the ventilation so bad in the mines as, in your opinion, to have a bad effect, and, to a great extent, upon the health of the men ?—I think not, in our neighbourhood.

1572. (*Mr. Davey.*) Are you of opinion that the climbing of the ladders is beneficial or otherwise to the men ?—That depends upon how they take them. If they went on steadily and properly, as they might do, I should not think it would hurt them much; but if they were to go up them as I have done they might make it injurious to them.

1573. (*Chairman.*) I suppose that the men are naturally anxious to get away from their work, and come to the surface ?—It is not that altogether; but perhaps three or four get together, and they try to see which can get up the fastest.

1574. In point of fact they race up ?—Yes.

1575. (*Mr. Kendall.*) Have you observed any of the miners with enlarged veins in their legs ?—I cannot tell you; but this I know, that when I used to work every vein of my arms would show as plain as could be; but they do not show now. I recollect working and breaking the stones, and then I was able to take up a 9 lb. or 10 lb. mallet, and beat the borer with it then.

1576. I do not mean that; but this is what I mean, that after the men have been in the habit of going up and down the ladders, have you observed in their

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legs varicose veins?—I never recollect anything of that sort in their legs.

1577. (*Chairman*). Do the men provide their own borers?—They take them out; they take out so many borers, which are weighed to them; they are put to book to such a pair; so much weight against a man, and then when his bargain is out, perhaps once in two months, if he is in the same place, he must send his tools to the surface, to have them weighed.

1578. Do you make deductions for the wear and tear in the borers?—Yes.

1579. Are the borers made of steel now?—Yes; there used to be a piece of steel put at the end of the bar of iron; but the whole of it now is made of steel.

1580. That, I suppose, is an advantage to the miner?—Yes; over the iron borer.

1581. He can do more work, I suppose, with the steel borer?—Yes.

1582. (*Mr. Davey.*) How far should you bore a hole before you cease to get any dust from it, and before you applied the water?—That would depend, of course, upon the inclination of the hole; some holes might go in nearly vertical, even to two or three inches deep, we should put water in that; but in holes that do not dip so fast we hardly ever put in the water until it will contain enough to cover the bottom of the hole, because then the fine stuff would come up, and would not settle at the bottom, and if it only got damp it would deaden the blow coming upon it

1583. Did you ever find any inconvenience from the dust coming into your mouth?—I cannot say that I have found the dust coming into my mouth. I have used a mop sometimes. I have known a piece rather softish, and over the ladder put below at cut cross place, the borer has been pushed through, and there it has been necessary to put a little bit of rag over to confine the dust.

1584. Do you think that the dust may be confined altogether?—I think it might, so that it should not injure a man in using a borer.

1585. (*Mr. Holland.*) Do the miners ever injure themselves by beating the borer?—I think that it might be done. I think that a man might, by overstraining himself, injure himself in that way, the same as in any other kind of work.

1586. But is it common?—I think it is a very rare occurrence.

1587. Do you think that the injury is not done by quick beating, but by overstraining themselves?—I do not know that any man ever got a pain by beating a borer. I do not say that it is not possible, in trying to see what he could do, by overstraining himself.

The witness withdrew.

Mr. WILLIAM RICH examined.

Mr. W. Rich.

1588. (*Chairman*). I believe you are captain at the Caradon Consols?—Yes.

1589. And you had been a miner for some years before you became captain?—Yes; ever since I was ten years old.

1590. Did you suffer from working in the mines, when you were young?—I have suffered inconvenience from the bad air.

1591. Have you known instances where there has been bad air?—Yes, certainly.

1592. Is the bad air caused by the want of ventilation?—Quite so.

1593. What is the depth of the mine?—Sixty fathoms below the surface.

1594. Are there more shafts than one in it?—There is only one shaft. We have made that one air-tight, and we divide it in the middle, so as to have clear ventilation.

1595. When you say you have divided it in the middle, do you mean that it is divided up and down?—Yes; and we have made it air-tight.

1596. How many men have you at the present time working underground?—Twenty-seven men.

1597. Are they all healthy?—They are very well, I think.

1598. What is your opinion as to the cause of the ill-health of the miners?—It is bad ventilation, generally, and the dust from the ore, and the powder-smoke, and various causes.

1599. Dust does come from the ore?—Certainly.

1600. And I suppose if there is mundic in it, it is much worse?—Yes; mundicky and copper are very bad.

1601. How does it affect the men?—It produces a tightness in the chest, and a difficulty in breathing; it loads up the lungs.

1602. Does it affect the general health of the miners, or what is the first symptom of illness in the miners?—Paleness in the face, shortness in the breath, and weakness in the legs, and a difficulty in climbing.

1603. Do you think that the climbing up the ladder has nothing to do with it?—It is a very trying thing, the climbing up deep mines; but the men need not climb so hard as they do; they can make it hard or easy, as they please.

1604. But do they not sometimes race up?—Certainly they do.

1605. Is not that injurious to them?—Yes.

1606. When a miner's health begins first to fail and he is then placed under the doctor's hands and recovers, does he return to the mine again?—Yes, very frequently; and he may be put into nice comfortable places, where he is unable to go underground.

1607. (*Mr. Austin Bruce.*) You have spoken of the men suffering. Have cases often come under your knowledge of men suffering as you have described?—I have seen men very frequently suffering, but not lately; I think it is not so very much. We have not one who is at present sick.

1608. Do you think that these sufferings are almost the necessary consequence of the men working underground, in the copper mines, or do you think they can be prevented?—There are places where it is impossible to obviate them.

1609. Why do you suppose so?—Because there must necessarily be bad ventilation; you cannot convey the air; it is very difficult, in a hollow piece of ground to do so; the machinery sometimes is inadequate for the work.

1610. Is it because it cannot be done, or because it is expensive to do it?—Sometimes it cannot be done and at other times it is expensive; but any man with reason will do all that he can to remedy it.

1611. I suppose there is a great difference between one mine and another, in the manner in which the ventilation is conducted?—Certainly.

1612. Has it been your business to view other mines besides your own?—Yes, several.

1613. Have you found in them considerable difference?—Yes, I have; just as there is in farming.

1614. But good farming and bad farming affect the profits of the farmer, but they do not affect the health of the labourers?—Just so.

1615. Well-managed ventilation would affect the profits of the owner, but it would also affect the health and lives of the men employed by him?—Yes, certainly.

1616. I suppose there is also a considerable difference caused by the skill or the ignorance of the different captains employed in the mines?—Yes. In some places there is not sufficient attention paid to the subject of ventilation as there ought to be.

1617. Where people are rather short of capital, I suppose, they do not take the same means to carry ventilation into the close ends that others do?—It is

not always the case that they are short of capital, and poor mines are sometimes as well ventilated as the richer mines.

1618. In cases where you have observed inferior ventilation, as compared with mines generally, what, in your opinion, has been the cause of it?—I do not know that I know of any particular case that is inferior. I have certainly seen places that might be improved.

1619. Your experience does not go very far back, for you appear to be young?—Yes.

1620. What is your age?—Thirty-six.

1621. Have you observed in your time any improvement in the general health of the miners?—I cannot say that I have.

1622. Are the arrangements for ventilation better now than they were when you first started?—They are just the same.

1623. You say that you have known your workmen suffering from the symptoms you described just now?—No, not one of ours.

1624. Where, then, has it been where you have perceived such symptoms?—In a very large mine, where they had a large number of men. Our men are very few in number, perhaps there might be one or two out of the twenty-five or twenty-six, but very few.

1625. How many workmen in a hundred would probably be affected as you have described?—Perhaps not one in a hundred.

1626. What is the age of the youngest man in your mine?—About seventeen.

1627. What is the age of the oldest?—About thirty-seven or thirty-eight.

1628. How does it happen that you have got so young a body of men?—We pick out good men; we have very few men.

1629. (*Chairman.*) Have you ever seen any artificial means of ventilation tried?—Yes, various means.

1630. Do you think that they have been tried with good results?—Yes, with great effect.

1631. Why should not the same means be employed for ventilating the bad ends?—The same means are employed in many places, where there are many men, and the air is not sufficiently good for a large number of men.

1632. What are the artificial means that you allude to?—It is to force the water, or pump it down, by fans, and things of that kind.

1633. Have you ever seen that done from the surface?—Yes; and at other times from the levels below, where the air is fresh.

1634. When it is done from the levels below, it is done by boys, is it not?—Yes, or by a stream of water.

1635. (*Mr. Kendall.*) You say that you are only 36 years of age?—Yes.

1636. Did you work your way up as a miner before you became an agent?—Yes.

1637. When did you first begin?—When I was 10 years old.

1638 How did you work your way up; as a tributer or as a tut-man?—In all gradations, all the way up.

1639–1640. What depth have you worked down?—Never below 200 fathoms.

1641. Was the air very hot at 200 fathoms down?—Yes.

1642. That was before you could get any connection between, I suppose?—Yes.

1643–1644. You have stated that the ventilation is just the same as it was?—I do not see much difference.

1645. As you have visited many mines, do you think that in many mines, from false economy, ventilation is neglected?—I think it is false economy where they do not do it.

1646. Have you seen the men working in bad air which might have been easily remedied by a small outlay?—Yes.

1647. Do you think that the agents are accountable for that state of things, or that the agents desire to please the adventurers?—I do not think that the adventurers ever control them.

1648. Generally speaking, do you find the adventurers are willing to do what they can for the benefit of the miners?—Yes.

1649. Do you think that the want of ventilation proceeds from false economy, or from want of thought on the part of the agents?—It is certainly false economy. They want to work as cheaply as possible.

1650. Did you ever see any man in the Caradon Consols Mine working where the candles burnt very dimly?—Yes. I have worked myself there, and there are plenty of shafts in that mine.

1651. Before there was any connexion, and before you sunk the winze?—Yes; when the winze was in the course of being sunk; just before the hole was made, we had better ventilation, and perhaps in a week or two things might be improved.

1652. But there I presume you contrived to get your air doors in, and so on?—Yes; they did everything they could, I believe, generally speaking.

1653. Have you often seen the men working in places where the candles would burn dim?—Yes, and they have been obliged to leave them.

1654. Have you known men who were notorious for working in bad air, and who suffered in consequence?—I have seen a good many men who were not at all particular.

1655. And they have suffered from it, have they?—Yes, certainly.

1656. But your experience leads you to think that not more than one man in 100 suffers?—I do not think they do.

1657. (*Mr. Fulke Egerton.*) I suppose that in most mines there are not more than two or three bad places?—Perhaps not.

1658. (*Chairman.*) Would the men who were working in these bad places forfeit anything by leaving their work if the air was bad?—Not at all.

1659. They would not suffer in their pocket by leaving their work?—If they refused to work their remedy would be simple; they could go away, and go somewhere else.

1660. But suppose they could not get employment?—That is the point; but they could not be long out. Able men generally can get employment.

1661. Generally speaking, do the men work on because it is their only means of obtaining a livelihood?—Yes.

The witness withdrew.

DAVID BUZZA examined.

David Buzza.

1662. (*Chairman.*) What is your age?—60.

1663. How long have you been working in mines?—I have been underground for 50 years.

1664. Where are you working now?—I am working in the mine that is called West Caradon.

1665. Have you ever worked in other mines?—Yes, in many.

1666. What is your work now in West Caradon?—I am on tribute.

1667. Do you prefer working on tribute as compared with tut-work?—Yes.

1668. Does it answer your purpose better?—It is not so bad for the air on tribute as it is on tut-work.

1669. Is that one of your reasons for preferring

LISKEARD.

David Buzza.

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tribute?—Yes; with the advantage, perhaps, of getting a trifle more money at times. But what I have come here for this afternoon is this: I worked in a mine called Devon Great Consols, and my family is now residing at Tavistock. I have quarters here. I have been turned away, after I had done very badly for some months; 14 months; all that I earned during 14 months was 15*l.* 1*s.* 4*d.*

1670. Was that at Devon Great Consols?—Yes.

1671. You gave up work there?—I complained that I had done badly, and that I had not got money enough, and it was in their power to let me get more, and because I complained they turned me away out of that mine, and they would not let me work in any mine in the district. And so this is how a miner is tossed about. I went to the different mines in the district, and I could not get any more work. "I have no work for you," they said.

1672. Have you suffered in your health when you have been working in the mines?—Yes, I suffered rather.

1673. Have you suffered at all in your breathing?—I understood that this was for the welfare of the miners all through.

1674. But my question was whether you had ever suffered in your health from working the mines?—Yes, many times.

1675. How has it affected your health?—It has affected me in my breath.

1676. Do you feel the effects of it now?—Yes, I do feel the effects now; but I have not suffered so much so much as many.

1677. When did you begin first to suffer?—When I began to take a man's part; not when I was a boy.

1678. Did you go down under ground as a boy?—Yes. I went down, and came out again after working some time, and went home, and got into bed, and just when I came home I had no stomach to eat anything, and I would rise in the morning just like that, and was sometimes home for a month without working at all.

1679. Were you under the doctor's hands?—Yes; I have had a doctor; but I believe that the doctor is not of much service for men working in poor air; they call it the miners' complaint, after a man has done working.

1680. Have you got that complaint upon you now?—Yes; I have got a little of it; at times I have got a very bad cough and short breath.

1681. Can you go up the ladders now?—Very badly; nothing like what I used to do; but then there is one thing besides this, my age is great; I am an old man for a miner, 60 years of age; I was 60 last February.

1682. Are you now working at tribute work?—Yes.

1683. Are you doing well at it?—No; I have done very badly indeed.

1684. Are you working in a pair?—I have a boy working with me; we generally work one man and a boy.

1685. Are there no more than two of you as a pair?—Some are working four and some two.

1686. How old is the boy who is working with you?—He is 13 years of age.

1687. Is he a relation of yours?—No; he is quite a stranger.

1688. (*Mr. Kendall.*) What level are you working at?—I am working at level 38.

1639. What did you take up last month?—I have had since I have been there for the last six months 7*l.* 10*s.* for six months.

1690. For you and the boy?—No; for myself.

1691. When you were ill, what did the doctor give you for your cough?—Sometimes I got a few pills and a powder, and so on.

The witness withdrew.

Mr. RICHARD PASCOE examined.

Mr. R. Pascoe.

1692. (*Chairman.*) In what mine are you engaged?—In the Gonamena mine.

1693. Have you been a miner all your life?—Yes.

1694. And employed in this district?—Not all the time.

1695. But have you been employed in Cornwall principally?—Yes; and also some time in Devon, and a short time in Scotland, in the Kirkcudbright mines; and I was in Ayrshire for three years, and in most of them round this district.

1696. How long have you been in the mine you have mentioned?—I worked there for some years before I was agent, and I have been agent for six years; I worked there for five years before I became agent.

1697. What is the depth of that mine?—90 fathoms; that is, about 100 fathoms from the surface.

1698. Is it a well-ventilated mine?—Yes, it is. We have two shafts; one farther west and the other in the east.

1699. How many men do you employ in that mine?—There are 16 miners employed underground.

1700. Did you ever suffer in your health while mining?—Yes, I did; and it was from working in the poor air I have suffered.

1701. What was the effect produced upon you?—You feel it in your knees, and you have shortness of breath, and a pain in your head.

1702. Did you get well again after you left the mine?—Yes.

1703. Did you go back again to work in the mine?—Not into the poor air.

1704. How do you ascertain the presence of poor air, otherwise than by its making you feel unwell?—By the candle; and when you come into good air you feel it directly. You have a pain in your head, and pains in your legs.

1705. You do not feel it so much while you are working?—No.

1706. Do you only judge of the presence of bad air by its effect upon the candles?—Yes; at the time you are there.

1707. Were you in the habit of leaving off work when the candle began to burn dimly?—No. I have worked there many times when we could keep no light.

1708. Why did you go on working under such circumstances?—Because I was anxious to get more money. It was very foolish; but when a man can get a little extra money he will work a little more.

1709. Do you mean that they will work when the candles will not burn?—Yes; and if we wanted to ventilate one place to another we should just work a little more. I have run the risk of my life to work a little more to get the place well ventilated.

1710. Are the men paid for doing that?—Nothing.

1711. If you had given up the work, I suppose you would not have been paid?—Yes. We know that it must be done, and that we must go and do it, thinking that an hour or two more would not hurt us.

1712. But still you have suffered from the effects?—Yes. I did not work in it long; just for some hours, and then go off.

1713. Did you ever go in for a few minutes to work, and then come out to get fresh air?—Yes.

1714. Are there no means of bringing in fresh air to such a place as you are speaking of?—There are many places like it that might be better ventilated if they only went to a little extra cost, by having timber sawed up thin, and put over the air soliers in the bottom of the level; that would convey the air.

1715. By that means you would form a current of air ?—Yes.

1716. Have you seen pipes put in for that purpose? —Yes ; they have put them in in one mine; we drew out 150 fathoms with air sollers.

1717. Were they made of iron or of wood ?—Of wood.

1718. Have you any artificial means for forcing the air down from above into those places ?—No ; it is ventilated from one level to another by winzes ; they make the air go in over and come back again over.

1719. Why is that not always done ?—It is the expense ; very often it might be done better with more expense.

1720. If the men complained, do you not think that they would do it ?—They might in some cases.

1721. Would it not also be for the advantage of the owners of the mine ?—Yes, in many cases it would.

1722. Do you think that the matter is not brought under the notice of the owners themselves ?—I think that the men are driven to it very often by the agents to work extra ; to do a thing where they have not work in another mine ; and if they have not this place they do not know where to go and get their living ; it is like that in many cases.

1723. (*Mr. Kendall.*) When you say that they are driven to it, I understand you to mean in this way, that a man goes to an agent in a mine, and says, " Can you give me any employment ?" The agent says, " I do not know that I want any men ; but " there is such and such an end, and if your will try " that you may," and the man takes it ?—Yes.

1724. That is what you mean ?—Yes.

1725. And in an end of that kind you say that the outlay of a small sum of money would produce better ventilation ?—Yes.

1726. Did you ever know a case of an agent being asked to make a small outlay of that kind, and refusing to do so ?—No ; but I do not know that a man would venture to ask that. I do not mean that the captain would oblige a man to go there, but the man's circumstances may be such that he does not know where else to go and get his living.

1727. That is to say, the captain does not say, " You must go and work in that place," nor, " If you you will not work in that place I will turn you off," but if a man wants employment the agent may say to him, " There is such and such a place ; you may " try it," and rather than not work at all the man will run the risk ?—Yes.

1728. And you are of opinion that the outlay of a small sum of money would prevent that risk ?—Yes, oftentimes, but sometimes it could not.

1729. Do you think it has not been done because a man has been afraid to ask an agent for fear he should he dismissed ?—Yes.

1730. But you never knew an instance of a man asking an agent and the agent refusing ?—No ; but I do not think that a man would venture to do it.

1731. (*Mr. Fulke Egerton.*) Are the agents constantly going over the mines ?—They should do so ; the agent has to go into every place ; wherever a man goes the agent has to go ; but a few minutes will do it.

1732. (*Mr. Davey.*) Are you not aware that they pay an additional price to the workers for those ends where there is poor air ?—Yes ; that is because a a man cannot work so much.

1733. For example, if you could drive an end for 4*l.* a fathom, provided it was in good air, you would pay 6*l.* a fathom for driving it if it were in foul air ? —Yes.

1733. (*Mr. Kendall.*) Do you know any instances at this moment of any men working in that way ?— No ; I have not been in any mine to see anything of that kind for some years. Our mine is at present well ventilated, and most mines of late have been so.

1735. Do you think the mines are better ventilated than they used to be ?—Yes, I do think so.

1736. Has there been great improvement in them in that respect ?—Yes. I know that South Caradon and West Caradon have been considerably improved in the last few years.

1737. Would you get many men at the present time to work in bad ends ?—Yes, I think so ; they would work there now rather than remain out of work.

1738. (*Mr. St. Aubyn.*) By what means has the ventilation been improved ; has it been by making additional winzes, or in what way ?—By causing more ventilation, by winzes, and holing the mines, holing one mine into another. West Caradon and South Caradon are ventilated one from another, and by that means a current of air is carried through all the mines.

1739. That is by connecting one mine with another ?—Yes.

1740. Speaking of a mine that has no connection with another underground, are you of opinion that the methods of ventilating have improved ?—No, not in all.

1741. (*Mr. Austin Bruce.*) Are there many men who are now suffering from working in bad places ? —I do not know of many now.

1742. I do not speak generally of your own particular neighbourhood, but within the district with which you are acquainted, are there, in your opinion, many men suffering as you have described ?—Perhaps not many, but of course working underground is not like above ground ; a man cannot live and work as long under ground ; they want a change of air ; they are down amongst the powder smoke and candle smoke, and certainly that will injure a man. If I go down for three or four hours, when I come up again I spit up all the black smoke.

1743. Even now, when you are not in the habit of working below ?—Yes.

1744. And that would of course be worse for the men, who are exerting themselves in their work, because they breathe faster?—Yes ; and they take in more of that candle smoke, and that is very bad ; but the men do injure themselves often when they need not do it, by running into the powder smoke, when they are very hot to see what has been done ; they rush into danger when they ought not to do it.

1745. Have you ever seen any close end into which sufficient ventilation might not be carried at some inconsiderable expense ?—Yes ; I have seen it where you could not ventilate a place ; I have seen ends of that sort.

1746. From what cause was that ?—Because the air was entirely dead all round, and you want to hole two places from one shaft to another, and you will get it so that you cannot throw the air in. There is no such thing to be done as to put a machine in ; and the men have to work in times like that.

1747. Are there no artificial means which could be resorted to for throwing air into those places ?—Not without incurring a great expense. There are times when you cannot ventilate.

1748. And those are the instances I presume in which there is the most suffering ?—Yes.

1749. I suppose, although you have ceased to be a worker, you have kept up your acquaintance with workmen ?—Yes ; with a great many.

1750. Do you know many of them who are suffering from the effects of working in bad air ?—No, I do not know many now.

1751. You have described the state in which you have been yourself when you have gone on working in bad air. If you have felt the inconvenience of that, do you imagine that if you had continued that kind of life you would have been in as good health as you are now ?—No. I should not be living now.

1752. And there must have been many more miners in your position ?—Yes ; but they would not work in those places long ; they could not.

1753. The instances in which you worked in bad

places were not the ordinary instances, but the exceptions ?—Yes.

1754. Were the exceptions frequent enough to tell upon your general health ?—They told upon my health, and I was bad for a while, so bad that I could not work so well ; I was not so strong, and then I would go into the good air again.

1755. If you had not possessed sufficient intelligence to raise yourself to your present position, and had been obliged to lead the life of a working miner, do you think you would have been in tolerably good health now ?—I should not work in those places. There are ways, if men will just put themselves to work upon tribute ; but men have not sometimes courage enough to turn from tut-work to tribute-work. They do not understand the work, and they refuse places. But if a miner were sharp enough, he might work at tribute, and that is generally in good air.

1756. But still somebody must do the bad work ?—Yes.

1757. A sharp man and a clever man might avoid those places ?—Yes.

1758. But still somebody must go into them ?—Yes.

1759. So that there is unhealthy work going on in most mines ?—Yes ; in most large mines.

1760. (*Mr. Falke Egerton.*) I understood you to say, that in some mines the unhealthy work was unavoidable ?—Yes ; in large mines.

1761. I suppose that those are places that are being driven onwards ?—Yes.

1762. Eventually they will become well ventilated ?—Yes ; after a while.

1763. How long do you suppose that they will remain in an ill-ventilated state ?—I cannot tell you that.

1764. (*Chairman.*) Does it take sometimes as much as two or three months to complete a communication ?—Sometimes two or three months.

1765. Does it ever take as long as six months ?—Yes ; to ventilate a good place.

1766. In the meantime the air in that place is bad and unwholesome ?—Yes; and then it gets worse ; and it will continually get worse until you just bole further in ; but very often places might be better ventilated by incurring a little extra expense.

1767. (*Mr. Davey.*) What proportion of the people in a mine would be working in bad air ?—Perhaps not one in 100 ; it is only at times that you find a place like that.

1768. (*Chairman.*) Are many of those miners who worked with you at the time you have referred to now dead ?—Yes ; several of them have died.

1769. At what age did they die ?—At about 30 or 40 ; they have killed themselves in that time. My father died at 44, and I believe all through breathing poor air.

1770. Have you any tut workers now ?—Yes.

1771. Where are they working now ?—They do not work in the poor air ; they would not.

1772. Should you say that it was more generally the needy miners who undertake this kind of work ?—Yes ; they are forced to work at it. Take the case of a man with a large family ; he is afraid to leave tut work. When you have tribute work you get what you can. A man works upon little, and that keeps him under water always ; and if he cannot go to tribute, perhaps his judgment is not good enough to enable him to know when he takes a good place.

1763. Have you never seen any means by which air could be forced down into those bad ends ?—Yes; it could be done by an engine ; by putting in an air machine to be attached to the engine, that will blow down the air, and force it in. We have put in machines to throw it down 120 fathoms, so that we might keep 20 men at work by it.

1764. You would get a supply of good air by these machines, so that 20 men would be enabled to work ?—Yes.

1765. How is the air conveyed along ?—In wooden pipes or in zinc pipes.

1766. Have you tried zinc pipes ?—Yes.

1767. Does not the zinc soon decay ?—That depends upon whether the water is coppery ; if it is, it will eat it out very fast.

1768. Did you ever try gutta percha ?—No.

1769. The water would have no effect upon that ?—No ; but I never saw it tried.

1770. Do you not think that it might answer ?—I should think it would, and keep the air very sweet.

1771. You would also have the advantage of being able to move the gutta percha pipes from one part to another ?—Yes. Where there is an engine you can throw the air anywhere up or down ; that could be done ; and they might ventilate many mines better than they are, if they went to a little expense in a machine.

1772. Has your mine got one of these machines ?—Yes; we have done it by air sollers. We have thrown down good air 150 fathoms ; we have thrown it by machines 120 fathoms, which I think would supply 20 men.

1773. (*Mr. Austin Bruce.*) Would not that reach any close end that you have seen ?—Yes ; but those close ends may not have an engine. It might be so in little mines, where there is no engine.

1774. (*Chairman.*) If you had had an engine, you could ventiate any close end ?—Yes ; anywhere.

1775. (*Mr. Davey.*) I think you stated just now that it was only the needy men who would work in these close places ?—Yes.

1776. Are they not likely to be the greedy miners who do so ?—No. I do not think that they get so much on the average. I have worked in those places where there has been bad air, and when I have had a good pitch, I have been a little greedy to ventilate the place ; I have worked some days to get the place ventilated.

1777. (*Mr. Austin Bruce.*) You stated that you had been working in Kirkcudbright and in Ayrshire ?—Yes ; in Kirkcudbright it was in copper mines, and in Ayrshire coal mines.

1778. As compared with the Cornish miners, which are the most healthy class ; the Scotch or the Cornish ?—The Scotch miners were very healthy, and the mines were chiefly ventilated by sollers ; I saw it done there.

1779. Was there any difference as between the copper mines in Kirkcudbrightshire and the collieries in Ayrshire ?—There was no comparison to be made between the two ; the copper mines were the healthiest.

1780. Why do you think that was so ?—Their works were not extended so far ; it was not so deep ; there were no copper mines in Kirkcudbright that were deep ; the deepest was 30 fathoms.

1781. Were the collieries well ventilated ?—Yes, pretty well ; not well, but just middling. You could not complain much.

1782. (*Mr. St. Aubyn.*) Were you ever employed at South Caradon before it was connected with West Caradon underground ?—No.

1783. How do you know that the miners enjoy better health than they did formerly ?—Because all the miners are thrown together now.

1784. Were you there at that time ?—Yes. One was partly ventilated from one place ; but since I have been there it has been ventilated all over.

1785. Did you know the miners before the mines were connected ?—Yes.

1786. The health of the miners is better now than it was then ?—Yes.

1787. You think that it is on account of the air being better that the miners health has been improved ?—Yes.

1788. Have you no man engine there ?—No ; we are connected only 90 fathoms deep below the adit.

1789. Is the adit 10 fathoms ?—Yes.

1790. (*Mr. Holland.*) Did you ever work in cold damp air?—Yes, a little, but not much.

1791. I mean when you could not keep yourself warm?—Yes.

1792. Is that a very rare occurrence?—Yes.

1793. Did that very quickly make you poorly?—Yes; it will make you bad very quick.

1794. Did you completely recover from that after working some time underground?—I believe I was completely recovered.

1795. Have you no cough now?—Nothing more than from cold; I do not feel anything from it I think. LISKEARD. *Mr. R. Pascoe.* 15 April 1862.

1796. Have you known of many people recovering often being considerably affected by the poor air?—Not many; not after working in it a good while; I never did.

1797. They never recover completely, do they?—No; they might have worked a little, but they never get well enough to be sound men.

The witness withdrew.

Adjourned till to-morrow at half past 10 o'clock.

Wednesday, 16th April 1862.

PRESENT:

The Right Hon. Lord KINNAIRD, K.T.	H. AUSTIN BRUCE, Esq., M.P.
The Hon. A. FULKE EGERTON, M.P.	P. H. HOLLAND, Esq.
NICHOLAS KENDALL, Esq., M.P.	RICHARD DAVEY, Esq., M.P.

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

A MINER examined.

1798. (*Chairman.*) You are at present employed, I believe, as engine man?—Yes. *A Miner.* 16 April 1862.

1799. How many years have you worked in mines?—About 28 years.

1800. How long is it since you have given up the underground work?—The last time about eight years.

1801. At what age did you commence work?—I commenced work, I suppose, at the age of 10 years.

1802. I suppose you did not go under ground then?—No, but I was at the surface; I went under ground, I suppose, at about 13 or 14 years of age.

1803. Did you work principally as a tributer or as a tut-work man?—I worked for many years as a tributer, both as a tributer and at tut-work.

1804. Which work did you prefer?—I preferred to work at tribute.

1805. What was your reason for preferring it?—It is generally more healthy; there is better air, and in addition to that it is generally day work, not so much working by night as by day; but my chief reason is that it is better air generally.

1806. There are three corps, are there not?—Yes, at tut work.

1807. Do they change about from night to day, or do the night men always work at night?—There are six men, two in a corps, the men that would work forenoon this week would work afternoon next week, and the night corps the following week, so that they always change over.

1808. Did you ever in any mines in which you have worked experience inconvenience from the poor air?—Very much so; that has disabled me from working under ground; I was obliged to give it up for that reason.

1809. In what mines did you work?—I have worked in various mines, and I have suffered inconvenience from the air.

1810. Have you worked in large mines?—Yes.

1811. Will you mention any one mine?—I have worked in South Caradon since I have been in the neighbourhood.

1812. Before that did you work in another part of Cornwall?—Yes, I worked in the Polberro Consols at St. Agnes.

1813. When did your health fail?—My health first failed about 14 years ago.

1814. Which mine were you working in then?—I worked in a little mine then on first going into this neighbourhood, nearly 20 years since, the Caradon Consols; they were then driving an adit level, and it was driven for 125 or 130 fathoms; there was no shaft, no draught.

1815. Were there no artificial means of ventilation?—None whatever. That was the first mine that I worked in when I came into this neighbourhood, nearly 20 years since.

1816. What height and breadth was the adit of 130 fathoms driven?—It was perhaps from 3 feet to 3½ feet in breadth, and from 6½ feet to 7 feet in height.

1817. For that distance there was no winze or any means of natural ventilation?—None whatever.

1818. No air was forced in by any machine?—None whatever. There was first a cross cut of perhaps about 90 fathoms, then it intersected the lode, and afterwards it was driven perhaps 20 fathoms or 25 fathoms on the course of the lode. Then there was a turn which made it so much worse, and after driving perhaps 25 fathoms on the lode, then there was a cross cut again, a turn again from the course of the lode under the engine shaft. That cross cut had to be driven perhaps some 20 fathoms, and it would come in contact with the engine shaft.

1819. The object was to reach the engine shaft?—Yes.

1820. But till you reached that shaft there was no communication of air?—None whatever.

1821. How many men were working in that end—Six men, two at a time.

1822. Did you test the air at any time to see whether it was poor or not?—We had the candles to test it, we applied the candles, and they would not burn standing upright; we were obliged to keep them on the side.

1823. They would burn if kept on the side?—Yes, but not standing upright.

1824. Did you ever try whether it made any difference whether the candles were kept high or low down in the end?—It will make a little difference when there is a stream of water coming out of the end, it will make a difference in the bottom of the level, the air is then a little better.

1825. But there was no stream of water sent down from the surface?—None whatever.

1826. For how many hours did you work at that time each corps?—Eight hours.

1827. Was there any time between when the first corps left and the second corps succeeded?—We were expected to relieve each other.

1828. At once?—Yes.

1829. For how long did you work in this bad air?—I worked perhaps six months, many others had worked previously to my coming there. I think that I took the place of a man who had been so disabled that he had to give up work, and he died in consequence.

1830. Did you know at the time when you took that work that it was likely to affect your health?—Of course I knew that the air was not sufficiently

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good, still being a young man I did not feel its effects directly, and of course I thought that it would not have injured me, but shortly afterwards I felt its effects.

1831. About when did you begin to feel bad air? was it when you first went to work?—Not at first.

1832. What distance should you say from the shaft was it that you began first to feel the bad air?—I believe that I began to feel the effects of the bad air perhaps 20 fathoms from the shaft.

1833. The candle was affected?—The candle was affected at perhaps more than 40 fathoms, 50 fathoms before it reached the shaft.

1834. Was there any difference on entering that end on a Monday morning from entering it on any other day?—Very much. In working on the other days there would be the powder smoke and the candle smoke which would be confined in the place; there not being a sufficient body of air, it would not live; it would die in the place; and on Monday mornings, of course, having been absent from Saturday, all this would naturally have gone away.

1835. How long should you suppose that the powder smoke, when you were working, remained in that end?—It was never clear of powder smoke from Monday morning until Saturday night, being continuously working through the week.

1836. How many blasts do you suppose were driven during the day in that end?—We generally calculated to blast three holes each corps—sometimes it would be more.

1837. So that in the 24 hours there would be nine blasts?—Yes.

1838. Was it a dry end or a wet end?—It was a dry end.

1839. Was there any dust at all in driving?—It is naturally so where it is dry.

1840. Whether you are driving by pick or by bore in a dry end there is dust?—Yes, naturally.

1841. But I suppose that you endeavour to keep it down by applying water, do you not?—If we are boring a hole, if we can conveniently do so, we use water.

1842. But sometimes, I suppose, you cannot get the water?—Sometimes we cannot get the water into it. If we are boring a hole where it is flat we cannot, but if we are boring a hole in any direction where it dips a little, we can get water into it. In boring a flat hole at the back of the end, or at the roof of the end, we cannot get water into it.

1843. And, therefore, there is a good deal of dust?—There is naturally dust.

1844. Do you think that you inhale that dust?—Yes; I had a very serious illness, for between two and three years I could not work at all. I never did a day's work for more than two years, and for years after I was unable to work again. I spat up a black substance, supposed to be the candle smoke and the powder smoke having been inhaled and lodged in the stomach or upon the liver, or something of the sort. For years after I declined working under ground I spat up this black stuff.

1845. Did you go on constantly doing it?—Yes, every day, for years after I had declined working underground.

1846. Do you know whether the other men who were working with you were affected equally?—The man that I worked with worked very little after leaving off working in this place.

1847. He died?—He died some two or three years afterwards.

1848. Then the reason why men work in those places is, in the first place, because they think that they may escape injury, and in the next place they do it, because it is the only means of earning their livelihood?—Yes; the principal thing is, that it is their only means—if they left that place, they would not know where to get another.

1849. Do you think that they are paid more for working in that air?—I believe that, generally speaking, they are not paid so well. There is not that difference made in the price which they get for excavating the ground which there ought to be; the badness of the air is not taken into consideration generally as it ought to be.

1850. Was this represented to the managers or captains of the mines?—They were perfectly aware of it.

1851. And yet they took no means whatever to supply you with fresh air?—No, they did not at the time; not until they came into communication with the engine shaft.

1852. I suppose that you paid club-money at that time?—Yes.

1853. Did you get an allowance during the year that you were laid up?—None whatever from the mine; we get no allowance from the club unless there is a visible injury.

1854. Then it is not if a man is put off work from the effect of the work?—No.

1855. You mean by a "visible injury," an accident?—Yes; a broken limb, or something of that sort.

1856. Is that the case, as far as your knowledge goes, with regard to other mines? Is the club-money not given to men who are off work from illness?—Not generally speaking; there are a few exceptions, but, generally speaking, they receive nothing.

1857. Who is the judge whether you are entitled to this relief or not?—The agents generally.

1858. Does the other 9*d.* which you pay for the doctor include attendance on the family?—Yes.

1859. Did the doctor attend you during that time?—Yes; but still we derive a very considerable inconvenience frequently from paying the doctors in that way.

1860. Why?—We frequently think that they do not pay sufficient attention to us as they otherwise would do, provided it was managed in some other way; it is frequently complained of. During the former part of my illness the mine doctor attended me; but after some time I did not recover perhaps as fast as he could have desired, and I had to apply to another. I had to go to Plymouth to the physicians there.

1861. Did they do you any good?—Yes.

1862. Do you feel the effects at the present time?—Yes.

1863. Can you go up the ladder with equal facility to what you could?—No, I feel a want of breath.

1864. How old are you?—I am in my 40th year.

1865. Do you know many miners of that age or older than that?—Yes, there are several who are of that age.

1866. Do you know many working in mines under ground at present of that age?—Yes.

1867. Have they suffered?—Yes, they suffer more or less. There are not many miners, at the age of 45 or 50, but who suffer either more or less from what they term the miner's complaint, that is, a tightness and shortness of breath.

1868. Did it seize you suddenly at all?—No, I felt myself declining for some months before I was obliged to give up work.

1869. You felt a weakness?—Yes, a natural weakness.

1870. And was that aggravated by climbing the ladder?—Yes, I had very great difficulty in climbing the ladder. If we are working in a poor air place, we generally find it out first in climbing the ladder; we generally find it out first in our legs and knees failing us; after working we generally find a very great pain or weakness in the legs and knees in coming up the ladders.

1871. Which would not be the case if the men were not working in poor air?—No, we do not suffer to anything like that degree when we are working in good air.

1872. So that that is one of the symptoms of poor air?—Yes.

1873. Is that known as a general symptom?—Yes.

1874. Do the men when they have that feeling leave off that work?—No, if they were to leave off that work they would not know where to go or what to do in order to get a livelihood for themselves and their families.

1875. Therefore, although they know that this may be fatal, necessity compels them to work?—Yes, of course many men work until they are obliged to give up. I knew perfectly well the last time I was under ground that I should have to give it up; in fact, I never experienced such a difficulty before or since as I did that day; I worked so long that I could really do no more.

1876. Did you ever catch cold in coming up?—Very likely I have done so frequently.

1877. Was there a changing house at this mine where you worked?—In the first mine that I worked in we changed in a barn belonging to the farm on which the mine was; we had no fire in it.

1878. Where you last worked, what was the description of dry?—There was no dry then; there was a changing house, but it was not a dry house; there was no fire, and no provision was made for drying the clothes; so that frequently, if our clothes were very wet, we had to carry them to the smith's shop, and hang them about, or throw them about wherever we could.

1879. So that if you came on a wet day to your work the clothes which you took off would be wet?—Yes, they would be the same when we came up.

1880. And you would have to put on those same clothes?—Yes; there were no means of drying them.

1881. But there are some places where there are those means?—Yes; in many mines provision is made for drying the underground clothes; but there is not that attention paid to the clothes of the men which they wear to the mine; they are not considered. The man who looks after the dry does not consider that he is requested to pay attention to these clothes, generally speaking.

1882. The man who looks after the dry only looks after the mining clothes?—Yes.

1883. If your clothes are wet when you come to the mine, he does not look after them?—He does not dry them.

1884. Not even in the dry house?—No, it is not generally done.

1885. How far were you living from the last mine where you worked under ground? Did you live in Liskeard then?—Yes.

1886. (*Mr. Kendall.*) You were speaking of the poor air at 90 fathoms, and then you mentioned 25 fathoms and an angle, and another 25 fathoms and another angle. In your experience, did you ever know either before or since such a distance where a man could even live?—I never found such a distance in any other place.

1887. Is it not a very rare thing?—Yes; it does not often occur, but it frequently occurs in mines, that it is driven a very considerable distance from any draught.

1888. But it is a very rare case to go in even 50 fathoms without some little help?—No, not at all; it frequently occurs to go 50 fathoms, and a great many fathoms more than that, without any communication of air.

1889. What was the nature of the ground; was it slate or granite?—Granite.

1890. Were you able, upon an average, to make three blasts each corps?—Yes.

1891. What was the general price of your end?—From 5*l.* to 7*l.* or 8*l.*; it was not violently hard ground.

1892. Where had you been working before you went to that place?—I worked at the Polbero Consols at St. Agnes.

1893. What level did you work in there?—It is shallow there, perhaps about 30 or 40 fathoms from the surface.

1894. There is no bad air there?—Not generally speaking; it is principally a tribute mine, and there are more shafts; there are a great number of shafts in that mine.

1895. Are you one of a family of miners?—was your father a miner before you?—Yes.

1896. What aged man was he when he died?—He was about 52 when he died.

1897. Was he an agent or a miner?—A miner.

1898. Did he die from any disease?—He died in a decline; he was not able to work under ground for some three or four years before his death.

1899. What age were you when he died?—I was about 26.

1900. Were you strong as a young man?—Yes.

1901. Very strong?—Yes.

1902. And healthy?—Yes.

1903. With no cough at all?—No.

1904. Were you sober as a young man?—Yes.

1905. You say that the agents were perfectly well aware that you were working in bad air?—Yes.

1906. Was the company a poor company?—No.

1907. They could have afforded to put up means to improve the air?—Yes; they afforded to put up an engine afterwards, and worked it for some time, but there was no engine in the mine at the time.

1908. Why do you think that the agents allowed you to work in that air—what was the object of forcing you on in that way?—Their object was, I suppose, to communicate with the engine shaft.

1909. Why would they not go to the expense of having a fan or something or other?—It was not above 15 fathoms from the surface, so that they might have put down a small shaft or two with little expense.

1910. And that small expense was spared?—Yes.

1911. You think that they ought to have gone to that expense?—Yes.

1912. In fact, it was economy that did it?—Yes; it was saving on their parts, no doubt; they might have done it with very little expense; they might have put down two or three shafts in that distance, and it would have proved of very great benefit to the men working.

1913. You say that you worked in South Caradon once?—Yes.

1914. South Caradon has become an extensive mine?—Yes.

1915. Was it an extensive mine when you worked there?—Yes.

1916. Taking the ventilation of that mine as a whole, was the ventilation very fair?—Some places were bad; but, generally speaking, I suppose that it is as good as the average.

1917. Were there many places where candles would not burn well in South Caradon while you were there?—Yes.

1918. That was before they ventilated it by winzes and so on?—Yes, there were not as many shafts in South Caradon at that time as there are at present.

1919. Were any means taken in South Caradon of forcing in air at those bad ends?—Yes, there were many places; they had got a small fan machine, but frequently the air forced in by these fan machines is impure where they take it; they do not take it direct from the shaft; it is not so pure air as it should be; they take that air at a certain place in the level, when it ought to have been taken from the shaft generally; so that it is not pure air that is always forced in by these fan machines.

1920. Did you know any place in South Caradon while you were there, where, at a moderate expense, they might have forced in air and did not do it?—Yes, in the last mine that I worked in.

1921. (*Chairman.*) Was that South Caradon?—Yes.

1922. (*Mr. Kendall.*) That was not where you first worked?—No, that was the Caradon Consols.

1923. What end did you last work in?—The 120 fathoms level.

1924. How far were you then in beyond any communication with the air?—We were in perhaps 40 fathoms from the shaft, and there was an angle in the level, and we had to drive on the cross course to

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intersect the lode, and it was a timber level; we had to put in timber into that level, and that makes the air so much the worse.

1925. Then were you in 40 fathoms before you had an angle?—No, not 40 fathoms before the angle, but perhaps 15 fathoms from the shaft before the angle.

1926. And how many fathoms after the angle?—25 fathoms.

1927. How far was it before you made any communication?—At that distance they cut a lode and then sank a winze on the lode to the cross level.

1928. In sinking that winze the communication was still only through this drift?—Yes.

1929. Was the air bad in that winze?—Yes.

1930. How many men were working in that winze?—Four.

1931. You had eight hours' rest?—Yes.

1932. After you had rested was there a perceptible difference in the air?—Yes, there was a very great difference in the morning.

1933. A supply had come in?—There was a better supply; there was not the same foul smell. The candles are generally not of the best kind; the wick of the candle is frequently made of hempy stuff, when it ought to be of the best cotton. We frequently consider that the candle smoke does us as much or more hurt than the powder smoke.

1934. Before you communicated the air was very inferior?—Yes.

1935. How long was it after you began to work before you found the candle show a difference?—Not very long, two or three hours perhaps, and even in the first commencement it would not burn so clearly as in the good air parts.

1936. You were obliged to blast in the sinking?—Yes.

1937. How long was it before the smoke got out?—It would never get out at all while we continued working; before the smoke of one hole was gone, or, as we term it, died away, in the place, we had to blast another, so that in these poor places we are constantly working in smoke either more or less.

1938. Might the agents at a small expense have supplied you with better air?—Yes, they might have put in a waterfall from the engine shaft.

1939. Was any remonstrance ever made to them?—Frequently.

1940. And what did they say?—The reply is, "If you do not like it, you must leave it."

1941. Do you recollect what you got a fathom for sinking in the winze?—I did not sink more than two or three feet before I was obliged to give it up. I was laid prostrate.

1942. (*Chairman.*) Can you give us the names of any miners who are now working in an end with poor air?—Not at present working underground, I cannot, perhaps, give you the necessary information at present.

1943. (*Mr. Kendall.*) Take an average of the South Caradon mine, how many men do you think there are working underground there at a rough guess?—I cannot tell, I cannot answer the question now.

1944. When you were there how many were there?—I suppose there were 300 men underground when I was there, I think I am safe in saying that.

1945. How many of the 300 do you think were working in a bad end when you were there?—It would be difficult to say the number.

1946. Were there half a dozen men working in bad ends?—Yes, a great number more than that, unquestionably; it would be a very rare thing to meet with a mine of that description without finding a great number more than that working in a bad end at any time.

1947. (*Chairman.*) How many men are working in the mine where you are employed now?—I think I was informed some week or two since, that there are 300 men working underground there.

1948. Are there any bad ends with poor air in that mine?—I am not prepared to say exactly, there was one some time since, that was driven perhaps, about four score fathoms from the shaft, after being driven, perhaps, 60 fathoms they had a communication of air, what we term a waterfall from the shaft.

1949. (*Mr. Holland.*) How many years have you worked as a miner?—About 28 years I have been working in mines.

1950. You say that you have worked in ends where the candle would not burn unless it was sloped?—Yes.

1951. How often has it occurred to you to be obliged to do that?—Very often.

1952. How often at a time?—For twelve months at a time in many places—for many months at a time frequently.

1953. How long was it before the working in bad air began to affect your health?—Perhaps five or six months; I am not prepared to say exactly. In the first place that I speak of, it was stopped for some little time, and we worked at sinking an engine shaft, after being working there some five or six months. I am not prepared to say to a month exactly.

1954. Do you mean to say that for the whole day you had to slope the candle?—Yes, the whole eight hours.

1955. And could you work eight hours in such air continually?—Yes. When we had blasted a hole, perhaps we might go out into the fresh air there, but in many places in the old parts it would be too far down from the surface; but there we could go out from the end, because this level being taken up from the surface, we could go out and remain perhaps ten minutes or a quarter of an hour while the worst of the smoke was on, the heat would subside a little bit. In deep mines of course we had not that chance.

1956. (*Mr. Davey.*) You have been asked whether you yourself know of any place similar to the one that you have spoken of where there was such a length of level without any communication or any attempt to put in air?—I do not know any place at present.

1957. Have you ever heard of such a place before?—I cannot call to recollection such a place, but it frequently occurs in driving a level that men have to work in bad air for many months successively.

1958. You do not know any place so bad as that?—No.

1959. You say that you blasted about three holes in a corps?—Yes.

1960. How could you manage to do that when the air was so bad?—We were obliged to do it; we managed to do it; we had to make the best of the air.

1961. Is it not very unusual for a man to go in and bore another hole before the smoke has in some measure dispersed?—I have stated that we might perhaps stop ten minutes or a quarter of an hour between, but it is not at all unusual for men to go in after that time and work again.

1962. Do you not know that the smoke in a level of that kind will not disperse in a quarter of an hour, or anything like it?—I have said that it did not disperse; we always worked in smoke.

1963. From the experience which I have had I think that it is a moral impossibility for any man to go and bore a hole in a close end of that description in so short a space of time as you speak of, namely, a quarter of an hour—I have never seen anything like it?—It is frequently the case.

1964. What wages did you get whilst you were there?—Perhaps from 3*l.* to 3*l.* 5*s.*, or 3*l.* 10*s.*

1965. And what were the ordinary wages at other places at the same time?—It might have been just the same perhaps.

1966. Was it quite as much as that?—Yes, I believe that it was rather more, generally speaking; and especially in South Caradon, at the time it was considered more.

1967. Did not you get an extra price for working there?—No.

1968. You spoke of the candles being of a bad quality?—Yes.

1969. Do you know that if the candles were made of the best cotton they would not give you any light underground ?—Yes, provided that the wicks were sufficiently large.

1970. But the cotton itself in air, such as you have described, would not give any light ?—In some mines they have the cotton wick.

1971. (*Mr. F. Egerton.*) I understood you to say that you look after the engine ?—Yes.

1972. It is a steam-engine ?—Yes.

1973. Is the boiler-house used as a drying-house ?—No.

1974. There is another house used as a drying-house ?—Yes.

1975. Is that heated ?—Yes.

1976. From the engine ?—No, it is heated by a fire in the same house.

1977. Is it under the same roof as the boiler-house ?—No, it is apart from the boiler-house. There are iron pipes which go through the entire house, so that it is heated at either end; there is a fire-place at each end of those pipes.

1978. Then the men can dry their clothes there ?—There is one man by day and another by night, in order to dry the underground clothes ; they are dried in the same house where the men change.

1979. In what state are your boilers ?—The boilers are in a very good state.

1980. Do you know anything about the boilers generally which are in use at these mines ; are they generally old boilers, or are they bought new ?—They are frequently bought new. I am not aware but that every boiler which is in our mine at present was new when it was put there. I believe so.

1981. Do not men very often change their clothes in the boiler-house ?—It is frequently the case in many mines.

1982. Then you consider that that is tolerably safe if the boilers are in a good state ?—No, it is not considered safe at all; it is customary, perhaps; the men do not like it, generally speaking.

1983. Do you think that there is any cause for that fear ?—It has occurred that boilers have blown up, and many lives have been sacrificed in consequence. I have known it happen in the county. I was very near one, one morning, in the Polberro Consols mine, in St. Agnes, where several men were on the boiler, and one end was blown out. I do not know that either one lost his life, but several men were considerably injured.

1984. (*Mr. A. Bruce.*) How long is it since you worked in a close end ?—It is about eight or nine years since I last worked.

1985. I think you said that since that time the ventilation had been improved in the mine ?—Yes ; in the last mine, in South Caradon, two shafts have been sunk since that time.

1986. In what mine did you suffer in the way that you have described ?—In a small mine called Caradon Consols, some little distance from South and West Caradon.

1987. You say that the candles would burn dimly in those badly ventilated close ends ?—Yes.

1988. Did you ever begin to suffer from the bad air before the candle would show any sign of growing dim ?—You would suffer, of course, from the time you went into it ; you would feel a want of air.

1989. Did you or the candle show signs of feeling it ?—Yourself, especially in working, in beating the borer where it is a hard end, you would feel a want of breath; there was not a sufficient quantity of air to inhale in order to support you as it ought to do in working hard.

1990. In beating the borer you would feel those symptoms of distress much sooner in bad air than in common air ?—Yes, of course.

1991. Have you ever remarked that you were breathing in an atmosphere in which there was much dust ?—Yes.

1992. Do you think that you have been the worse for it ?—A great deal the worse for it.

1993. How soon did you feel the worse for it ?—That depends very materially, of course, upon the kind of constitution of a man ; hence I have been told by many medical gentlemen in the course of my time when I applied to them that if I had not been a man of extraordinary constitution I should have died.

1994. Did you feel it actually whilst you were at work ?—Yes, I believe that I did ; but I felt the effects of it most at the first place that I spoke of. After working in the end for some five or six months it was stopped for some time, and we commenced sinking a new engine shaft from the surface. After working there for, I think, two or three weeks, one night when I was engaged in work some bad sensation came over me, and something just like a swarm of black flies, as it were, came before my eyes, and, of course, I felt very unwell, indeed, and especially in my head, so that I had to discontinue working for some three or four weeks. I applied to a medical gentleman, and he told me that it was the effects of bad air.

1995. Did you feel immediately the effects of the dust being in the air ?—Yes ; in the time of working you would feel it.

1996. Would a man going down in a perfectly healthy state, and working in air impregnated with dust, feel at once that he was breathing dust ?—A man, without working at all, in a perfectly healthy state, if he was going into an end of that description, would feel it much worse than a man who was working in it.

1997. Would there be any marks upon your mouth of the fact that you had been breathing dusty air ?—Frequently ; in coming to the surface, frequently the nostrils and so on would be considerably furred with dust and smoke and so on.

1998. How many men were working in a close end at a time ?—Two generally.

1999. Have you known any other persons complain of the same sort of feelings as you have described ?—Yes, I knew two men who died from the effects of it, who worked in the same end that I did, my partner who worked with me died some two years afterwards.

2000. (*Mr. Kendall.*) That was in the Caradon Consols ?—Yes, one man left and went home and died from the effects of it, never having done another day's work ; I took his place.

2001. (*Mr. A. Bruce.*) The first mine that you were in was worse ventilated than the one that you worked in afterwards ?—Yes.

2002. Do you know whether it continues to have the reputation of being badly ventilated ?—It is seldom that you go into a mine but that there are more or less bad places in it, especially in large mines. Where they are driving on the course of the lode, in order to ventilate it properly, to say the least of it, at the end of every 20 fathoms a winze ought to be sunk from one level to the other, but frequently in order to spare expense it is driven much further.

2003. Be good enough to answer my question ; has this particular mine, namely, the Caradon Consols, in which you first worked now a name for being worse ventilated than other mines in the neighbourhood ?—No, it has never been worked on a large scale ; we were the only pair of men working in the mine at the time.

2004. Then do you believe that it was worse ventilated than the surrounding mines ?—I do not say that it was worse after this end came in communication with the engine shaft.

2005. But there would be constantly new ends being driven ?—Yes.

2006. And wherever new ends were being driven, therefore the same sufferings would have to be gone through by the workmen engaged in driving them ?—Yes, but it would not be driven so far before a winze would be sunk from one level to the other ; but this was an adit level taken up from the surface ; it was driven under the hill. When we first began to drive a close level, there would be perhaps only six feet in the back of the level ; at the time that it came

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in contact with the engine shaft it was from 15 to 20 fathoms.

2007. Where are you now working ?—At Wheal Trelawny mine.

2008. Are there means of artificial ventilation provided which were not provided at the Caradon Consols ?—There are occasionally.

2009. Would those means of ventilation have been sufficient to reach such a close end as that in which you describe yourself to have worked ?—They had not the means of a waterfall in Caradon Consols ; they have in Wheal Trelawny, from the engine shaft, but there was no engine shaft in the mine at all, the only means which they had of communicating air would be sinking a small shaft upon the back of the level.

2010. Would they, therefore, have the means of preventing those sufferings in the close ends, which you describe yourself to have undergone ?—There are means ; they have the means of a waterfall now from the engine shaft.

2011. Could those means have been applied at the Caradon Consols ?—No, because there was no water ; the only means which they had of communicating air would have been by sinking a small shaft from the surface upon the back of the level which we were driving.

2012. You said that you preferred tribute work as being more healthy ?—Yes.

2013. Was that because you could choose the place in which you worked, or for what reason ?—It was because it was generally more open, better ventilated; the tutwork man is engaged frequently in driving the level, and the tributer comes behind and stopes the back of the level.

2014. Is all close end work tutwork ?—Generally the tutwork is either driving an end or sinking a winze from one level to the other.

2015. Is all driving of close ends tutwork ?—Yes.

2016. Do you think that on the whole men suffer as much in these days as they did in the days when you were working with your hands ?—Yes, to a very great extent.

2017. You think that there is no material improvement in ventilation ?—Not generally speaking.

2018. Do you think that, as a general rule, by proper ventilation the health of the miners might be improved ?—It might be greatly improved.

2019. Could you have undertaken in the mines in which you have been working, to have provided ventilation which would have prevented such sufferings as those which you have described ?—In very many cases.

2020. (*Mr. Holland.*) Did you ever work in cold-damp ?—It is generally supposed that there is a degree of cold-damp in granite mines where it is poor air.

2021. Did you feel it yourself ?—I cannot say that I did, not to distinguish it very materially.

The witness withdrew.

Mr. JOHN SAMPSON examined.

Mr. J. Sampson.

2022. (*Chairman.*) How old are you ?—Forty.

2023. You are not working underground now ?—No.

2024. What is your present occupation ?—I am inspector of the Liskeard waterworks.

2025. But you have worked as a miner ?—Yes, about 20 years.

2026. Underground?—Underground about 15 years, and about 5 years at the surface ; the first 5 years.

2027. At what age did you commence ?—About 10, but I did not go underground till about 15.

2028. What was the nature of your work ; was it tutwork or tribute work ?—Generally on tribute at the Fowey Consols for the eight years that I worked there, and at tutwork as well at the same place.

2029. What other mines did you work in ?—West Caradon and Craddock Moor.

2030. At Fowey Consols did you work in any end where the air was bad ?—Yes ; in one the end was rather bad ; at times it was worse than at other times. We worked there with a waterfall, that is, a stream of water falling through a series of pipes; and then the air is forced in by means of a fall of water through these pipes ; it is forced in through other pipes into the end. The air was very dead at the time.

2031. But means were taken for ventilation ?—Yes, a little, as far as they could under the circumstances.

2032. (*Mr. Holland.*) You mean a small trickle through a large pipe ?—The larger the stream the better the air. It is carried down in perpendicular pipes into a square box, and the other pipes are carried off from the top of the box. The end of the pipe is below the surface of the water, and then the pipe is carried on into the end, or wherever it may be.

2033. (*Chairman.*) Did you experience any bad effects in Fowey Consols ?—Yes, a little, not much. I did not work in the bad air long, only three months there.

2034. And then you took to the tribute work ?—Yes.

2035. (*Mr. Kendall.*) In what end was the bad air ?—I think it was the 40 fathoms end, driving back under Pedlar's shaft, as far as I can recollect about it ; it is a good while ago. It was a long end driving back to a shaft. I think that it was Pedlar's down-right shaft.

2036. (*Chairman.*) For what reason did you prefer tribute work?—One reason was, because it was better air, and another reason was, because I could get more money generally at it at the Fowey Consols.

2037. Why is it better air?—(*The witness produced a drawing.*) The draught is supposed to be coming down one side of these borings. This is supposed to be a shaft divided with timber, and passing up here. This is where the tributers are working, and it passes on here and up these winzes, and out at the adit level, and here the same. The air is circulating all round these places, and passing through these winzes, and out at the adit level. It is better ventilated than at tutwork. At tutwork the current of air does not come further than this, and there is no current here (*pointing to the drawing*) ; it does not reach up to these men. There is a better circulation of air in these places than in the others.

2038. (*Mr. A. Bruce.*) There is no current here (*pointing to the drawing*) because there is no draught? —No ; by-and-bye when you worked a hole through there would be a current of air.

2039. (*Chairman.*) But till they form a connexion with the winze the air is bad, unless artificial means are taken to produce it ?—Yes. This is a little fan machine, supposed to be blowing air on to these men on account of there being no ventilation. There is no circulation of air lower than that point (*pointing to the drawing*), and you get a little good air here, and it is blown in from this little machine to these men. This part is supposed to be well ventilated, and to play down as far as that, and out at the adit level. If there was no adit level there then the air would have to pass down here, and circulate not so freely as now, and pass up this side.

2040. After you left that mine in what mine did you work ?—West Caradon.

2041. What did you work at in West Caradon ?—Tutwork generally ; I commenced working on tut-work.

2042. Is that a deep mine ?—Not very ; I think I have worked at the 80 fathoms.

2043. Was there any bad end with poor air there? —Yes, there were a good many poor ends, but when

I went to work there first I did not work in the poor air, it was in a stope, so that the first place I worked in was well ventilated. The stope was on tutwork; they used to stope a good deal in West Caradon on tutwork at the first outset of the mine.

2044. Did you afterwards work in a bad end in West Caradon?—Yes, I worked in an end at the 80 fathoms which was bad, a good way off.

2045. How did you find out that it was bad?—By a difficulty in breathing, and the candle would not burn freely, and so on, and when the candle will not burn freely we find that the air must be bad; the candle is forced to be held almost flat to make it burn at all.

2046. Do you fix it in that way?—We have a knob of clay, and stick it on to the side of the level where we are working, close to the work; it is rested on any place where it is most convenient.

2047. What sensation did you experience?—Just as if there was something inside a person's head flashing, as if the head was splitting in two, every pulse that you feel it appears as if there is something inside pressing the head abroad.

2048. Were you able to work in that?—We did work for some time, but it was very bad doing it; there are always two.

2049. How long did you work in that end?—I worked there for about three years, but it was not always so bad as that; sometimes it was bad, but when we hole and have pipes, we get a good draught.

2050. How long were you working in that end?—About two years altogether in the end, and sinking winzes from one end to the other.

2051. But your health did not materially suffer then?—No, because I was young at the time; it must be nine years ago that I worked there.

2052. What was the last mine that you worked in?—Craddock Moor; I did not work there more than a month; I would not work there any longer because the ventilation was not good enough to please me; I had no family, and I would not work in bad air, except as little as I could possibly help. The air was so bad there that I would not stay there.

2053. Men who have a family are often obliged to work in a bad end?—Yes, they are forced to do so, they cannot get away very well; that is the reason. They are forced to stick there because they have no chance of getting away.

2054. Do they represent to the agents or otherwise that the air is bad?—Yes, very frequently, they tell them that the air is bad.

2055. And something is done to correct it?—Sometimes there is and sometimes not.

2056. Sometimes no attention is paid to them?—Yes.

2057. Is any reason given why no attention is paid to them?—They will tell you that it must be done, and that if you cannot do it some person else will. They say that it must be holed, and that if you cannot do it some person else will.

2058. Then you do not know from your own experience the evil effects of bad air?—I have known it only for a time. I have never felt anything since I have knocked up working.

2059. Do you know any men who have suffered from it?—My father did, there is no doubt of it; he worked underground until he was about 55, and he died at that age.

2060. (*Mr. Kendall.*) Where did he work?—At Fowey Consols.

2061. (*Chairman.*) How long is it since he died?—About 10 years, I think.

2062. What did he die of?—They call it the miner's disease, it is a difficulty of breathing; I can hardly tell what they call it; it is something like as if the heart was always beating too freely, and a difficulty of breathing, and so on, as if you had a cold. He went to two or three physicians, and he told them that he thought he was in a consumption, and all of them told him that his lungs were not in the least affected. A few months before he died he began to spit up phlegm and so on, and continued to do so until he died.

2063. Had he given up work long before he died?—He knocked off working at one time for 12 months, and then he went to work again a little while, and soon laid up again, and in a few months after he was laid up the second time he died.

2064. Have the miners any intimation before they are really affected that they are likely to suffer from working?—The only intimation I think is that they feel as if they were choked for want of breath.

2065. Is that when they are at work?—That is when they are at work and when they are not at work, both. When they get about 40 years of age or a little after that time the men feel as if their lungs were quite choked up, and they cannot draw in their breath freely.

2066. In that case do they experience any difficulty in going up the ladders?—Yes, I have no doubt that they feel a deal of difficulty. When I was working we youths used to be able to run away from the old men very easily. I believe that ladder climbing never hurt me in the least while I was working in good air, but put me in bad air, and 10 fathoms is enough for any youth to climb.

2067. Leaving a place where you had been working in bad air and then ascending the ladder, it affects you differently from what it does when you have been working in good air?—Yes, you feel as if perhaps you had been working 24 hours right out without stopping; you feel as if your head was almost splitting, and a pain right up the legs, and also in fact you feel it all over your body as soon as you begin to climb the ladders if you have been working in bad air, but if you have been working in good air you can climb the ladders just as fast as you like. Any person who is used to it can do so.

2068. But I suppose that it is not a wise thing to race up?—No, not by any means. Of course the heart will beat very hard in going up the ladder fast.

2069. In the Fowey Consols is there any dry?—We used then to dry our clothes at the blacksmith's shop, that was some 16 years ago, I cannot tell anything about that now.

2070. Did the men catch cold?—Yes, I believe that the men caught cold by sitting in the footways more than anything else. That is tutwork men, the tributers would also catch cold, because they had miserable places to change in at Fowey Consols while I was there, they had miserable little barracks. I do not know whether it has been altered since I came away.

2071. But it is desirable that there should be a warm place?—Yes, I should think so; that it would be a good deal better for men if, instead of sticking about in the footway, they could get up and have a warm comfortable place to change their clothes in.

2072. But why are they standing in the footway?—If they come above and meet the captain at the head, and should happen to be up before time, the captain will spale them 2*s.* 6*d.*

2073. Before the eight hours have expired?—Yes; they have these places down here, they will perhaps blast a hole or two, and they cannot get there again; they will perhaps do this by 9 o'clock, they will expect to get up about 10 o'clock, and they will be there perhaps half an hour or sometimes three-quarters of an hour sticking there waiting for the bell to ring, and as soon as the bell rings they will go up and change, but before they can get up, they are perhaps stiff with the cold; they get entirely chilled by sitting there so long.

2074. That is their own doing?—Yes; but in my opinion it might be prevented if the captains would allow them to come up; they keep them in the mine instead of letting them come up, and giving them a nice clean room to change in.

2075. But why are they detained?—Because they oftentimes commence to leave their work before they ought to leave it.

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2076. But tutwork is by piecework?—Yes, all by piecework.

2077. How many holes can two men bore, do you suppose, in the eight hours?—About three or four; it is according to the ground, some ground bores harder than others.

2078. Take granite?—About three holes, about two feet deep, would be just enough.

2079. That is supposing the air to be good?—That is supposing the air to be pretty good; if it is bad air they would do as much perhaps if they had the advantage to do it, but sometimes in an end they have not the advantage to bore three holes together. They must blast before they can bore the second, and then if they are forced to go in and bore one hole, and blast that hole before they can bore two more, it will require perhaps more than their eight hours; but if they could bore and blast the three holes together, they might then go up, because they would then have done their work, and they would have no more that they could do for two or three hours.

2080. Although it was bad air you think that they could bore as many as three holes in an end?—Yes, they might bore three holes in an end against the eight hours were expired, but not if they had to shoot them singly.

2081. (*Mr. Kendall.*) Do they frequently bore three holes?—Yes, sometimes they will, if they can get the advantage to bore three holes.

2082. Taking the average, do you think that two holes are bored once out of 20 times together before blasting?—Yes, in bad air ends more than that; I always used to calculate to bore as many holes as we could.

2083. I understand from you that if there were comfortable drying houses at the surfaces the men might not be kept at the footways so long?—Yes.

2084. How would you manage about the time?—They would not attempt to come up every day before time, unless they had done their hour's work. The men would come up into this comfortable room and sit down, and the captain should come and see that they were all there; and if they should happen to be up ten minutes before time, they might change comfortably.

2085. Why should that affect their leaving the work before time?—They have no watch, and cannot tell what time to leave.

2086. How will a comfortable dry affect that?—Instead of standing in the footways they would come up and sit in the drying house.

2087. (*Chairman.*) But they would be fined all the same, would they not?—No; the captain should not fine them, but they should be allowed to stay there.

2088. Is there nobody below to whom they could communicate as to whether, when they had blasted, they might have permission to leave their work, as they could not go back to it?—No; there is no person nearer than the counting-house.

2089. So that if a man has set off two shots and fired his hole half an hour before his time is up, he must still wait in the mine, although he cannot work?—Yes.

2090. Supposing that the time was nearly up, would the men who were at tut-work wait till the others came down to relieve them?—They will get as near the surface as they can, because if they are far down in the mine it will take them a much longer time to come up, and instead of eight hours they will have had nine. If the men were coming down, those men coming down would fill the ladders, so that the men already underground would not have a chance of getting to the ladders till all those men were down.

2091. Therefore it is the object of the men to get up to the top of the ladder before the new set are coming down?—Yes, in order that they may not be kept waiting.

2092. (*Mr. Kendall.*) Do you think that in any of the large mines it frequently occurs that men are waiting there?—Yes, I believe it to be so in every mine in Cornwall; in every place that I have worked at I have found it so.

2093. (*Chairman.*) Do not men sometimes catch cold even below by standing?—Yes, by standing in these draughty places they might catch cold, not quite so quickly as at the footways, but they catch cold by standing there as well as in other places.

2094. Are there no means taken to give notice down below in the mine when the time is nearly up?—No means in the world that I have ever seen.

2095. Could not that be done?—It would be a difficult matter in an extensive mine, I have no doubt.

2096. (*Mr. Kendall.*) Do not the agents of the mines generally go down almost every day?—Yes.

2097. And as they are passing through the mines just before they go up, is not the captain supposed to know the time, does he take his watch with him or not?—I never saw the captain or anybody else with a watch underground. In South Caradon I heard a man say that Captain May would throw a stone and break a man's watch if he took it underground, because he said they should wait for relief, but it is not always the case that there are six men.

2098. (*Chairman.*) Are the orders in mines that the men should not leave their tut-work till they are relieved?—I believe they are, all of them, required to work eight hours, but there are other cases where there is no relief to come.

2099. Are they to remain at their work till the relief comes? is that the condition upon which they undertake tut-work?—They are supposed to do so when they are working six men, but not if there are only four men. These men may be hundreds of fathoms down, and they know nothing about the time. If the afternoon corps men get up five minutes before the time, I have known them spaled 2*s.* 6*d.*

2100. Do the captains visit each set once a-day, or how often?—Sometimes once or twice a week, it is according to the part of the mine.

2101. At what time do the captains generally come up?—About two o'clock generally.

2102. Before the men come up?—Yes.

2103. (*Mr. Kendall.*) Are there not many surface captains looking about to send men down to their places, so as to be in time?—I believe that the surface captains have nothing to do with the underground men regarding relief. A captain comes out with every corps to see that the men go down at the proper time.

2104. Is it not the system that the agent every now and then looks about to see that parties do go down in time to relieve those corps?—Yes, I believe that that is the usual system, but what I am speaking of is of four men, where there is no chance of any relief coming.

2105. (*Mr. Austin Bruce.*) I suppose that it may be taken as a general rule that all tribute work is done in well-ventilated parts of the mine?—As a general rule it is so, because these levels and winzes and things are driven and sunk first, before the tributers come on, as a general rule.

2106. Have you ever worked at tribute work in bad air?—Yes, sometimes in high backs before it is holed at all, it is carried up in a single piece and closed up at the ends; it is sometimes bad at first, but it extends as they get up.

2107. Are any means taken there to improve the natural ventilation?—Sometimes the men themselves will put a trap-door in the level so as to cause a draught to play up in the back as much as they possibly can.

2108. You have done a good deal of tut-work too, have you not?—Yes.

2109. As a general rule, was the ventilation there good or bad?—Bad generally.

2110. Supposing that you were to divide your working life into two periods, how much of it did you work at tribute work, and how much of it at tut-work?—I should think, perhaps, about half of each.

2111. During the time that you worked at tut-work,

how much of your time was spent in bad air ?—I should think not more than 12 months altogether.

2112. Out of how many years ?—Seven and a half years.

2113. Do you believe that that is about the usual proportion of time which miners spend in bad air ?—No ; many will spend a good deal more than that in bad air, I would not do it.

2114. Then you attribute your having spent less than the ordinary time in bad air, to the fact that you were able to choose your work ?—Yes, I was able to choose my work more than a great many men were.

2115. Do you think that that 12 months has had any permanent bad effect upon your health ?—I do not know, I have not felt anything since I have not been working underground.

2116. What was the longest time that you ever worked together in bad air ?—About three months.

2117. How did you feel at the end of that three months ?—I felt as if I failed a good deal in the time, I know that I failed a good deal in the time ; I felt weak and sleepy, and stupid, and almost always had a headache, a sick headache.

2118. Did you take any holiday at the end of that three months ?—No.

2119. What did you do ?—I still continued on at the work, because we had a better air place afterwards.

2120. Did you recover while at work ?—Yes, afterwards.

2121. How long were you before you got back to your usual state of health ?—I did not take any notice of that, I cannot tell, perhaps, it might have been about two or three months before I got back again. Such things we do not take a great deal of notice of, generally.

2122. (*Mr. Holland.*) Was this throbbing at the head, which you have spoken of; the first symptom which you had of bad air ?—Yes, a splitting headache is the first thing, and then you feel it in the limbs. As soon as you take any exertion you feel like one terribly fatigued.

2123. The knees failing under you ?—Yes, everything. If you try to do anything you feel as if you were uncommonly fatigued, as if you were almost worn out with fatigue.

2124. You wonder what has tired you so much ?—Yes.

2125. You talked of working three months in very bad air ; do you mean in such bad air that a candle would not burn without being sloped ?—Yes, the greater part of the time a candle would burn scarcely at all, and at the latter end when we were close upon holing, the candle would go out more than 50 times a day, and we had to keep lighting it with a match, and to keep it almost flat to make it burn at all, and to keep picking it with a pin. We could not stand longer than shooting two holes, and had then to go away or our head would be splitting. It was in West Caradon, in sinking a winze 50 or 60 fathoms away from another winze, before holing it was very bad. If they are rising at any place they call it holing or making a hole through.

2126. Could you work for eight hours together in such air as that the candle went out ?—No.

2127. How long did you work there ?—As long as we could, perhaps five or six hours.

2128. Did you work six hours together ?—Yes, they generally stayed down for that time, they would come out of the bad air for a little time, and then return.

2129. How long could you work together in that very bad air ?—Perhaps an hour, that would be quite enough. Then we should come up on the level, and sit down and have a little fresh air.

2130. How long was it before you returned ?—Perhaps half-an-hour, the air would get fresh in the bottom and then we should go down again.

2131. In fact you would only work about two-thirds of your time ?—Yes.

2132. And then you would not work so hard ?—No.

2133. You would lose about half your work ?—Yes.

2134. Were you not paid more per fathom for that work ?—Yes.

2135. How much more ?—We are generally paid according to the measurement.

2136. If you take your bargain in bad air, do you not make an allowance for it ?—Yes, if the ground could not be driven or sunk for 5*l.* a fathom, they would give 10*l.* if it required it.

2137. If the air was good you could do it for 3*l.*—Yes.

2138. And make more money yourselves ?—Yes.

2139. (*Mr. Davey.*) Were there many places in West Caradon similar to what you have spoken of ?—Yes ; there were a good many places where there was bad air at times, and it is so in almost every mine ; they can hardly help it. There are a good many places which might be better ventilated than they are.

2140. Were there many such places at the same time as you were there ?—I cannot tell you, because when we are working in a certain district we do not visit other places generally. Miners take offence at other miners going to their ends ; they generally get a little way out of the end, and sit down and have a chat.

2141. (*Mr. Austin Bruce.*) Does every miner in your opinion have his turn at bad air ?—There are some, I suppose, who have scarcely ever worked in any bad air in their lives, but as a general rule I suppose that the greatest part of them have had a little, some more than others.

2142. How do some manage to escape bad air altogether ?—By their working on tribute they will generally escape the greatest part of it, but if not they are almost sure to have some ; I have escaped bad air myself before now.

2143. How many men were working in the whole mine of which you speak ?—I cannot tell that ; perhaps 400 or 500 men, I should think, at the time.

2144. Did the men who worked with you suffer in the same way as you did ?—Yes, exactly the same.

2145. Could you judge by your eye that they were suffering ?—I think not, because miners generally look delicate, and if they are working in bad air it will tell upon them in a little while, but you cannot tell it by looking at them.

2146. Did any of the men who worked with you fall permanently ill ?—No.

2147. They recovered when they got into better air ?—Yes, because they were all young men ; I believe that I was nearly the oldest of the four ; one called Morris was with us ; whether he was a little older than I was I do not know, but not much.

2148. Have you ever worked in a place to which in your opinion good air might not with proper arrangements have been brought ?—I have worked in ends before now where good air might have been brought if they had taken pains to do it.

2149. But have you ever worked in any to which air could not have been brought ?—No ; it might be always brought by artificial means, if it could not be any other means.

2150. Would those artificial means have been so expensive as to be altogether unreasonable ?—No ; it would cost about 25*s.* a month for a boy to blow a small fan machine just to blow in air to a couple of men, besides the expense of the machine, but I think that there are better means.

2151. In driving those close ends you made your bargain as to the rate at which you were working, I suppose ?—Yes, so much per fathom.

2152. In making that bargain, did you take into consideration the quality of the air in which you were likely to be working ?—Yes.

2153. Did you consider that you could do so much more in good air than in bad ?—Yes.

2154. Would you, therefore, have asked a higher price for work done in bad air than in good air ?—Yes.

2155. Did you actually consider those circumstances

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yourself when you made your bargain ?—Yes ; the circumstances of poor air.

2156. In your opinion in those cases in which you worked in bad air, would the lower price which you would have taken, had the air been good, have made up to the masters for the expense of providing sufficient ventilation ?—In some instances it would, and in others it would not. When you get a great distance off, the expense, perhaps, would be more to put in means to get air than you would save in the price.

2157. Then, supposing ventilation had been supplied in those cases, the masters would have been under some temporary loss as long as that end was being driven ?—Yes, there is no doubt of that.

2158. Have you studied the ventilation of different shafts ?—Yes.

2159. Do you see at some shafts means used which are not used at others ?—Yes, it is very frequently the case.

2160. Where they might be used ?—Yes.

2161. Equally in all ?—Not equally in all, but the greatest of them might be used. I think that the air soller is one of the best things which was ever invented. This is supposed to be a level 10 feet high, instead of seven (*pointing to the drawing*), and these pieces of wood are put in across the level to take the tramroad or railroad ; it is covered with boards ; it is sollered over with boards.

2162. (*Mr. Holland.*) So as to make a floor ?—Yes. There is a space between that and the bottom of two or three feet. The air will play under the soller close to the end, back over, and take its regular course again.

2163. (*Mr. Austin Bruce.*) An artificial draught is created by those means ?—No, it is not an artificial draught ; it is a regular draught coming down the shaft. It is driven in there, instead of being carried up there (*pointing to the drawing*).

2164. It is, therefore, artificial ?—You may call this an artificial draught altogether if you like.

2165. But for making that soller you would not have the same supply of air ?—No ; it is an artificial level, not an artificial draught.

2166. (*Mr. Holland.*) It is an artificial channel for the draught ?—Yes.

2167. (*Mr. Kendall.*) Take a granite end at about 8*l.* a fathom, if you had to sink holes, how many holes would you bore where the air was very dead ?—Two are just enough.

2168. Are not two a good deal ?—No, they might bore two holes if the air is dead, but not what they call bad.

2169. Take bad air ?—In bad air, two holes would be a hard day's work.

2170. (*Chairman.*) But they could do it ?—Yes, they might do so, but they would soon kill themselves if the air is actually bad.

2171. Suppose that it is from smoke ?—The smoke does not injure any person half so much as the deadness of the air, if there is no current of air.

2172. When the smoke does not get away, how many holes can you bore ?—Two would be just enough if the smoke would not clear away quick enough.

2173. Do you suppose that nobody has ever bored more than two?—Yes, they bore four sometimes ; I have done so myself, but it must not be in a bad air end.

2174. (*Mr. Davey.*) Supposing that the end was 100 fathoms from the mouth of the adit without any artificial means of throwing in air, how many holes could they bore ?—I should think that one would be enough there.

2175. (*Mr. Kendall.*) When you got ill, did you get into the doctor's hands or not ?—Yes, just to have an emetic and a few things to get the stuff out of my stomach, that was all.

2176. Then you went into better air ?—Yes.

2177. And that was the best medicine which you could have ?—Yes.

2178. Have you been in the doctor's hands at all since you have left off mining ?—No.

2179. Are you a strong man ?—Yes, quite strong, I believe that I have never taken a dose of medicine since I have been out of the mining.

2180. You can do as good a day's work as the next man now, I suppose ?—Yes ; and I am in very good health, and am quite lively.

2181. Was your father a miner ?—Yes ; all his lifetime.

2182. He died young ?—At 55.

2183. Were any of your brothers miners ?—I have one a miner now.

2184. How old is he ?—He is about 20 or 21, I think, now ; he lives at St. Cleer.

2185. Is he working in bad air now ?—Yes ; he looks so now.

2186. (*Chairman*). Where ?—At Craddock Moor. That is a very badly ventilated mine, I have no doubt of it ; it was so when I was there, and they tell me that they have sunk a shaft down to 40 fathoms since ; all below that is bad air.

2187. And are there no artificial means for ventilating it ?—I do not know anything about that, I have not been there ; in mines it is the old air passing round and round so many times that it becomes impure.

2188. (*Mr. Kendall*). As far as the agents are concerned, have you ever made any complaints to them about bad air ?—Yes, I have myself asked for timber to put in air sollers, and was not allowed to have it. I have asked agents about it, and they would not allow us to have timber ; they said, " It is " not worth doing." In the end that I speak of, in the 80 fathoms level in West Caradon, we put in air sollers unknown to the captains.

2189. Where did you get the wood ?—Where we could catch it.

2190. (*Chairman.*) You were refused permission to have it ?—Yes, we were refused timber, and I believe that we drove that end cheaper than any person else did before or afterwards ; and we could do it, because we could be in that end and shoot four holes, whereas formerly they could only do two. I think that the air soller is as good a thing as could be adopted for the ventilation of mines.

2191. (*Mr. Austin Bruce.*) Do you say that your brother is now working in a mine ?—Yes.

2192. And that it is badly ventilated ?—Yes, the men tell me so ; I cannot give evidence upon it.

2193. (*Mr. Kendall.*) I suppose that when you could afford it you went to tribute, and when you could not afford it you went to tut-work ?—Yes, we could not get much on tut-work.

2194. And I suppose that that is the case throughout the whole mining population ?—Yes ; they will go to tribute if they possibly can, because tut-work wages are so low. If they can get credit from the shopkeeper they will go and live upon the poor shopkeeper, and he is obliged to suffer.

2195. (*Chairman.*) How long is the tribute man without getting anything, and subsisting on sist ?—Sometimes two months.

2196. What do they allow him for sist during that time ?—In some mines more than others. In some they allow about 20*s.* a month, and in some 40*s.* At West Caradon they used to allow 40*s.*, but I have heard that they only allow 20*s.* now on sist.

2197. (*Mr. Davey.*) You do not go on 12 months without a settlement ?—No ; they have a debt bill given them ; they are perhaps 3*l.* or 4*l.* in debt at the end of the month.

2198. (*Chairman.*) It is a settlement on the wrong side ?—Yes.

2199. (*Mr. Kendall.*) Sometimes it is otherwise ?—Yes ; sometimes they get 50*l.* or 100*l.*, or 120*l.* If they should have a high tribute and get a good supply of ore, they might have a good start.

The witness withdrew.

Mr. Peter Clymo examined.

2200. (*Chairman.*) I believe that you are a considerable proprietor of the South Caradon mine ?—Yes.

2201. You are the principal manager there ?—Yes.

2202. Is that mine a copper or a tin mine ?—Copper.

2203. Do you manage other mines?—I am the manager of Mary Ann mine, a lead mine.

2204. How long has the South Caradon mine been in existence ?—We began in 1836.

2205. I believe that you discovered it ; you were there from the commencement of it ?—Yes.

2206. How many men have you in the South Caradon mine underground ?—Underground we have now upwards of 400. I have not counted them particularly.

2207. And how many women and children above ground ?—Upwards of 200, I should say.

2208. Have you any boys employed underground ?—Yes.

2209. At what age do you allow them to go down underground ? Have you any fixed age ?—No ; they go down generally about 12, 13, or 14, generally with their fathers.

2210. What is the nature of the work in which the women are employed ?—The women are employed in separating the ores.

2211. And at the South Caradon mine they work under cover ?—Yes, principally.

2212. You think that that is an advantage and comfort ?—Yes, it is a great comfort, both in winter time and in wet weather.

2213. What wages can women earn ?—They get 1*s.* a day ; those are their regular wages.

2214. Have they any deductions ?—Twopence a month for the doctor.

2215. Are there young girls and young boys employed ?—Yes, at almost all ages, from 7 or 8, I suppose, upwards.

2216. They are also employed in picking ?—In separating the ores, but they get different wages. It is the elder girls who get 1*s.* a day.

2217. Do the underground men work with you at both tribute and tut-work ?—Both.

2218. They have a changing house, I think ?—Yes.

2219. Do you think that that is a very great comfort to the men ?—A very great comfort.

2220. It is appreciated by them ?—Very much.

2221. Do you think that it is calculated to be an advantage to their health ?—There is no question about it.

2222. Will you describe it ?—What they have now is very different from what they used to have many years ago ; there was nothing of the kind ; there was no dry or anything of the sort ; there was a house in which the men used to change, and there was no fire, or anything of the kind ; and, in fact, in many places there were not even windows. I have seen myself many times a long house where there were places for windows, but not even a window or a door hung, so that a strong wind must be going through ; but now, in mines of any magnitude, the whole of them have dries, whereby the men's underground clothes are dried, and made comfortable for them against they come to their different corps; and also, if they should happen to get wet in going to the mine, their walking clothes are dried for them against they come up.

2223. Are the clothes which they come in, if they get wet, ever dried ?—Yes.

2224. To your knowledge are there many as good drying houses as the one which you have put up at South Caradon ?—There are drying houses, but I do not know whether they are generally so good.

2225. You have also, I believe, warm water for them to wash in ?—We have. It is condensing water brought from the engine, and it is close by the dry.

2226. The dry is sufficient accommodation for the 400 men ?—Yes ; we have two there.

2227. About what was the cost of putting up that dry ?—I should say that in the largest which we have put up there, the last one, the slate and altogether was expensive, and I should think that it cost 100*l.*

2228. But you think that for the comfort of the men it is money well expended ?—There is no doubt about it.

2229. Is it within your knowledge that there are places, such as you described just now, without windows and without any heating apparatus ?—I do not know at present ; but I am speaking of years gone by.

2230. Do the miners employed in your mine ever engage in any other work besides that of the mine ?—Not that I am aware of.

2231. I suppose that they have many of them gardens at their own homes ?—Yes, most of them, that is to say, the married men.

2232. Your miners commence work, I suppose, at the same hours as in the other mines ; there are three corps ?—Yes ; that is to say, the tut-work men they come at six in the morning, and two in the afternoon and ten at night.

2233. Have the tribute men any special hours ?—Not particularly ; they come perhaps about half-past six or seven in the morning ; then they take their own time. If they are doing pretty well, you will find that they will work perhaps till nine or ten at night ; but if they are not earning more than just their regular wages, if they are earning perhaps about 1*l.* a week, they will come up at three, four, or five in the afternoon.

2234. I suppose that in some cases the tribute men do not earn anything for some time ?—Sometimes ; there are a great many of them ; they are like the adventurers in a mine, they speculate on tribute, they take a piece of ground which has been lying idle perhaps for years sometimes.

2235. Do you think that the tribute system is a good system for the proprietors of mines ?—I think so ; a great deal of ground is worked in that manner which would not otherwise be worked. For instance, we have perhaps a piece of ground 50 fathoms long that has been lying idle for years, and nothing is done in it, and then a pair of men have been searching ground, and they come to this place, and perhaps find a kindly little piece, and they say that they will try a pitch, and they take it of the agent. They frequently rise up a fathom or two, and find a bunch of ore in that piece of ground, and that ore would never have been discovered but for the tributers.

2236. How much have you ever known in that way at a rough guess to be the result of this tribute work ?—Many thousands of pounds worth.

2237. Discovered in that way ?—Entirely in that way. We have given 13*s.* 4*d.* in the pound for every pound's worth of ore, two-thirds. Then after the men have worked there two months, perhaps that pitch will let sometimes for 2*s.* 6*d.* or 5*s.* in the pound ; it depends upon the richness, of course.

2238. You say two months, I thought that the tribute work was let for one month ?—One month or two months if they like ; the tributers have the option of going on a second month if they think proper. If they wish to give up at the end of a month, they come in and give the agent notice the Wednesday before the month is out.

2239. At the end of the two months the ground is reset ?—Yes ; the agents go down again then, and fix a new tribute on the piece of ground.

2240. Will you state to the Commission the manner in which this is managed on the settling day?—There are certain limits. A piece of ground may be 10, 15, or 20 fathoms long, which is let so many fathoms east or west from a certain winze. That piece of ground is let to a certain number of men, and the agents go down and calculate the number of tons

which they think those men can break in a month, and what they think the one will be worth per ton. That will amount to so much money ; then their cost is so much ; they see in a moment what their cost is ; they add the labour to it, say 8*l.*, if there are two men, and they see what tribute those men ought to have in order to earn that amount so as to pay the cost of the wages. We generally calculate the tributers to earn a pound a week.

2241. I suppose that where the tributers work in most mines it is naturally better ventilated than where the tut-work men work ?—Yes, because where tributers are working, generally speaking, the level has been driven through and winzes are sunk, so that they are working between two draughts, between two winzes.

2242. What means of ventilation do you employ for ventilating a close end ?—We sink winzes occasionally, sometimes, perhaps, every 20 fathoms ; we sink winzes from one level to the other, and particularly when we have copper, or tin, or lead, or whatever it may be, to sink on. But supposing that there is not copper, tin, or lead to sink on, we sometimes drive further ; then we put in an air machine, we have several air machines in our mine, what we call fan machines, which blow a very beautiful stream of air into the end.

2243. Worked by a boy ?—Yes.

2244. What is the cost of the boy ?—Each boy gets about 15*s.* or 16*s.* a month.

2245. What would be the cost of the machine itself ?—That is trifling ; a pound or two perhaps.

2246. There is no reason why it should not be used ?—No reason whatever ; in fact it will be a great loss to the adventurers if they do not use it, because the men can do so much more work.

2247. Where that machine is placed there must be a good current of air ?—Yes ; it is always put where there is a good current of air. In some places there may be a winze back so many fathoms, through which there is a great draught which is not wanted, and then we cover over that winze ; we always endeavour to have our machine where there is a good current of air.

2248. Do you ever divide a level for the purpose of making a current, as you would a shaft ; what is called in coal mines bratticing ?—No, it has been done, but I have not seen such a thing for many years. I have seen, many years gone by, what we call air sollers put at the bottom of the level. You have to walk over them, and put your barrows and everything over them.

2249. Does that answer ?—It used to answer, but nothing like so well as the machines.

2250. You would have to drive the height of the level higher ?—Yes, and not only that, but in those days there used not to be railroads, it was all wheeled by barrows, and walking over those sollers you could hardly ever keep them air-tight.

2251. But that would not be the case if you could lay rails on them ?—No, it would no doubt be better, but it is very little used now ; I have not seen such a thing for years.

2252. But you have never seen a level divided by canvas or otherwise ?—No.

2253. You have never seen the same principle carried out in a level as is carried out in a shaft by dividing it ?—No.

2254. In a shaft so divided there is a down-cast and an up-cast current ?—Yes.

2255. Does that draught vary according to the weather ?—Yes, sometimes if you are sinking a shaft, even from the surface, in very hot weather there is no draught, and you are obliged to throw in water and lime and all sorts of things in order to break the damp. There is a sort of damp which stands, you can see it like a cloud below a certain place on looking down the shaft, and many times water or hot lime has been obliged to be thrown down in order to break it.

2256. That is in sinking the shaft ?—Yes.

2257. Are the men working below then ?—Not if the air is very bad, they do not attempt to do so. That is the reason why they sometimes throw down this water or lime or so on, in order to break the damp, and then the air plays down and the men are then able to work.

2258. Do you use steel boring tools ?—Yes.

2259. That is a great advantage to the men ?—I have no doubt it is on the whole, I think it is the cheapest for the adventurers, the men can do more work with it.

2260. Those tools do not require sharpening so often ?—They do not.

2261. Then that is a saving to the men ?—It is a saving to the men and also to the adventurers, unquestionably, particularly in hard ground.

2262. Have your men any set of rules given them with regard to blasting, and their conduct down in the mine ?—No particular rule. It is all done with the safety fuse, it used to be done with a large nail, but that is hardly ever used now.

2263. Then any accident happening from blasting must be the fault of the men ?—I believe that a good deal of it is that.

2264. But there is a certain danger nevertheless in blasting ?—There must be some, particularly if the men are not very careful in what they put into the hole for tamping ; they should be very careful in selecting the stuff for tamping, that is in filling up the hole upon the charge. But I am sorry to say, that many of them are not sufficiently particular in that respect, the men take anything for that purpose, being in a hurry to got their work done ; but that is a very important thing, and they ought to be very careful about it, they are frequently cautioned about being very particular in that respect.

2265. With regard to the men who are working at tut-work when the eight hours have expired, is the agreement with them that they are to remain at their work till the other men come to relieve them ?—It is not always the case. Sometimes when you want to push on a certain place you oblige the men to relieve in place, so that those who are down must not leave till the others come to relieve them ; but that is not always the case. Perhaps, two-thirds of our men meet in the ladder road, when the bell rings the men at the surface go down and meet the others coming up.

2266. Which body of men gives way to the other if they meet in coming up and down ?—I do not know that there is any particular rule for that, when they get to the bottom of a ladder they stop and let the others pass.

2267. The men leaving their work, I suppose, are anxious to get to the surface ?—Yes, sometimes they climb too fast, and that, no doubt, does them an injury.

2268. Do they come up before their time ?—Very seldom ; I believe if they are found to come up before their time and the agents see them, they will have a fine.

2269. Have they any means of knowing what the time is below ?—Scores of them carry watches underground.

2270. In your mine ?—Yes, but they do not want it ; they can tell as nearly as possible by their candles. A candle is calculated to burn so long, and they can tell very nearly.

2271. I suppose that there is a great difference in the composition of the candles ?—Yes.

2272. I suppose that you contract for the candles with which you supply the men ?—That is the case sometimes, but we do not do so ; we order our candles from different parties as we want them, and if any man sends a bad article we do not give him an order the next time.

2273. But I suppose that in many mines they contract for their candles ?—Yes, sometimes they contract for six or twelve months.

2274. And then they are sometimes bad ?—The contractors will try sometimes to send in bad articles without great caution.

2275. I suppose that a bad candle is injurious to

the miner ?—Yes, particularly in a close place, there is a very bad smell with some of them.

2276. I believe that in your mine the men ascend by ladders ?—Yes.

2277. Have you not a footway out at the side ?—Yes; they come up to the adit, and then walk out through the adit.

2278. What height of ladder have your men to climb in the South Caradon mine ?—Our deepest part is 140 fathoms under the adit.

2279. And when they get to the adit they walk out ?—Yes.

2280. Do they ever fall away from the ladders ?—It is the case sometimes, but not very often.

2281. By what is that occasioned—by carelessness ?—I cannot tell. They sometimes carry a pick down in their hands, and then if a man has not pretty long fingers he has not much hold upon the ladder-stay, and they slip in that way.

2282. Are the ladders inspected ?—Yes. We have what we call a timber manager with us, and a pitman, who always examine the ladders; they are going down every day, and they would see if there is anything amiss directly.

2283. I suppose that the men never go down in skips in any mine that you are acquainted with ?—Not here.

2284. Have you ever seen the man engine at work ?—Yes.

2285. Do you think that that is a good invention for some mines ?—I have no doubt that it is a very good thing, particularly when you have a deep mine. A great deal depends upon whether you have more than one lode. If you have but one lode, and all your men are working, for instance, within say 200 or 300 fathoms, then a man engine, no doubt, is a very good thing if you have a particular shaft that you can spare for it. But take our mine. We are raising our ore from 12 different lodes; those lodes are hundreds and hundreds of fathoms apart. There is a pit north and south from the different lodes, and then east and west from there; so that if we had a machine in one part of our mine, not more than a quarter part of the men would get up by it, because they could get up sooner from the other places by the footways.

2286. If there was a man engine, do you think that a man would travel any distance to it rather than climb the ladder ?—If it was within a reasonable distance, no doubt he would prefer the machine, but he would not travel a great distance to it.

2287. In a bad end is it shown to be bad by the candle not burning; is that how the men judge ?—Yes; the candle will tell you the first thing, before the men can feel it.

2288. Would the men then report to the captain that the candle would not burn ?—They come whenever there is anything of that sort; but the captains discover it themselves, and then they have a machine put in; but if they should not happen to discover it, the men are sure to tell them of it.

2289. In a well-regulated mine the complaints of the men are immediately attended to ?—Yes.

2290. What is the greatest heat in your mine ?—It is a cool mine, generally speaking; the granite is generally much cooler than the killis or slate.

2291. (*Mr. Kendall.*) Prior to your coming to South Caradon you had very large experience, had you not ?—I was at Fowey Consols for many years.

2292. And you had also this advantage, that your father was one of the most experienced miners in the county of Cornwall ?—Yes, he did nothing else all his days.

2293. Did your father ever work underground as a miner ?—Yes, he worked underground as a miner a good many years after I can recollect.

2294. Did you ever work underground yourself also ?—Yes.

2295. Before you were of age ?—Yes; I worked underground till I was 23 years of age. I never did anything else, in fact.

2296. You have gone from the very bottom up to the top of the tree ?—Yes.

2297. You have worked your way up ?—Yes.

2298. You were also one of the managers of Fowey Consols mine ?—Yes.

2299. When you were there, do you recollect what were the returns of that mine; were they larger than the returns of almost any mine in the county ?—Yes, they were very large indeed. We had sometimes 300 or 400 tons a week.

2300. It was supposed to be one of the most extensive and best worked mines in the county, was it not ?—Yes, it always had that name.

2301. What was the ventilation in that mine ?—Generally speaking, pretty well; we had a good many shafts there. The worst places that we had at all there I suppose were in the cross cuts, because you cannot sink winzes there, having no level over.

2302. Had you many forcing machines there for the air ?—Yes, a great many.

2303. But still there were several bad ends there ?—Yes, there were some bad ends.

2304. After you came here, and you made the discovery yourself of South Caradon, you took from your brother the management of that mine ?—After my brother's decease.

2305. And you and he together inspected that mine a good deal ?—Yes, I went there frequently before I came here to reside.

2306. After you came here to reside you went underground frequently yourself ?—Yes.

2307. You paid great attention to it ?—Yes.

2308. Have you given great attention to ventilation at the Caradon mines ?—We have.

2309. Have you been very careful in selecting your agents since you ceased to go underground ?—Yes, we always select men that we can depend on.

2310. South Caradon was the first discovery ?—It was the first discovery in this neighbourhood.

2311. (*Chairman.*) Are East and West Caradon yours ?—No.

2312. (*Mr. Kendall.*) Did you ever know a case where there was bad air, and where men complained of bad air, and asked for some means of curing it, and it was refused by the agents ?—Never. I never heard of such a thing.

2313. You have bad ends at South Caradon even now ?—I am not aware that we have. Of course when you get in a certain distance from a winze the place will naturally get close.

2314. Prior to putting in the air pumps the air of course gets a little dead, and then you remedy it ?—Yes; we then put in a machine directly for drawing the air, and where we have long distances we have at different times ordered zinc pipes on purpose, because a wooden pipe will destroy the air a good deal more than zinc; the zinc pipes convey a great deal better air than the wooden pipes would.

The following extract from the evidence of a Miner was read to the witness :—

"(*Mr. Kendall.*) Did you know any place in South
" Caradon while you were there where, at a mode-
" rate expense, they might have forced in air, and
" did not do it ?—Yes, in the last mine that I worked
" in.

" (*Chairman.*) Was that South Caradon ?—Yes.

" (*Mr. Kendall.*) That was not where you first
" worked ?—No, that was the Caradon Consols.

" What end did you last work in ?—The 120
" fathoms level.

" How far were you then in beyond any communi-
" cation with the air ?—We were in, perhaps, 40 fa-
" thoms from the shaft; and there was an angle in
" the level, and we had to drive on the cross course
" to intersect the lode, and it was a timber level; we
" had to put in timber into that level, and that makes
" the air so much the worse.

" Then were you in 40 fathoms before you had
" an angle ?—No, not 40 fathoms before the angle,

" but, perhaps, 15 fathoms from the shaft before the " angle.

" And how many fathoms after the angle ?—25 " fathoms.

" How far was it before you made any communi- " cation ?—At that distance they cut a lode and then " sank a winze on the lode to the cross level.

" In sinking that winze the communication was " still only through this drift ?—Yes.

" Was the air bad in that winze ?—Yes.

" How many men were working in that winze ?— " Four.

" You had eight hours' rest ?—Yes.

" After you had rested was there a perceptible " difference in the air ?—Yes, there was a very great " difference in the morning.

" A supply had come in ?—There was a better " supply. There was not the same foul smell. The " candles are generally not of the best kind, the wick " of the candle is frequently made of hempy stuff " when it ought to be of the best cotton. We fre- " quently consider that the candle smoke does us as " much or more hurt than the powder smoke.

" Before you communicated the air was very in- " ferior ?—Yes.

" How long was it after you began to work before " you found the candle show a difference ?—Not very " long, two or three hours perhaps, and even in the " first commencement it would not burn so clearly as " in the good air parts.

" You were obliged to blast in the sinking ?—Yes.

" How long was it before the smoke got out ?— " It would never get out at all while we continued " working ; before the smoke of one hole was gone, " or, as we term it, had died away in the place, we had " to blast another, so that in these poor places we " were constantly working in smoke, either more or " less.

" Might the agents at a small expense have sup- " plied you with better air ?—Yes, they might have " put in a waterfall from the engine shaft.

" Was any remonstrance ever made to them ?— " Frequently.

" And what did they say ?—The reply is, 'If you " 'do not like it you must leave it.'"

2315. Do you believe that that is correct ?—I do not.

2316. Do you think that in any mine of fair working, and where there is fair judgment, they would allow a thing of that kind to exist as a mere matter of policy, to say nothing of humanity ?—I do not think that they would. Whenever we hear that question (and I have heard it asked scores of times when I was an agent), we say, "Very well, you go and do the best you can, and we will get a machine as soon as possible." We have, perhaps, a machine out of use, and we apply it directly. I never saw an instance of men complaining without something being done to remedy it.

2317. You very frequently do not stop the work, but you say, "Go on as well as you can, and we will remedy it ?"—Yes. I should think that the man who gave the evidence which has just been read about the candles is no miner, because if you have got a candle made of the best cotton, if that candle goes out, you cannot blow it up again ; but they get the best cotton and some of this inferior cotton put together generally. If that candle goes out you can blow it up again in a moment, but if you have a candle which is made solely of cotton you will never blow it up.

2318. Will the cotton give as good a light as the other ?—No.

2319. Of course, sometimes before you can get a connexion, and where there is great difficulty in sending in air, men may have to work in bad ends ; but did you ever know an instance in fair mining of men being obliged to work in bad air for as much as three months consecutively ?—They are not obliged to do so.

2320. But do they do so ?—Yes ; I have no doubt that there have been instances of it.

2321. Do you think that you have had any instance in South Caradon of men working three months in such an end ?—I cannot say at all.

2322. But it is possible ?—It is possible in any mine.

2323. With regard to boring, does much dust arise in boring ?—Yes.

2324. Injuriously to the men, in your opinion ?— No doubt about it, particularly when you commence your hole. For instance, the men will hole, and the head, perhaps, is close to the bit where they begin to bore, and at every blow of the borer the dust flies all round, and they must be constantly inhaling it.

2325. Can you suggest any remedy for that ?—No, I do not see what you can do.

2326. You refer to mundic and to copper and to slate ?—Yes.

2327. In certain positions the men must have a dust, which is injurious to them ?—Yes, because when you are working upon the lode, a miner will always do with as little room as possible, particularly if the ground is hard on each side, then you would be sometimes surprised to see the men, and you would be afraid that they were knocking their heads.

2328. Will you refer to that plan ? you observe that some men are supposed to be waiting there. Do you think that, generally speaking, men come out much before their time, and remain there afraid to go to the surface ?—I do not think that they do.

2329. And that they catch cold, being afraid to come up ?—I do not think that it is the case.

2330. Would not the agent himself prevent that ? —The agent of the mine would go and endeavour to catch them there, and he would find them directly ; you may depend that it is not so, I do not mean to say that there never was an instance.

2331. But you think it is not at all common ?—It is not general, depend upon it.

2332. Do you feel sure upon that point ?—I am quite certain of it.

2333. I suppose it is a long time since you had a pick in your hand ? — Yes, but I can recollect it perfectly well.

2334. Suppose you were to be 100 fathoms or a long way in, where there was no ventilation at all, and with bad air, and where the ground had cost in driving 8*l.* a fathom, how many single holes could be bored in eight hours ?—About three.

2335. In bad air ?—I cannot tell if the air was very bad.

2336. I am talking of an adit 100 fathoms or more driven in without any ventilation at all ?—I have seen nearly as good air in a place 100 fathoms in, and where the level is straight, but if you have turns it becomes worse.

2337. I am talking of very bad air ?—Then perhaps they would not bore more than two.

2338. With regard to the watches and the time that is kept, do you not think, taking the miners as a body, that in their time of changing they are generally tolerably correct ?—Yes, they tell very near indeed.

2339. Do you feel satisfied that there are many men who carry watches underground ?—Yes, I have done it, and I have seen scores do it.

2340. If a man has a watch, does he not like to carry it underground ; is he not proud of his watch ? —Yes.

2341. Did you ever know a captain object to a watch ?—Never.

2342. Did you ever hear of such a thing ?— Never.

2343. With regard to the ventilation, has it not been much improved since the time you can recollect ?— Very much so.

2344. Do you think that every day the miners' comforts are very much improved above-ground ?— Yes.

2345. But do you think there is still room for improvement ?—I do not know, because we have not studied the thing very much; there is no doubt but that

improvements may be made in some mines; for example, you may find now, in going through some of the metallic mines, no dry; but what I mean to say is, that, generally speaking, mines of any magnitude now-a-days have drys.

2346. And in those drys I suppose there is no objection to dry the clothes of the men who come there?—No; the clothes they wear.

2347. As well as the clothes they wear underground?—Yes.

2348. They take their working clothes, and go underground with them on, and if they return with them wet, they are dried?—Yes, they are dried and hung up in places until the morning, when they come.

2349. So far as the habits of the miners go, do you think they are much improved?—Yes; they have much improved in the last 20 years.

2350. You do not think that they drink so much?—No.

2351. They are more careful, are they not, with regard to bad air, and they will not go into it?—Yes, I am sure they are.

2352. What are the average gettings in your mine?—You must keep the tutmen separate from the others, if you put the tributers with them it throws the average up considerably.

2353. But in the district what are the average gettings of the tutmen?—In the district they are from 3*l.* 5*s.* to 3*l.* 10*s.*

2354. What do the tributers get?—They get more, for instance, if one should get what is termed a start, they may get, perhaps, 40*l.* or 50*l.* in a month, and that throws the average up considerably on the whole.

2355. (*Mr. Davey.*) With regard to boring, you say that when they are boring in the back, the man's head is close to the hole?—Yes.

2356. How deep would it be before he could prevent that?—It would be by the time the hole was about six inches deep.

2357. Can you always put something round so as to prevent any dust coming out?—That is not done except where you go a little on the incline, and you are boring near water, then you have a mop put about it.

2358. What number of holes do you suppose it would be necessary to have in the back of a level where you could not prevent the dust from coming out?—It is in the stopes, that is, where they are working in the back.

2359. As they would in the level?—Yes; they would sometimes. At the back of the end, the persons holding the borer would not be so near as they would in the back when they are rising in small gallies.

2360. There would be a very small proportion of the holes that produce dust as compared with the others?—It is only at the commencement; when a hole is cut down four or five inches deep, there is nothing of the sort.

2361. (*Mr. Fulke Egerton.*) Have you known many miners suffer from what is called the miner's disease?—Yes.

2362. Do you think fewer suffer now than have suffered in the past few years?—I think the number is smaller.

2363. Do you think that is because the captains look more after the ventilation, or because the men themselves look more after it?—I think it is both; the men are a little more particular, and the captains look more after it, and not only that, but the men's comforts are more attended to than they were 20 years ago; and I firmly believe, whoever lives to see it, that 15 or 20 years hence there will be less of that disease than there used to be, or than there is now.

2364. Have you had any experience in the deep mines of the west?—Yes. I have been in the mines a great number of times.

2365. Do you think that the same observation applies to them as to those in this neighbourhood, that the ventilation is more attended to and the condition of the miners improved?—I have no doubt that it is, generally speaking; but I cannot speak positively about it.

2366. (*Mr. Austin Bruce.*) What proportion of your men are engaged in tutwork out of the whole number?—I should suppose that there is more than one-half at present.

2367. As a rule the tutmen are working in worse ventilated portions of the mine than the tribute men?—Yes.

2368. I suppose that a certain portion of the close ends, do what you may, are ill-ventilated?—There are some, but not a great number; but then you find, as I said just now, that there are winzes sunk as often as it is at all advisable. With a regular mode of mining, and when there is a long distance between the winzes, we always endeavour to put in a machine.

2369. You do your utmost to diminish the evil; but still it exists, and must do to a certain extent?—It must exist in certain places, particularly in cross-cuts.

2370. You have spoken of men having worked continuously in bad air for three months?—Yes, I have no doubt that some of them have.

2371. Are there any instances of that kind in your mine at the present time?—No, not to my knowledge.

2372. What is the greatest length of time for which in your opinion men now work in bad air in your mine?—Really we have very little of anything of that sort in the mine at all, because as we have so many lodes, and so many cross cuts and shafts, our mine is really very well ventilated.

2373. You have spoken of the men working continuously for three months in bad air?—That was not from my own knowledge, I said that I had no doubt about it.

2374. Speaking from the knowledge you have of the surrounding district?—Yes.

2375. You have reduced the amount of bad air to a minimum?—Yes, it is very much reduced to what it used to be.

2376. But you are of opinion, I presume, that your own mine is a favourable specimen?—I do not know, not particularly so. In most well-conducted mines they have a great many shafts, I suppose that we have 9 or 10 shafts in our mine from the surface altogether, and in some places there is a difficulty in carrying a light, the draught is so strong, and that is the case in many other mines. You will find in some instances that the comforts of the men are not well attended to, but, generally speaking, they are much better attended to than they used to be.

2377. You have said that your men complain and that their complaints are always redressed?—I have never known an instance but what they were; the moment the complaint is made there is always something done directly to endeavour to remedy it.

2378. Of course that would depend upon whether the thing was feasible without unreasonable expenditure?—Yes.

2379. Have you close ends to drive which must be driven, whether the ventilation be good or bad?—Yes, for instance, suppose that you had got a winze coming down here (*describing the same*), and the level coming on towards it, and this (*pointing to the same*) was a good way off the winze; it would be a very considerable expense to do anything to relieve it, and then perhaps you would not have more than a fathom or two to drive to alter this winze, when you would have plenty of ventilation, and the men might be working in a bad place just at that time.

2380. You said that the candle indicates the existence of bad air before the men feel it?—Yes.

2381. Are you sure of that?—Yes; I have been many times in places where the candle would not burn. I have worked on a tribute when I had the candle, perhaps, seven or eight feet behind me; it would not burn where I was working, and we were doing very well, and you do not think about the injury then.

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2382. But you were injuring yourself?—Yes, no doubt about it.

2383. You have told me that you have worked when actually the candle would not burn, and my question is whether to a certain extent the air would not be tainted even before the candle by not burning showed the condition of the air?—No; you will find that wherever there is a little failure in the air the candle will show it, and instead of having the candle upright it must lean; as the air gets worse you must have it down in a horizontal way.

2384. I understood you to say that you gave over working in the mine at the age of 23?—I gave over working when I obtained a situation.

2385. And that was at the age of 23?—Yes.

2386. Had you at that time suffered at all from working in close ends?—Not that I am aware of.

2387. I suppose you were without difficulty able to choose the ground in which you would work?—Generally speaking, I worked on tribute when I was underground, although I have worked on tutwork, and as I aid before, the tributers have better ventilation generally.

2388. How many workmen do you employ in your present mine?—I think altogether there are nearly 500.

2389. Is there a doctor's fund?—Yes.

2390. Are the miners attended by the doctor without payment?—Yes; there are two doctors.

2391. Are there any miners now under treatment for what is called the miner's disease?—I do not know, but I do not think there is so much of that in this neighbourhood as there is in the west; it depends a good deal upon a man's constitution; for instance, you will see two men coming up the ladder, one man is a strong healthy man who has got good wind, and you will find another who has not got nearly such good wind, but he will not be outdone by his comrade, if he can help it.

2392. (*Mr. Kendall.*) You say that you can judge very well by the burning of the candles as to the state of the air?—Yes.

2393. And you came to this conclusion when you were a tributer, that you could often work in an end where the candle would not burn, and you put it back some eight or nine feet behind you?—Yes.

2394. Then the candle according to that is more sensitive than a human being?—Yes.

2395. You can work where a candle will not burn?—Yes; the candle in the place that I spoke of, the moment you put it in, went out directly.

2396. With regard to the holing, if you are driving to meet a winze, and you find that you are very near, and the air becomes bad, then as it might cause some expense to bring in air, you prefer very often to let the men work on in the bad air?—Yes, giving them an extra price for the work, for in a short time they will get ventilation.

2397. But might it not take a long time, say two or three months?—After two or three months we should put in a machine.

2398. (*Chairman*). Do you suppose that in every mine there are ventilating machines?—In every mine, I have no doubt of it.

2399. Do you think that there are machines for ventilation in every young mine?—When they are required, but they are not required in a young mine until the works get extensive.

2400. When the levels are so extended as to produce foul air, do you think there is sure to be a machine put down?—Yes, different machines in any mine of any extent.

2401. If that be so, why are complaints made as to the foul air? you have stated that there were men working in bad air, but if there are these machines, why are complaints made?—There are particular places we may expect in a short time to hole to a certain place where there will be a communication, and you may then have a close place for some time, perhaps for a few weeks or a month, and you would not go to a greater expense; and probably then you would give the men an extra price, and they would get on with the work as soon as possible.

2402. But would they not do that to the injury of their health?—Very little injury.

2403. In a poor mine I presume it is less likely that they would go to any extra expense when they are perhaps merely exploring?—You will find that the agents will be more particular than they ought to be.

2404. But generally they would let the men work on to enable them to get to an end?—It might be the case, I cannot say that it is so.

2405. You have stated that there are some mines where the comforts of the men are not so well attended to?—I think you will find that that is so.

2406. You have also stated that the complaints which are made are more attended to than they were 20 years ago?—Yes.

2407. Are they more attended to now than they were 10 years ago?—I think so; there is no doubt about it.

2408. Are you of opinion that there is a general improvement going on?—Yes, you may depend upon that, as to the comforts of the men throughout the country.

2409. Evidence has been given before this Commission, referring to the state of things some seven, eight, nine, or ten years ago; the complaints of the miners then may not have been so well attended to as they are now?—No.

2410. Do you know anything of the Caradon Consols mine?—Yes.

2411. Do you remember that being commenced, and the shaft sunk?—Yes, I was an adventurer there, when they first commenced.

2412. You sunk one shaft?—Yes.

2413. Will you be good enough to describe to the Commissioners what was done there?—The shaft was sunk down to a certain depth, I think 30 feet under the adit.

2414. Was the adit extended?—Yes, it was holed to that shaft, and the shaft was sunk about 30 fathoms under it, that was in the first working.

2415. Before they holed to where the engine shaft is, what distance was there between the engine shaft and the shaft which you sunk first?—Really I cannot tell now, it is many years ago; but I think there was a shaft between, sunk down for ventilation as well as I recollect.

2416. Was the air bad in it while the men were working?—I do not recollect, I have been there, but I was only an adventurer, I was not underground but seldom.

2417. But in the case of sinking a new shaft, and then driving the adit at the end of that adit, it is very probable, is it not, that the air would be bad?—If it extended a long way it would naturally get close, and particularly where you have harder ground where you must blast.

2418. And where it is not straight?—Yes, more particularly so; then again where you are obliged to timber, the air is not so good as when there is none.

2419. Is timber affected by the damp?—Yes; that is the case, it is in a soft state and gets very weak.

2420. That I suppose vitiates the air?—Yes.

2421. Do they never put hemp into candles instead of cotton?—I believe not; it is a mixture, I think, generally speaking.

2422. A mixture of hemp and cotton?—Yes.

2423. Not inferior cotton, and good cotton mixed together, but hemp and cotton?—I think there is some hemp.

2424. Should you prefer a candle made of hemp and cotton mixed?—Yes, it gives a better light, and not only that, but the men sometimes in driving home through a level the candles will go out, and then you cannot blow them up again if they are made with nothing but cotton, but with hemp mixed you can.

2425. You stated that you knew that sometimes the candles supplied by contract were of inferior

quality ?—Yes ; I have no doubt that they are sometimes.

2426. Therefore it is possible that in inferior candles more hemp may be put than cotton ?—It is more with regard to the grease than the wick.

2427. Would it be any saving to the manufacturer to put hemp in instead of cotton?—The hemp would be cheaper, no doubt.

2428. Then it is quite possible that a man might put hemp in if he wished to commit a fraud ?—They may put in more sometimes, but as soon as it is detected a complaint is made directly ; for example, last Saturday week we had to order some candles in our lead mine, and the question was asked, "Where "did we have the last from ?" "From so and so, but "the candles were not good." Then I said, "Do not "send the order there, but send the order to Ply-"mouth ;" and we sent there immediately, and the other man lost the order.

2429. But suppose you had made a contract with a man for six months' supply, would not the man in that case be obliged to use those candles ?—We always make a reservation when we make a contract, and say, "If you do not send good candles we shall "order them elsewhere, and charge you with the "difference in price."

2430. Suppose that any mine agent has made a contract for a quantity of candles that are inferior, would he not probably let the men continue to use them ?—If the men complained of them I should think he would not ; we have sent back scores of boxes.

2431. (*Mr. Kendall.*) If they do not come up to the sample they are returned ?—Yes.

2432. (*Chairman.*) How long is it since your dry has been erected ?—One has been erected for several years.

2433. The new one ?—I cannot tell you how long that has been erected, not more than 12 months ; we have more men employed there than before, and we had therefore not room enough. Then there was one that we had in the higher part, we had one up at the head that was burned down, we had not room altogether for the men, and when that one was burned down we agreed to build them a new one, and now we have plenty of room for the whole of the men.

2434. Have you ever been to Fowey Consols?—Yes, but not for some years.

2435. You perhaps do not know whether there is a dry there or not ?—No.

2436. (*Mr. Davey.*) You stated just now that you were an adventurer or shareholder in the Caradon Consols ?—Yes.

2437. Is it probable that you would drive an adit 130 fathoms, only 15 fathoms from the surface without ventilation ?—It is not at all likely, where there was but that distance, no doubt, there would be a shaft sunk on purpose for ventilation.

2438. You could drive a level more expeditiously, could you not, and consequently much more cheaply ?—Yes.

2439. How do you find the miners generally ? do they appear to you to be an independent class of men ?—Like all other classes, they are different ; but some of them are very independent.

2440. For example, if you were to insist upon anything being done in the mine, and they did not choose to do it, would they take up their hats and walk away ?—Yes ; there have been instances of that kind. It might be said to them, "If you do so and so, you "must go," and they would leave ; but generally speaking where you have a proper system and things are to be attended to, they know what the rules and regulations are as well as we do, and we have very little trouble with them.

2441. (*Mr. Kendall.*) Suppose you were to make innovations in any way, would they submit quietly to them, or would they say we do not like it ?—Many of them say, "We do not like it."

2442. As a body do you consider them to be a tolerably independent class of men ?—Yes.

2443. Which in your opinion is the most independent, the agricultural labourer or the miner ?—I think the miner is.

2444. (*Chairman.*) Should you say that the tut-work men are as independent as the tribute men ?—They are pretty much the same.

2445. Are they not very often compelled to work, and from necessity in bad ends ?—There is no necessity, because a man when the work is out can leave at any time.

2446. But is work so plentiful generally that he could obtain work elsewhere if he threw up his work at any particular place ?—Yes ; now it is the case.

2447. (*Mr. Kendall.*) Suppose that a man were in a bad end, and he said to the agent, "I do not like "the air at this end, I shall give up my take there," would that operate as a bar to his working in any other part of the mine, or, in other words, would he be a marked man ?—No.

2448. Would any part of the mine be as open to him as to any other miner ?—Yes ; the agent would not put himself out of the way. If he liked to take a pitch, he might take it directly if he were a well-conducted man.

2449. (*Chairman.*) I suppose there must be many miners who are not earning large wages, but who have large families, and are obliged to take work which, if they were as independent as tribute men, they would not take ?—I think there are more tributers badly off than tutmen. The tutmen get pretty regular wages, but the tributers may go on sometimes for two or three months, and get but very little, and the men who, I think, are in the greatest poverty are the tributers. Then again a great deal depends upon a man's wife. In this neighbourhood there are scores of them ; but between them there is as much difference as between light and darkness. You will find two men, and one of the two has got a clean, decent, wholesome, industrious wife, and that man's children will be kept as clean and as comfortable as possible ; you will then see one of the same pair, who has got a dirty, careless wife, and the family will be in rags, and yet that man will make the same gettings, and his house will be in the greatest mess possible. You will see the one man going on as comfortably as possible, and the other will be always in misery.

2450. What are the wages that the tutmen have earned during the last month, or at what rate have they taken sets at ?—I think that our men would average somewhere about 3*l.* 5*s.* to 3*l.* 10*s.*, some more and some less ; some men are much better men than others. If you give them the same price for the ground they will get perhaps 10*s.* a month more than another man, and therefore some will get more and others less.

2451. What should you say was the least ?—Some of them, if the ground is against them, will not make perhaps more than 2*l.* a month, and even less than that sometimes in bad ground. You set to a pair of men and you give them 4*l.* a fathom, and, before they have half driven six feet of ground, the ground will become such that they ought to have 7*l.* or 8*l.* a fathom ; then those men are thrown back, and sometimes men will drop their tools, and run away and leave it. But we are never in the habit of taking out a bargain of that sort, because if the ground goes the other way we never attempt to keep back anything ; we pay them what they earn, and we take the bad with the good.

2452. If it is bad they do not get any more, although it is a bad bargain ?—Instead of 3*l.* 10*s.* they would not get more than 2*l.* or 30*s.* If they are steady men we charge them with what they call subsist ; we advance a sum of money on the month then out—for instance, if you are going to pay next Saturday, you would pay for the work done in March month ; then you would have a month in hand, and we should advance them a little money to take it up, perhaps 10*s.* a man, or 1*l.* upon the month after, to enable them to purchase provisions for their families.

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2453. Is it generally the case that they are a month behindhand in their pay ?—It is generally the case.

2454. What is the reason of that ?—We have some little hold upon the men by that, they would not be running about and leaving their work so much.

2455. So that a man commencing work is not entitled to his pay for two months ?—No, unless he had some advanced to him, but when a man leaves a mine he has a month's wages coming from that mine.

2456. That is supposing that he is not out of work ?—Yes, if he is out of work he gets nothing, but at the end of the month we advance him some money, there is hardly a month but what we do that.

2457. Are the wages you have mentioned clear of all deductions ?—Clear of all costs, that is the money they carry home.

The witness withdrew.

Mr. WILLIAM JOHNS examined.

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2458. (*Chairman.*) What is the name of the mine of which you have the management ?—West Caradon.

2459. How many men have you employed underground ?—About 450 men, women, and children. That is what we call our complement, it varies at times.

2460. How many of those are working underground ?—About 300 working men.

2461. How many shafts have you in the mine ?—Four.

2462. Is West Caradon connected with any other mines underground ?—There is a connexion between West Caradon and South Caradon, and with Gova Meva, they all communicate one with the other.

2463. That I suppose helps the ventilation ?—Yes, it causes ventilation throughout the whole mine.

2464. Then the ventilation is good ?—Very good indeed, I think the best that I ever was in.

2465. For how long have you worked in the mines ?—From my boyhood upwards, I was a working man upwards of 20 years, and I have been manager about 12 years.

2466. Have you always been at this mine ?—I have been at this mine for the last three years and three months.

2467. Were you in the west before that ?—Yes.

2468. In what part of the country did you work as a working man ?—Principally at Redruth and Gwennap.

2469. Have you worked in very large mines ?—I worked in the Carn Brea mine for many years.

2470. Have you ever been at work in the close ends and in bad air ?—I never had occasion to work in the close ends. I worked principally as a tributer.

2471. What was your reason for working as a tributer ; was it to avoid the close ends ?—No ; but I fancied that the tributers could earn more than at tut-work, as a whole.

2472. But to work as a tributer must you not have some means of your own, as you may not earn anything ?—We generally calculate that we get extra means, and are able to put something aside ; taking the whole year round, we generally calculate that the tribute men do better than the tut-work men ; they work longer hours, generally speaking.

2473. They are able to do that, are they not, on account of breathing better air ?—I do not know ; it depends upon circumstances ; sometimes we earn something extra.

2474. When you have got a good lode ?—Yes.

2475. Should you say that where the tribute men work the place is generally better ventilated than where the tut-men work ?—It is generally pretty well ventilated in some instances ; there might be a little foul air connected with it, but we generally manage as tributers to work round, and get it well ventilated.

2476. You meant poor air when you said foul air ?—Yes.

2477. I suppose as a tributer you used the borer ?—Yes, the tributers use the borer as well as the tutwork men ; there is no exception with regard to that.

2478. In your present mine are there no bad ends ?—No. I should say that our mine is very well ventilated, because we have 13 or 14 different lodes in the mine, and they are well ventilated. I suppose that the extent, taking the different levels driven, is beyond eight miles, if it was opened out, and more than eight miles by communicating one level with another ; there is a communication.

2479. Is it a copper mine ?—Yes.

2480. Is there much mundic there ?—Yes, there is a portion of mundic.

2481. There is no artificial ventilation, is there ?—No ; we do our best to get well ventilated, and we ventilate it by sinking winzes.

2482. Have you any other artificial means of doing it ?—Should there be required a machine, a fan machine, we put it on.

2483. Are the fan machines worked by a boy ?—Yes.

2484. Have you ever seen any other means of ventilation used in any mines ?—Yes ; there are machines attached to the engines sometimes.

2485. Have you seen them at work ?—Yes, we use them in the mines we are connected with ; but that entirely depends upon how fast your engine works. Where it works four or five strokes a minute it can be blown down very effectually, but where the engine works slowly it will not be sufficient.

2486. I suppose the speed could be increased by a wheel ?—Yes, it could be multiplied.

2487. In what part of the county is the mine situated where they have a machine applied to the engine ?—There is one now working at

2488. Is that near to this place ?—Yes.

2489. Near your mine ?—Yes, in the same district.

2490. Is there only one shaft there ?—There is only one shaft in that mine.

2491. Is it a young mine ?—Yes.

2492. You have ladders, I suppose, in the mines ?—Yes ; our footways are principally through winzes on the course of the lode.

2493. It is not a direct ascent, but from one level to another ?—Yes ; we have a footway in our mine direct on the course of the lode, from the surface to the bottom of the mine on the different lodes.

2494. What is the greatest depth where the ladders are continuous ?—About 30 fathoms is the most continuous line of ladders we have got, but they are quite safe from the shaft to the surface.

2495. Are the men distressed by ascending them ?—Not at all.

2496. Have you a dry ?—Yes.

2497. Is that attached to the engine house ?—No, it is quite distinct from the engine house.

2498. Is it a comfortable changing house ?—Yes, as comfortable as we can possibly make it.

2499. Do the women work under cover at your mine ?—Yes, in some cases.

2500. I suppose they are the better for working under cover ?—Yes ; but they cannot always work under cover ; we work them all under cover as much as we possibly can.

2501. Have they any room set apart for themselves to enable them to boil their water for tea ?—We have three for the girls working on the floors at the different places, and they can warm their water for their tea or for their dinner.

2502. That, I suppose, is a great comfort to them ?—Yes, especially so in the winter time.

2503. Does that arrangement keep them separated from the men ?—Yes ; the men have nothing to do with them, not more than what are working on the floors.

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2504. Do you know anything at all about the ages of the men, or are there any old men working there ?—Yes ; their ages range from 60 to 13 or 14.

2505. There are some as old as 60 ?—Yes.

2506. Have they been working all their lives in the mines ?—Yes, they have ; and some men had been working in the mine before I knew anything of it.

2507. Working in a well-ventilated mine you think is not injurious to health ?—No, not so much as might be supposed by many others.

2508. Is there anything in the smoke of the candles or the powder that you think might affect the men at all ?—It is very likely that the smoke of the powder is not so good for the constitution as fresh open air, but they are not compelled to go into it. If they blast a hole in the end, they are not compelled to go in till the smoke has thoroughly cleared out.

2509. With a system of good ventilation, how long would that take ?—In some places the smoke is gone in five minutes, and in some others in 10 minutes.

2510. Is your ventilation affected by the atmosphere ?—I do not know, we have plenty of good shafts ; and the more you have of them the greater the draught.

2511. (*Mr. Fulke Egerton.*) Do the men who are employed pay a certain sum for medical assistance ?—Yes, they do.

2512. How much do they pay ?—We deduct 1*s.* 6*d.* per month from each man, one half of which goes to the medical assistant, and the other to the fund, should they be hurt.

2513. Do they receive a certain allowance from the fund whilst they are sick ?—Yes, they receive 1*s.* a day as long as they are sick.

2514. Is that allowance confined to the men who suffer only from accidents, or is it extended to those who suffer from illness ?—It is extended to both ; if a man should be poorly, and he is a steady working man, we give him 1*s.* a day, and when he is well enough and comes back again, he goes to the counting-house, and his name is erased out from the club book.

2515. Do you know how many men there are under medical treatment at the present moment on the books ?—There are two men whom we call infirm men, and they were infirm men before I came to the mine ; but those are the only two I know of, with the exception of the case of a small accident, who are on the club, out of 500 men one is a mere nothing.

2516. What is the greatest number of men who you can recollect have been on the club books ?—Perhaps seven or eight on account of small accidents, for some two or three days or a month.

2517. Have you had any on the books suffering from what is called the miner's disease ?—Not since I have been a mine agent ; not particularly that, but they get old and infirm like many other classes, and then we give them easy work to do at the surface, and after that if we thought it right we should give them a small remuneration as long as they lived.

2518. Have you had experience in other mines besides the one you have mentioned ?—Yes, I am agent in other mines besides that.

2519. Do you consider that the ventilation in this mine is better attended to than in other mines ?—There is very good ventilation in this mine, and we have an advantage in the way of ventilation in this mine over many others ; we have a great many lodes, and they communicate the ventilation to three different mines ; having such extensive workings, perfect ventilation is produced.

2520. (*Mr. Austin Bruce.*) Have you ever known the men at the close ends give over working in consequence of the bad air ?—No, not that I am aware of, that is, not entirely to give up ; there are some exceptions, sometimes we drive an end, and we have a winze go down before that end, and perhaps a week or a fortnight might accomplish the object, but some of them might take cold just during that time, but not give up entirely.

2521. You spent your youth in the west, did you not ?—Yes, having visited that district for about three years and three months.

2522. Did you know of much suffering there from bad ventilation ?—No.

2523. Did you ever know of any instance ?—Not one.

2524. Do you mean that you never knew a man suffer in that way in all your life ?—Not in the west, while I was a western mine agent I did not know of one being laid up from bad air.

2525. Have you known men suffer from what is called the miner's disease ?—They say so, but I never knew of one.

2526. Have you never heard a man complain of any sort of suffering in consequence of working in close ends ?—No, I never had any complaint made to me as a mine agent.

2527. Did you never hear of any complaint of that kind being made ?—People say so, but I never had any complaint made to me ; we always study the comforts of the miners, and if they have not good air we are obliged to give them extra air ; we do not get so much work done if they are in bad air.

2528. (*Mr. Holland.*) Did you suffer from what is called the miner's disease ?—Parties say that there is such a disease, and I have heard of such, but I never witnessed anything of the sort. I worked as a working man for 20 years, and I never suffered anything of the sort.

2529. (*Mr. A. Bruce.*) Perhaps you never worked in close ends ?—I worked principally as a tributor.

The witness withdrew.

Mr. WILLIAM COCK examined.

Mr. W. Cock.

2530. (*Chairman.*) At what mine are you captain ?—South Caradon, Wheal Hooper.

2531. Is that a young mine ?—Yes.

2532. How long has it been worked ?—About four years.

2533. Have you been there since its commencement ?—Yes, I was there at its commencement.

2534. Is there one shaft or two at that mine ?—Yes.

2535. To what extent have you driven the ends from the shaft ?—Our farthest is between 90 and 100 fathoms.

2536. At the end of that 100 fathoms what means of ventilation have you ?—We have an air machine attached to the engine, a piston machine.

2537. How is the air blown down to the ends ; is it in pipes ?—Yes, the foul air is taken out.

2538. The effect is to draw the foul air out ?—Yes.

2539. Are there two pipes ?—There is another pipe.

2540. (*Mr. A. Bruce.*) Is that Struvie's engine ?—It is a pumping engine.

2541. (*Chairman.*) How does it work ?—It is attached to the engine ; it works stroke for stroke with the engine ; it draws out the foul air, and discharges through another run of pipes to the surface.

2542. Is the fresh air sent into the mine by pipes ?—No.

2543. You exhaust the foul air from the mine ?—Yes.

2544. Does that plan answer perfectly ?—It answers very well.

2545. Are there no complaints at the far end of this mine ?—Not when the men keep the pipes in proper condition.

2546. How many different levels have you below ?—Only one.

2547. Is it straight ?—Yes.

2548. The engine draws the air from the extreme end. How does the fresh air find its way in ; is it from the exhaustion of the other ?—Yes.

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Mr. W. Cock.

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2549. What are the pipes that you spoke of?—They are the passage through which the foul air is drawn.

2550. To the engine?—Yes.

2551. At the far end, while the men are working, can the candles burn?—Yes.

2552. Have you ever seen the candles fail there at all?—Never.

2553. You have been a miner yourself, have you not?—Yes.

2554. In what part of the county did you work?—At St. Agnes.

2555. In deep mines?—Ninety fathoms.

2556. Was there any poor air at any of the ends in the mine you were working in?—Yes.

2557. Did you work as a tut-worker or as a tributer?—As both.

2558. As a tut-man, did you ever encounter bad air?—I have in some places; I have worked in different mines.

2559. In some places have you met with poor air?—Yes, I have in some cases.

2560. How did you discover the presence of the poor air, by the burning of the candles or by your own feelings?—By the burning of the candles.

2561. Did you find that it affected your health at all?—I do not know that it ever did.

2562. Did it produce any sensation while you were working?—No.

2563. You felt no effect from it whilst working?—No.

2564. Was it very poor air or not?—Not very bad.

2565. Was the other man who was working with you affected in any way?—Not at all.

2566. I suppose the shaft is divided?—Yes.

2567. The exhaustion of the air takes place through the ladder shaft, down which the men go, does it not?—Yes, the foul air is discharged at the surface through the pipes.

2568. Do you suppose that the fresh air finds its way down the lift?—Yes.

2569. Is the division of the shaft close, or is it open wood work?—It is close.

2570. Quite close?—Pretty well.

2571. It is not stopped up in any way?—No.

2572. Do you know what was the cost of this engine for exhausting the air?—I should think not more than 20*l*.

2573. Is that much for such an engine?—Not a great deal.

2574. What horse-power should you think it would take to drive it?—I should think four or five horse-power.

2575. Do you think that could be applied to any mine?—Yes.

2576. From your experience of it does it get out of order?—It draws about 200 cubic feet a minute.

2577. Has it ever got out of order?—Not since it has been working.

2578. From your experience would you recommend it to be adopted in mines where ventilation is required?—Yes.

2579. (*Mr. Davey.*) You stated just now that you had always good air in the mine as long as the pipes were kept in order?—Yes.

2580. Do the men sometimes neglect to keep the pipes in order?—Yes, they do.

2581. The consequence of that, I suppose, is, that they find a difficulty in working?—Yes. Those pipes are made in about nine feet lengths, and at the joints where they do not fit they are stopped up with clay, and by means of water sometimes the clay works out, and it requires to be renewed with clay or grease.

2582. Which the men, I suppose, neglect to apply?—Yes.

2583. Why do you stop up the parts where they do not fit with clay? Could you not find any other means of stopping them up better than clay?—Sometimes they are stopped with grease, and that would not wash out.

2584. As long as the pipes are properly attended to, you get very good air?—Yes.

2585. Had you ever seen any of those machines before?—Yes.

2586. At what mines?—At West Caradon.

2587. Have you seen any of that description in St. Agnes?—No.

2588. What mines did you work in?—At Consols.

2589. That mine being worked entirely by tributers, you always had good air, I suppose?—That mine is well ventilated generally.

2590. (*Mr. Holland.*) What size is this ventilating engine?—Twenty-four inches square.

2591. What is the length of the stroke?—Eight feet.

2592. That would be a 32-feet stroke?—Yes, it is double.

2593. How many strokes does it make a minute?—About three.

2594. About 200 feet a minute?—Yes.

2595. How many men does it supply with air?—Six; only two at a time.

2596. Is there a pipe that goes through the end to draw the air away from the end?—Yes.

2597. Does that connect with the division of the shaft?—Yes.

2598. Is the division of the shaft air-tight?—Not quite.

2599. Is there an air pipe all the way up?—Yes.

2600. What size is that?—Five inches.

2601. It is a duck engine, is it not, like a gasometer rising up and down in a tube of water?—No, not with water, it is worked by valves similar to a steam engine.

2602. Do you find that that is sufficient to keep the mine cool and sweet?—Yes.

2603. (*Mr. Austin Bruce.*) Have you ever heard of the disease called the miner's disease?—Yes, I have heard of it.

2604. Did you ever see anybody suffering from it?—I have seen men with a disease upon them in a consumption, I suppose; as it is commonly called the miner's disease.

2605. How do they show it?—By a shortness of breath generally.

2606. Where did you see those cases?—They are to be seen in most mining districts.

2607. Have you ever found any of your fellow-workmen suffering from it?—No.

2608. Have you ever known many men of your acquaintance suffering from it?—I do not know that I can name any one.

2609. Have you ever worked in close ends?—Yes, I have worked in a few.

2610. Were you ever at all the worse for it?—I do not know whether I was.

2611. Have you ever felt any increased difficulty in breathing in those places?—Yes, I have.

2612. Were you none the worse for that?—My staying in it was short, only just to examine it; that was one place that we have now raised from one level to another to give better ventilation, and in rising in this place the air was very scanty.

2613. What did you do?—We effected a communication between the two levels by a rise.

2614. How long was the air scanty?—For about three months.

2615. Were you working there all the time?—No; I was then an agent.

2616. Were there some men working there for the whole of the three months?—Yes.

2617. Were they the worse for it?—No; they are still working in the mine.

2618. Were they any the worse for it at the time?—No.

2619. (*Mr. Davey.*) You stated that you felt inconvenienced by this scanty air, did not the men who

worked there feel the same inconvenience ?—I believe not.

2620. Could they continue to work in a place where you could not remain to examine it ?—Yes.

2621. Did those men never complain ?—No, they complained that the air was foul of course, but that is like a good many others ; the place is put there entirely to afford better ventilation to the other parts.

2622. Do you think that the men generally suffer less after being accustomed to work in these places ?—I think they do.

LISKEARD. *Mr. W. Cock.* 16 April 1862.

The witness withdrew.

Adjourned to To-morrow at the South Caradon Mine, at 12 o'clock.

REFORM CLUB PALL MALL

Thursday, 17th April 1862.

PRESENT :

The Right Hon. Lord KINNAIRD, K.T.
The Hon. A. FULKE EGERTON, M.P.
H. AUSTIN BRUCE, Esq., M.P.
JOHN ST. AUBYN, Esq., M.P.
P. H. HOLLAND, Esq.

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

The Commissioners made a personal inspection of SOUTH CARADON MINE, *at which they took the following evidence.*

A MINER examined.

2623. (*Chairman.*) How many years have you worked as a miner ?—27, I am now 42 years of age, I was 16 before I went underground.

2624. Have you worked at tutwork ?—Yes.

2625. And in poor air ?—Yes, formerly. At one time I worked in a mine under the river where the air was very light. In the granite where the air is dead there is a damp, it will act on the head first, and you get a tightness in the head, and afterwards it will cause an overflow of bile, and make you very sick.

2626. (*Mr. Fulke Egerton.*) Like a sick head-ache in fact ?—Very much like a sick head-ache, and afterwards when you work in poor air again you feel it directly ; it will act upon the system even for years afterwards, and in working in good air after the poor air you feel it more, if you do not take medicine ; I had to take opening medicine directly on working in poor air, and it worked it off, and it relieved the system. In the damp air the candle wavers, it beats down, but in light poor air it will extinguish.

2627. (*Chairman.*) Which do you think is the worst ?—The damp, what the miners call the cold damp.

2628. Is that principally in sinking the shaft ?—Yes, and you sometimes get it in extending levels, and sometimes rising in the back from the long distance where there is no current of air.

2629. Would ventilation cure that ?—Yes, certainly. Where there is the damp when you explode, the powder smoke will rise perhaps half up the shaft, and will not ascend to the surface ; the damp will keep it down there, and many men have lost their lives in consequence, after it has exploded.

2630. Is that from the damp or from the powder ?—From the damp air ; powder does not affect us so much as people think, because there is charcoal in the powder.

2631. How would you ventilate that ?—By sending down pipes and blowing air.

2632. With what kind of machine ? — A fan machine.

2633. Worked by hand ?—Yes, we had several in this mine.

2634. (*Mr. Fulke Egerton.*) Was that on the surface or at the bottom of the shaft ?—The fan machine was on the surface. We are obliged to do it to get the shaft a certain depth, to make a level to get a current of air through. In sinking a new mine in the summer time we get the cold damp, in winter time we do not get it so often.

2635. (*Chairman.*) Do you think that in sinking new mines you encounter more bad or damp air than in large mines ?—Yes, until the mine is ventilated. After it is ventilated if there is one shaft on the top of a hill and another lower down, it is drawing through a regular current of air. The adit will do instead of another shaft.

A Miner. 17 April 1862.

2636. (*Mr. Fulke Egerton.*) This mine is very well ventilated, is it not ?—Very. I think that it is a model for mines in general ; there is such a thoroughfare ; there are West Caradon and Craddock Moor and South Caradon, nearly adjoining East Caradon ; there is a thoroughfare right through, and there is Gonamena ; they are all connected, so that a current of air passes through.

2637. East Caradon is not so well ventilated, is it ?—I am afraid not, by what I have heard. I have not been down in it. I have worked in the United mines.

2638. Where are they ?—In Gwennap.

2639. (*Chairman.*) Are they well ventilated ?—Yes ; but they are very hot ; they cannot extend far from the shaft on account of the air. If they can get a waterfall they will do. Water throws the purest air, but in all mines we cannot get it. This mine has been working many years, and has so many shafts that there is a good ventilation.

2640. Do you know anything of Wheal Morris ?—No ; I was never in it. That is a new mine, and there is what they term Caradon Slade ; that is a new one ; that is a little way from Bodmin Land Village. I live at Bodmin Land Village. To inspect the mines, there ought to be a practical miner—one who has had experience for 25 or 30 years, and then he can tell the distance of the levels.

2641. What kind of work are you on ?—I work on tribute. When we work on tribute we are up dressing the ore for a week or so at a time in the pure air, and that invigorates our system ; it throws off the gases which we inhale underground. Some go underground earlier than I did. I did not go underground till I was 16.

2642. (*Mr. Fulke Egerton.*) In your experience do you think that ventilation has improved all mines ?—A great deal in the last 20 years. The places which are extended horizontally are larger ; they make them now for small tramways. Formerly they were only so that a little boy could pass through with a barrow. I think that the better a mine is ventilated the better it will pay the adventurers.

2643. The usual height of the levels is about seven feet, is it not ?—Yes, usually ; they ought never to be driven less than that.

The Commissioners then inspected WHEAL NORRIS MINE, *where they took the following evidence.*

Mr. JAMES NANCE examined.

2644. (*Chairman.*) You are the agent of this mine ?—I am.

2645. What do you think is the great cause of the miner's disease ?—The men blast their holes, and

Mr. J. Nance.

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Mr. J. Nance.

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then there is no possibility of getting to work for some time till the holes are cleared out.

2646. (*Mr. Holland.*) About what time?—Perhaps half-an-hour sometimes, and sometimes three-quarters of an hour. They bore so much ground, and perhaps sometimes it is not quite so hard, and it is done more quickly at one time than at another. While in a state of perspiration they get in a draughty place, and stop there till the bell rings in order to prevent any collision with the agent, and there they contract their consumptive habits; I believe that to be the chief cause of the miner's complaint.

2647. (*Chairman.*) Do they ever stand waiting on the ladders before coming up, because if they came out before the time they would be fined?—There is no doubt they do; they stop in a draughty place; I believe that the miner's complaint generally begins with a cold, and that a succession of colds produces it.

2648. Then you think it very desirable to have a good changing house near the footpath?—Yes, and especially in the winter time.

2649. (*Mr. Holland.*) Your belief is that if the miners stopped there instead of down below they would escape the miner's complaint?—I believe they would to a large extent.

2650. Do you think that miners suffer very much from dust?—In some rises in rising there is no doubt they do.

2651. Does it do them much harm?—No; I do not think it does.

2652. Does it ever make them short-winded?—Generally speaking the rock is damp.

2653. Do they suffer much from powder smoke?—If they go into it too quickly of course it will be injurious.

2654. Do not they commonly go into it too quickly?—I think not.

2655. Have you worked in poor air?—Yes.

2656. What effect has it had upon you?—You feel very little from it when you are in it, but the sensation in coming into the fresh air is very singular; you feel a weakness for a minute or two, which you did not feel before.

2657. You feel an amount of fatigue far more than proportioned to the exertion?—Yes.

2658. Do you feel a shaking of the legs and knees?—Yes, when you get into the fresh air.

2659. Do you sometimes feel frightened and nervous without any apparent cause?—No, I think not; you feel a sensation on getting into the fresh air.

2660. (*Mr. A. Bruce.*) How long does it last?—Perhaps for two or three minutes; persons who work in those close places feel chilled considerably more than persons working in good air places.

2661. Is that all you feel?—That is all I felt, because I was never so much in it as some of them.

2662. (*Mr. Holland.*) Have you ever had indigestion produced by bad air; such air as you have described?—Not that I recollect. I have felt a little indigestion latterly.

2663. (*Mr. A. Bruce.*) How long were you underground?—In my training I was underground four years, but nothing more than being trained.

2664. (*Mr. Holland.*) Did you ever work in bad air?—One month.

2665. What was the state of your health at the end as compared with its state at the beginning?—I felt languid and feeble after the end of the month, rather more than I was before.

2666. Did it produce head-ache?—I have been subject to head-ache, I think, from my childhood, at times, but I do not recollect to have had any particularly from that cause. Close misty weather used to bring on head-ache with me.

2667. Have you noticed a loss of effective time from working in bad air?—I have never done so.

2668. (*Chairman.*) How much do you think it takes out of a man to go up the ladders 100 fathoms?—I should think a quarter part of his day's work.

2669. (*Mr. A. Bruce.*) Equal to two hours' work?—I think so.

2670. (*Chairman.*) To avoid that, what sort of machine do you think could be adopted? In the first place, what machines are adopted in order to save the ladders?—There is no other machine in Cornwall but the man-engine.

2671. In your opinion could no other machine be adopted for the same purpose?—I think that there might be substituted for it what we call a gig, what we repair our shafts with. That might work in slides similar to skips. There is a canopy at the top, and it is square with a door opening on one side, and it hangs on the top like a swivel, and you may turn it about as you like.

2672. (*Mr. A. Bruce.*) Could you use such a machine in a shaft which was not perpendicular?—Where a skip would work that would work; it could work on the same slides.

2673. (*Mr. Holland.*) Would it not work in any ordinary shaft?—Yes, any drawing shaft.

2674. (*Mr. A. Bruce.*) Would you work this machine in the same part of the shaft as that by which you bring up the ore?—Exactly the same part of the shaft.

2675. Could that be done without interfering with the delivery of the ore?—For the time that the men were going up and down they could not draw the stuff.

2676. Would there be time enough for the delivery of the ore after allowing for the time taken up by the men?—In most mines the whole of the time is not fully occupied in drawing. If the shaft was not sufficient to discharge the stuff and the men, there could be another shaft to do it.

2677. (*Chairman.*) What would be the cost of one of those cages?—It could be made for about 15*l.*

2678. (*Mr. A. Bruce.*) The main expense would be the rope, would it not?—The same gear would do for both.

2679. There would be a little more wear and tear of the gear, that would be all?—Yes.

2680. (*Chairman.*) What should you say would be the cost of such a contrivance per day, for sending down 100 men; how much coal would it cost per day?—I should not think that it would exceed one shilling.

2681. (*Mr. A. Bruce.*) Have you ever seen that contrivance in use?—No, not in this country.

2682. Have you ever heard it recommended to any agent?—Yes, I have heard it recommended hundreds of times.

2683. Have you ever heard any good objections to it?—I never heard any good objections to it.

2684. What objections have you heard to it?—The men when it has been recommended to them, have said, "We would rather trust to the ladders;" but I believe that if the proprietors of the mines had entered heartily into it, it would have been done years ago; but they appeared to be rather indifferent to the matter.

2685. Then the objection came from the men, and the proprietors did not press the thing?—Yes.

2686. Have you ever known any change, however beneficial, approved by the men at first?—I do not know, they all fell very readily into the proposition as to having soup on coming from underground.

2687. (*Mr. Holland.*) Do you not know that the man-engine was just as vehemently objected to by the men?—I think it was.

2688. And did they not adopt it the first week that it was put up?—Yes.

2689. And now they will not go up by the ladders when a man-engine is there?—No.

2690. They will wait three or four hours for it?—Yes.

2691. (*Chairman.*) Will you state at what mine you were working before you came here?—At Wheal Uny.

2692. In that mine was any provision made for cooking the men's food?—We had a soup kitchen erected, with benches round for them to sit, and each man as he came from his work had a basin of soup

tendered to him directly, before he changed his clothes.

2693. What did he pay for it ?—Nothing. Mr. Fox paid for it. Mr. Fox said, "We will go on and try "it, and perhaps ultimately we shall charge the men "a penny a week to cover the expense, we shall see "what the expense is." And after some time, he said, "Never mind, go on."

2694. What was the effect of it upon the health of the men ?—They looked much better.

2695. Do you think that they would pay a small sum for it ?—I do not think that they would object to pay a penny a week, and I think that that would cover all the expense.

2696. (*Mr. A. Bruce.*) Surely it would not cover the expense of the soup ?—Yes, it would. That does not include firing or attendance.

2697. (*Chairman.*) You think that the men would be willing to pay a fair price for the advantage of getting some soup on coming out from their work ?—I think so, if they had it once.

2698. (*Mr. St. Aubyn.*) Do you know any mine where that has been tried ?—Dolcoath.

2699. Is it still continued ?—I think not.

2700. The men never paid a penny a week at Dolcoath, did they ?—I think not.

2701. When Mr. Fox had the management of the mine he supplied soup ?—Yes.

2702. And when he left it that was left off ?—Yes, I think so.

2703. But you do not know any mine where the men pay a penny a week and have their soup ?—No.

2704. You, however, think that it would be a good thing ?—Yes.

2705. And that the men would do so ?—Yes.

2706. How much would you give them for that money, a pint of soup ?—Yes.

A MINER examined.

2707. (*Mr. Austin Bruce.*) How do you judge when your time is up ?—We can just tell when we are tired, and can just judge by the candles and the work which we do ; that is as nigh as we can tell.

2708. Is there any signal or bell ?—Here, to grass.

2709. But you do not hear it down below ?—No.

2710. Are you fined if you come up before the time ?—Yes, sometimes ; not at all times.

2711. Would you be fined in case you arrived five minutes before the time ?—No ; I suppose not so nice as that.

2712. What is the smallest time for which you have ever been fined ?—We cannot tell ; there is no certain time for it.

2713. Who takes your time ?—The agent here.

2714. Is he always here when you come out ?—Not always.

2715. You generally fire a shot, I suppose, before leaving your work ?—Sometimes we do, and sometimes we do not.

2716. Do you not generally manage to try to do so ?—No, we do not always.

2717. Do you leave your work before the other men come in to relieve you ?—Yes, sometimes.

2718. What is the rule—are you generally out before the fresh men come in ?—We generally calculate to get up before they go down.

2719. Supposing you happened to fire a shot half an hour before your time was up, you could not do much work between that and the end of your time ?—No.

2720. What do you do in such a case ?—Sometimes we will come up.

2721. Are you fined then ?—Sometimes.

2722. Supposing you fired a shot half an hour before your time was up, where you could not work afterwards, would you venture to come to the top ?—We do so if it is very wet and cold.

2723. And you run the risk of being fined ?—Yes, we do.

2724. Have you ever suffered from your work underground ?—Not that I know of. I never had a great deal of sickness.

2725. Have you ever worked in bad air ?—Yes.

2726. How long together ?—I can hardly tell. I have been working underground a good while now; perhaps, two or three months together.

2727. At the end of those two or three months, would you feel worse than at the beginning of them ?—No, nothing more than at any time of working. I feel head-ache.

2728. Do you sleep well and eat well ?—Yes, I always do.

2729. Have you seen others suffer from it worse than you ?—Yes, in time.

2730. Have you seen men obliged to give up working ?—I have known men who have been obliged to give up working.

2731. We have heard something about a cough, and bringing up black stuff ?—Yes.

2732. Have you known cases of that ?—I do not know that I do much in that way, but men who work in poor air do so.

2733. You have never done so ?—No. I have brought up black stuff, but I never have much cough, unless I catch a cold, then I find that I get loaded on the stomach.

2734. How old are you ?—Twenty-five. I went to work underground at nine years of age.

2735. That, I suppose, was in turning a fan ?—No.

2736. What sort of work did you do at nine years of age ?—Tributer's work ; turning the borer.

2737. Holding it while the other person struck ?—Yes.

2738. How long did that go on ?—For several years.

2739. Then what did you do ?—Then I was man enough to strike.

2740. Then you began striking ?—Yes.

2741. When were you old enough to strike ?—Boys when they go underground like to learn to strike just as soon as they go underground, if the ground is soft enough for them to do any good. When they go as tributers, fathers generally take their own sons with them, and they bring them on to do work as quickly as they can.

2742. Did you go with your father ?—No, my father did not work underground.

2743. With whom did you go ?—Thomas Pugano was the first man that I went with.

2744. Did he pay you wages ?—I learned with him three months for nothing, to teach me to work underground ; then I had 15*s.* a month ; after that I had no father or brother to take me underground ; and I was small, and I could not get much working at the floors.

2745. How many mines have you worked in ?—In a good many about here. I have worked at South Phœnix, and South Caradon, and West Caradon, and Wheal Marshall.

2746. Have you found some better ventilated than others ?—In old mines there is poor air in places ; it depends a good deal upon how far the men work from any thoroughfare or draft.

2747. Did you ever complain to the agent of not having air enough in a bad end ?—I do not know that I ever did ; I have not worked much in an end ; I have worked a good deal upon tribute.

2748. Have you ever known men complain of not having air enough ?—Yes.

2749. Have you known them complain of that to the agents ?—Yes.

2750. What has been the answer generally ?—Then they will make an allowance for that ; they will put machines to throw air to them.

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2751. Always ?—Almost always ; if the place is worth trying they will put some conveyance to throw air to them, and if not they will stop that place, and put the men in another place to work.

2752. What wages do you get, one month with another—3*l.* 10*s.* ?—Yes, I suppose so.

2753. (*Mr. St. Aubyn.*) Are you at tribute work now ?—No ; I am at tutwork sinking.

2754. You get the best wages that way ?—Yes.

The Commissioners then visited CRADDOCK MOOR *and* WEST CARADON MINES, *which they inspected ; after which they proceeded to St. Cleer, at which place they took the following evidence.*

A MINER (No. 1) examined.

A Miner (No. 1).

2755. (*Chairman.*) What mine do you work in?—West Caradon.

2756. How long have you been a miner ?—12 years.

2757. What do you work at principally ?—Tutwork.

2758. Do all the men work at tutwork in West Caradon ?—Yes.

2759. Are there any close ends there with the air not good ?—I cannot say.

2760. You have never worked in any ?—I have not been working in West Caradon more than about seven weeks.

2761. Where did you work before ?—At Crelake, which is at Tavistock.

2762. Did you ever work there when the air was poor ?—I did not work in any end, I worked in the stopes in Crelake, but there were some poor air ends there ; there was only one shaft in that mine.

2763. Are the men fined if they come up to grass before the time ?—Yes, if they make a practice of it, but once on a time I believe they forgive them.

2764. Have you worked in other mines in Cornwall ?—Yes.

2765. What other mines ?—In Fowey Consols and Par Consols.

2766. Is there a good changing house there ?—Yes.

2767. Do you know any men who have been affected from working in a bad end ?—Yes ; I have been affected in working at Par Consols myself.

2768. What was the effect of working there ?—It threw the rheumatism into my bones, and I was bad in the head.

2769. Did you get cold there ?—Yes.

2770. From what ?—From cold damp.

2771. What sort of thing is the cold damp ?—It makes the candle burn away up ; if a man is working hard and sweating, and stops a few minutes he gets chilled very quickly if it is in a cold place.

2772. The candle rises up, does it ?—Yes, the candle will run up terribly sometimes.

2773. (*Mr. Holland.*) Would your candle burn there ?—Yes.

2774. (*Chairman.*) Does that damp prevent the powder smoke getting away ? Were you blasting at that end ?—Yes.

2775. And did the powder smoke get away quickly ?—No.

2776. What did it do, did it hang ?—Yes, it hung about the place.

2777. How long ?—For a whole corps sometimes, I worked in one little mine, and there was plenty of circulation up in the level, but the smoke would come up six feet, and it was like a soller, it would rise no higher ; we were forced to give up working there, we could not work there at all.

2778. Did the men ever fall down before it ?—No.

2779. Were any means taken to remove it ?—No, the place was stopped working, they rose against it.

2780. The men would not work ?—No, we all of us gave up our place.

2781. How many were there of you ?—Six.

2782. Did any other men take to it afterwards ?—No.

2783. About how long ago is that ?—About three years.

2784. What was the effect upon you of working there ?—It affected me in my head.

2785. Did it produce giddiness ?—Giddiness and pain, and a beating in the head and heart, after six or seven fathoms I was forced to stop.

2786. How long did you continue to work in it ?—Four weeks.

2787. Were all the others equally affected with yourself ?—There was one not affected so much as the rest.

2788. (*Mr. Holland.*) Was your level in granite ?—No, in killas.

2789. (*Mr. Fulke Egerton.*) Did you ever feel much inconvenience from the dust ?—Yes, a great deal in the chest. I felt tied up in the chest and the breathing.

2790. (*Chairman.*) From what was the dust ?—From the hole in boring.

2791. Did you feel it in your mouth, or how did you know that it was from the dust ?—I spat it up, a great quantity of clots of nasty black stuff.

2792. Was not that powder smoke ?—No. I have been working in places where we have not shot at all, and have brought it away just the same.

2793. In what mine was the damp which you have described ?—We call the mine Scoble's, it is under the same company as Par Consols.

2794. Where was the dust which you spoke of?—We find it in every place where we work, not in one place only.

2795. (*Mr. Austin Bruce.*) Where are you working now ?—In West Caradon.

2796. Were you at Fowey before you came here ?—No, I was at Tavistock before I came here.

2797. How long were you at Fowey Consols ?—Six or seven years.

2798. Was it worse ventilated than other mines in which you have been ?—I think that the mine was ventilated pretty well, there are a great many shafts on, a new one was sinking for ventilation when I worked there last.

2799. Were the close ends well ventilated ?—Some were well ventilated, and some were driven a long way from any draught.

2800. Do you call a close end well ventilated in which you suffered in the manner which you have just described ?—No.

2801. Do you think that that could have been avoided ?—Yes, I think it could.

2802. Did you ask the agent to improve the air ?—We generally complain of having poor air when we have it, and try to have a machine to blow air to us ; sometimes we get it, and sometimes we cannot.

2803. What was the reason why you could not get it ?—I do not know, it might be done if they had a mind to put it for us.

2804. (*Chairman.*) Have you ever been refused ?—Yes.

2805. You have spoken to the agents, and they have refused to put it ?—Yes, they have refused to put it.

2806. (*Mr. Austin Bruce.*) How long is it since you worked in bad air ?—It is about three years ago since I worked in anything that was very bad.

2807. How have you managed to keep out of bad air during the last three years ?—I would not go in such a place.

2808. Were there people in the mines in which you have been working during the last three years, who were working in bad air ?—Yes.

2809. Did you know any of them ?—I cannot remember any by name now, I know that several worked in one mine. You cannot go in one mine

out of 20, or one out of 100 hardly, but there are some poor air places in it, hardly fit to work in.

2810. Are there any places in the mine in which you are now working, in which you think that it is dangerous to a man's health to work ?—I cannot say, I have not been over the other part of the mine.

2811. Have you for the last three years been working on tribute work ?—No, I have been working at tutwork two years, and about 12 months on tribute.

2812. Tutwork is generally more unwholesome than tribute work, is it not ?—Yes, a great deal more.

2813. Do you think that your health has suffered from the bad air in which you worked when a younger man ?—Yes, I am quite certain of it.

2814. How do you know it ?—When I worked in Par Consols the doctor told me that if I did not go away from where I was working, I should go into a consumption in less than six months.

2815. Did somebody take your place when you went away ?—Yes.

2816. You are a strong-made man ?—Yes.

2817. Was your health as good as that of most men ?—Yes, generally.

2818. Do you know what became of the men who followed you in that place ?—No.

2819. You do not know whether they had to give up too ?—No, I do not.

2820. How long have you been working ?—About 20 years.

2821. Should you say that during that time there had been an improvement in the mines ?—Yes, a great deal, a very great improvement.

2822. Do you think that the young men who begin to work now will have a better chance of keeping their health than those who began to work 20 years ago ?—Yes, a great deal better.

2823. For more reasons than one ?—There is a great deal more circulation now than there used to be when I went underground first.

2824. And is more care taken about drying the men's clothes ?—Yes, I seldom put up wet clothes myself.

2825. What is the deepest pit that you ever worked in ?—260 fathoms.

2826. How long did you take to mount that 260 fathoms ?—We used to ride in a man engine from the 240 fathoms.

2827. (*Chairman.*) Was that at Fowey Consols ?—Yes.

2828. (*Mr. Austin Bruce.*) You had only 20 fathoms to climb ?—Yes.

2829. What is the greatest height that you ever had to climb on the ladder ?—265 fathoms.

2830. Where was that ?—It was at Dolcoath, there was a man engine there, we used to ride from the 190 fathoms.

2831. When you had 260 fathoms to climb, how long did it take you ?—About an hour and a-half.

2832. Which was the hardest, that hour and a-half or an hour and a-half working ?—The hour and a-half climbing.

2833. Do you think that it took out of you as much as two hours of work ?—Yes, as much as all the four of working, I should think.

2834. Did you work fewer hours in consequence of the length that you had to climb ?—No.

2835. Your time was for eight hours all the time, was it ?—Yes, we were obliged to work eight hours to get a living for our families.

2836. Did that tell upon your health ?—No, I cannot say that it did.

2837. You were working in a healthy place then ?—Yes, we were working in better air there.

2838. If you had had that climbing over and above a bad close end, what would have been the consequence ?—I should not have been able to do it at all ; you feel it in your legs directly.

2839. Do you think that you could do the same day's work in eight hours when you had to climb 260 fathoms by a ladder ?—Yes, we always do the same work.

2840. (*Mr. Holland.*) In fact you were working 10 hours ?—Yes.

2841. (*Chairman.*) Do you think that you were as well able to do the work ?—No, I do not think that I was so well able to do it at all.

2842. (*Mr. Austin Bruce.*) After doing that day's work, and climbing 260 fathoms, were you ever so tired as not to be able to sleep or to be thrown off your feed ?—Yes, many a time ; I carried my parcel underground, and brought it home as I carried it, scores of times.

2843. And did you find others the same ?—Yes.

2844. You think that a man has a chance of a longer life who works in a pit where there is a man engine ?—Yes, if it be a deep one.

2845. What do you think is the amount of climbing which a man can do over and above his work without injury to his health ?—About 40 or 50 fathoms we do not take much account of, but if we be working in bad air we then feel it ; when we climb 10 fathoms we feel it in our legs directly.

2846. (*Chairman.*) But in good air, what depth could you climb without injury to your health ?—In good air we do not take any notice of it.

2847. Fifty fathoms ?—Fifty or 60 fathoms.

2848. Would climbing 200 fathoms be fatiguing, even if the air was good ; would you suffer from it ?—It would be a little fatiguing.

2849. (*Mr. Holland.*) What is a fair price per fathom for driving ?—It would depend upon the ground ; there are different sorts of ground, 10*l.*, 20*l.*, 30*l.*, and 45*l.*

2850. Supposing that you took some tutwork for driving, the price of which was, say, 5*l.* a fathom, how much more would you charge per fathom if you had to climb 260 fathoms to get from it ?—I do not know ; I do not see that it would make any difference in the price at all.

2851. You would prefer working in a mine where you had not to climb, to working in a mine where you had to climb ?—Yes.

2852. Would you not have more wages for climbing the extra distance ?—We ought to have more, but we are not allowed a halfpenny more wages.

2853. (*Mr. Austin Bruce,*) Do not the men go more readily to pits where there is not much climbing than to pits where there is much climbing ?—Yes, every man, where there is a little shallow level to drive, or a rise or a winze to sink would jump at it directly if he could get into a shallow place rather than a deep one.

2854. (*Chairman.*) Is there any difference in what is paid for driving in a shallow or in a deep mine ?—No difference at all.

2855. It is only according to the hardness of the ground ?—Yes.

2856. (*Mr. Austin Bruce.*) In the course of your life have you been attended by a doctor occasionally ?—Yes.

2857. Were you always attended whenever you were ill ?—Yes.

2858. Without paying ?—Yes ; we pay our money at the mine ; so much is kept out every month for the doctor.

2859. And the doctor attended you when you were ill, or when you had been hurt by an accident ?—Yes.

2860. When you were off your work, did you receive anything from the club ?—No, I never received anything from the club in my life.

2861. They do at some pits, do they not ?—Not for sick pay, unless it is at St. Blazey, under Squire Trefry, we have sick pay there ; but in other mines I never heard of sick pay except for accident.

2862. You had your medicines ?—Yes.

2863. But nothing else ?—Nothing else.

2864. How long have you ever been ill at a time ?—Four months.

2865. What was that owing to ?—Typhus fever

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and inflammation in my stomach and pipe. I was then working at West Caradon, about seven years ago.

2866. (*Mr. Holland.*) How much did you pay to the club?—Ninepence a month.

2867. (*Chairman.*) Supposing you were working in an end with poor air, and you were sick from that, would you get the club money?—No.

2868. Only for accident?—Only for accident.

2869. Some of the miners did not like giving evidence before us; what do you suppose this arose from?—A great many of them say that they are afraid that they will get turned away from the levels, that it would be known if they had said anything against the mines, and that they would be turned away.

2870. If they were turned away, would they get employment elsewhere?—I should think so, if there was any employment to be had.

2871. Would other agents take them if they were turned away?—I cannot say about that.

2872. (*Mr. A. Bruce.*) Do you think that there is any danger of a man being turned away in consequence of his giving evidence if he gives it fairly?—I do not know, in fact I do not care, because if I have not work at one place I must have it at another.

2873. Have you ever known men turned away for similar things?—I never knew a case of this sort before.

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The witness withdrew.

A MINER (No. 2) examined.

A Miner (No. 2).

2874. (*Chairman.*) What mine do you work in?—West Caradon now.

2875. What mine did you work in before?—South Caradon.

2876. For some time?—Yes; I worked at South Caradon for about six years this last time. I have worked there two spurs, and I have been at West Caradon a little more than two months since I have left South Caradon.

2877. Is West Caradon as well ventilated as South Caradon?—I do not think there is much difference.

2878. Have you ever worked in a bad end?—No; I worked on tribute generally, I have worked upon tutwork for a few months, but not very much; but I have been acquainted with the proceedings of persons who have worked in ends.

2879. In your own experience you have not worked on tutwork in ends with poor air?—No, I have not myself.

2880. Why do you prefer tribute work?—Because sometimes there is a greater chance of getting more money upon tribute than there is upon tutwork.

2881. But sometimes you are a long time without any?—Yes.

2882. There you are allowed sist money?—Not unless we get it. I have worked as much as two years, and have not received from the mine more than about 40*s.* per month right on.

2883. Then another year you have done better?—Yes; perhaps, upon the average, you do as well or better than they do upon tutwork. Then again on tribute we generally work by day.

2884. (*Mr. Austin Bruce.*) Have you ever suffered in health?—No, not very much; I do not know that I have.

2885. (*Chairman.*) Do you know of miners who have suffered in health?—Yes, I believe that I have known several who have shortened their days by working in close places. We calculate so. My father was a miner, and he died at the age of 55; he considered that he died by what we call the miner's complaint, by working in close places.

2886. (*Mr. Austin Bruce.*) Had he been suffering long before he died?—Yes, he was obliged to stay home from labour, I think, 16 or 17 months. There are several in the village now who are suffering from some complaint, and it is calculated that it is on account of working in poor air, and so on, in powder smoke, and so on.

2887. (*Chairman.*) Could we see those who are now suffering?—I cannot tell that. I cannot say that I know any person who is laid up at present.

2888. (*Mr. Austin Bruce.*) Had your father often to give over work before he died in consequence of his illness?—No, not more than just perhaps a day or so in and out, his breath being bad, and so on. The least little cold would affect the breath so that he was obliged to stay at home.

2889. Have you ever been working at all in a bad close end yourself?—I have not worked in an end, but I have worked in close places, that is, in a rise in the back; the place that I am now working in, is rather a closeish place.

2890. Have you complained of the want of sufficient ventilation?—No, we have not complained; I do not know that it is of much service to complain. I do not see how they can ventilate it.

2891. Why not?—One reason is, that it would not pay. I am working now in a pitch, and the captains give us two-thirds of the pound, and it will hardly pay. 13*s.* 4*d.* out of a pound is as much as they can give, as they are allowed to give by the mining gentlemen.

2892. (*Chairman.*) Do they give that because the air is not good there?—No, it is not on that account.

2893. (*Mr. Austin Bruce.*) Are you working now at that rate?—Yes.

2894. Have you been long working at that rate?—The last two or three months; it is going on for three months.

2895. How has it answered?—Not at a very great rate; perhaps we may have got 4*l.* a month. Generally speaking, when we are working in a close place, that is to say, where the air may be tolerably good but yet close, there being no thoroughfare, the agents, I consider, do not make allowance enough (and it is so considered by the men generally) in a close place; the smoke remains a long while in those places. Sufficient difference is not made between the price given for a place where there is a thoroughfare and for a place where there is none; and for the price which the agents give, we are obliged, if we have a mind to get any money to bring home to our families, to rush into the work again almost as soon as we shoot.

2896. (*Chairman.*) So that in consequence of the smoke not getting away you are obliged to go in too soon?—Yes; and powder smoke is a thing, I fancy, which chokes up the pipes as much as poor air when we are obliged to rush into it.

2897. (*Mr. Austin Bruce.*) You say that men are unwilling to work in small close places?—Yes; they are unwilling to do it, bnt they are obliged to do so if they are minded to get a livelihood.

2898. Why are they obliged?—Because they must have that or stay unemployed, perhaps, a month or so.

2899. But there are fewer men who will go there than into better ventilated places?—Yes; none would go there if they could help it.

2900. Does not that lead to the master paying a higher rate to the men who go into ill-ventilated places than to those who go into better ventilated places?—No; they do not calculate upon getting anything more.

2901. (*Chairman.*) The agents can always get men to go into those places?—Yes, and oftentimes men are glad to go there rather than stay out of employment; but they are not remunerated better, and they can hardly get so much money there because they have not the chance; they cannot work so much, because the agents do not give a better price for a place which is not very well ventilated than they do for a place

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which is properly ventilated. They can always get men in our neighbourhood now. There are always men at hand willing to go anywhere and work.

2902. (*Mr. Austin Bruce.*) What is the deepest shaft in which you have ever worked without a man engine ?—I have never worked more than these two mines ; about 140 fathoms is the deepest that I ever worked in.

2903. How long did it take you to climb up the 140 fathoms ?—We calculate about half an hour ; we can do it quicker than that, but in walking through the levels, and having, perhaps, a minute or two to fetch our breath, it will take half an hour and upwards. A person taking it pretty steadily will take nearly three-quarters of an hour to climb up 140 fathoms, to take it moderately.

2904. Did you find it very exhausting ?—Yes, very.

2905. Do you think that it took much out of you ?—Yes.

2906. As much as a quarter of a day's work ?—Yes, I should think so. It would do more injury than a quarter of a day's work ; and in these mines here if a person is working at 140 or 150 fathoms, and is working very hard ground, generally speaking, we have to carry all our tools, and sometimes we have a very heavy sling, perhaps 40 or 50 lbs. weight, upon our shoulders, to carry that distance.

2907. (*Chairman.*) I suppose that if means were provided for ascending you would be very glad to adopt them ?—Yes, quite so.

2908. You would not prefer the ladders ?—I never saw any man-engine, but I have heard individuals speak of it who have been accustomed to ride up and down, and they say that it is a very great benefit in deep mines.

2909. (*Mr. A. Bruce.*) I suppose that wherever you have worked you have always had a good drying place to change your clothes in ?—No, I do not see that I can boast of that. At South Caradon now it is pretty fair ; but I have been at West Caradon, and I do not consider that it is very much there.

2910. Have you ever worked in a mine where there was no warm place to dry your wet clothes, and in which you could change your clothes ?—Yes.

2911. What was the effect of working in such a place ?—I often caught cold, and so on. At South Caradon, about some ten years ago there was no dry at all. It is true that when we came up with our clothes wet, we were allowed to carry them down to the blacksmith's shop, and hang them over the forge which had been working during the day, and it was naturally warm ; and if our clothes were dry, well and good, but, if not, we must put them up as they were.

2912. That very much increased the risk of ill-health ?—Quite so.

2913. (*Chairman.*) Do you think that the miners are quite independent of the agents ?—No, I do not think they are at all.

2914. They are afraid of offending the agents ?—Yes, where men are so plentiful as they are in our neighbourhood, and I suppose, through the county at large, there are a good many individuals who hardly know what to do to get a job of work.

2915. With respect to your pay, it is always one month behind, is it not ?—Yes ; upon tutwork it is one month behind, but upon tribute it is as they can sell the ore. At West Caradon we must work six months before we can have pay-day upon the ore that we put in ; however, if the agents think that we have got money coming they allow us some subsist, but upon tutwork they always keep one month in hand.

2916. Is that general in this neighbourhood ?—Yes, it is general through the county, I suppose.

2917. So that a man who has been out of work gets nothing for two months ?—No, unless the agent will allow him 20*s.* to mocksist or subsist. "Sist" is what we term the general thing, and "mock" means lent.

The witness withdrew.

A MINER (No. 3) examined.

A Miner (No. 3).

2918. (*Chairman.*) What mine are you working in ?—Caradon Consols.

2919. At tribute or at tutwork ?—Tutwork.

2920. How long have you been there ?—Two years nearly.

2921. How long have you been a miner altogether ?—About 15 years.

2922. What other mines did you work in before ?—I worked in Polgooth before I came up to this part of the country, that is down at St. Austell.

2923. Is Polgooth the deepest mine that you ever worked in ?—Yes.

2924. What is the depth of Caradon Consols ?—70 fathoms now.

2925. Is that a young mine ?—No, it has been working a good many years.

2926. Are there any close ends with poor air there ?—No, not now ; there have been in the summer time too many close ends.

2927. Have you ever felt any ill effects from close air ?—I do not know that I have much.

2928. What is the difference as regards the air between summer and winter ?—The air is a great deal closer in the summer time.

2929. In blasting does the smoke get away quickly at the ends ?—No, not now, it will lie there now.

2930. Is there any damp ?—No, not now, at this time of the year, not in the winter part of the year.

2931. But in summer is there any ?—I think there is a little in the summer time.

2932. Have you never suffered in your health ?—No, I have been in the shaft over there these last 12 months ; and if there is any air at all in the mine it is in the shaft generally.

2933. Have you been working in the last 12 months at any end ?—I am now in an end ; our shaft is down now, and we are driving.

2934. Do you know any miners who have suffered from working in poor air ?—I do not know that I do about here now ; there are several miners here who are bad, but whether it is owing to the poor air or not, I do not know.

2935. What is the matter with them ?—I am sure I do not know ; it is what they call about here, the miner's complaint, I believe, that is to say, in the lungs and the liver, and one thing and another. I do not know exactly what it is.

2936. Are you a single man ?—No.

2937. Do you live here ?—Yes.

2938. (*Mr. A. Bruce.*) You have never been ill yourself ?—No.

2939. (*Chairman.*) Have you ever climbed any great depth of ladders ?—No, not lately ; not the last ten or dozen years.

2940. (*Mr. A. Bruce.*) What was the greatest height which you had to climb ?—230 fathoms.

2941. By a ladder ?—Yes.

2942. How long did that take you ?—I am sure I do not know, it would take an hour or an hour and a half, I suppose, if you went along smart.

2943. An hour and a half coming up ?—Yes, I suppose so.

2944. And how much going down ?—Three-quarters of an hour, perhaps, or just like that ; I cannot tell exactly to a quarter of an hour.

2945. Is an hour of climbing as bad as two hours of work ?—Yes, worse I think, that is in an upright shaft ; a great many shafts in this country are underlay, and that is not such hard work as when it is upright.

2946. Were you ever so tired as not to be able to sleep at night ?—I have been.

2947. After what sort of work ?—When the air has been close and you feel your legs aching.

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2948. Where was that?—Over at Caradon Consols the last summer.

2949. What sort of a place were you working in?—In the shaft then.

2950. Sinking the shaft?—Sinking the shaft.

2951. Was there a want of sufficient air?—Not there, not last summer.

2952. What was the cause of your suffering?—The poor air; I felt weakness in the legs; I do not know that I felt bad.

2953. Why was there poor air?—Because there was no circulation.

2954. Why was there no circulation?—Because we had only one shaft.

2955. Was nothing done to convey circulation?—Yes; we had a machine there.

2956. At work?—Yes.

2957. That was not enough?—No; it was not at the time.

2958. Do you know any reason why every shaft might not be sufficiently ventilated, if proper care was taken?—I do not know; I do not think that one shaft is enough in a mine, there ought to be two.

2959. I thought you said that you were working in a shaft last summer?—Yes.

2960. You were sinking a shaft?—Yes; we were then.

2961. Is there any reason why men sinking a shaft should not always be supplied with sufficient air?—There is a reason that it might be better.

2962. (*Chairman*). Where was the machine fixed?—About eight fathoms down from the surface.

2963. Was the shaft divided?—Yes.

2964. (*Mr. Holland.*) Did that division go to the bottom?—Yes.

2965. Then why was not there good air at the bottom?—Because there was no circulation anywhere in the shaft, and anywhere in the mine.

2966. (*Chairman.*) How was that machine worked?—With an engine.

2967. How soon was that put on after complaints were made about the poor air?—I do not know.

2968. Was it put on in consequence of complaints about the poor air?—Yes.

2969. And did that have the effect?—That would give some air; it made it a little better.

2970. Has the mine only one shaft now?—It has only one shaft now where we are working to.

2971. (*Mr. Holland.*) Is there no adit?—No, our shaft is divided from grass all the way down to where we are working now.

2972. (*Mr. Austin Bruce.*) How many men are working in that shaft?—Six men, there have been nine.

2973. How many were there at a time in the shaft?—Three.

2974. Did all three suffer as you did?—Yes.

2975. Did you make any complaint to the agent?—Yes, we told him that it was very poor air, and that we could not work there.

2976. What did he do?—He then had this machine.

2977. Were you then able to work better?—A little after that.

2978. It was not good enough?—No.

2979. Did you then complain again?—Yes. He cased the shaft close and made it air-tight; he thought that it would throw air better by being air-tight, so that the air should play through any place; it was like two shafts.

2980. Did that improve the air?—When he had done a little the winter came in, and we had then better air, so that we have had no trial of it yet; this summer will be a trial for it, I suppose.

2981. Are you still sinking there?—No, we have stopped sinking now, but we are driving.

2982. You are driving an end, I suppose?—Yes.

2983. But the ventilation is good, is it?—Yes, it is very good air now.

2984. (*Chairman.*) The candle burns well?—Yes, now.

2985. (*Mr. Austin Bruce.*) Where you are you have a good house to change your clothes and get them dry, have you not?—Tolerably well now.

2986. Have you ever been in a place where there was none?—Yes.

2987. Where?—Over at South Caradon; that is years ago; they have now better convenience there than they had then.

2988. Did you change your clothes when you came out?—Yes. When I have gone to mine I have gone over there in the afternoon in cold weather when there has been a little rain, and I have come up and put on my clothes when they have been frozen, at 10 o'clock, and my trowsers would stand up as stiff as a stick.

2989. That is to say, they were wet and were not dried, and they froze?—Yes; that is years back.

2990. Do you think that a man would do that often without some bad consequences?—No; I feel the pains of it to this day.

2991. There is not much of that now, is there?—No, I believe not. I do not work there now.

2992. But anywhere?—Not that I know of.

2993. You know, I suppose, what is going on at a good many of the mines about here?—We call round sometimes. We change in the boiler-house now at our mine.

2994. You know most of the mines about here?—Yes.

2995. Are there dries at all of them?—Yes, chiefly now, I believe.

2996. That was not the case when you were a boy, when you began working, say 20 years back?—No.

2997. (*Mr. Holland.*) Are there not a great many mines without dries now?—There are dries among these mines now.

2998. Not at all mines?—No, not at the whole of them. There is no dry at our mine at Caradon Consols; we change upon the boiler there; it is warm.

2999. There are a great many young mines which go on for several years before they get any place to dry?—Yes, a number of years.

3000. (*Mr. Austin Bruce.*) That cannot go on without injuring the health of the men?—No, I should not think it could.

3001. (*Mr. Holland.*) Are a great many miners rheumatic?—I am myself.

3002. You know a great many who are rheumatic, do you not?—A good many, I believe, have the rheumatics.

3003. Is it not a very common thing?—Yes, I believe it is.

3004. Is it not, to a great extent, owing to putting on damp clothes?—Yes, I believe so. I believe that that is one cause. I first got it with cold, and damp clothes put on.

3005. Do you often catch cold?—Yes.

3006. Does it affect your chest?—Yes.

3007. Have you any cough now?—No, not now.

3008. You have not a permanent cough?—No.

3009. Is your stomach is good order? have you a good digestion?—Yes, I believe that now I have.

3010. Do you not know many miners with a very bad digestion?—No, I do not now.

3011. (*Mr. A. Bruce.*) Can you, as a working miner, see anything which can be done in these mines to improve the health of those who work in them?—Yes, improvement can be made.

3012. What improvement would you suggest?—The improvement is, that in these mines where there is only one shaft there ought to be another; there ought to be two shafts, and then a hole from shaft to shaft to go down, and then there would be better air.

3013. Anything else besides better air?—I do not know. If a man has good air and a good price he would get better wages.

3014. (*Chairman.*) Do you know what distance there ought to be between one shaft and the other?—I do not know; I do not believe that there is much nicety in that for a few fathoms.

3015. If the men come to the surface before the time is up are they fined?—They are sometimes, if

they make a practice of it, I believe, that is to say, coming up night after night, or day after day, before the time; perhaps the first time they get a scolding, and then the next time they will perhaps be spaled

3016. Are you bound to stay down till the next corps come down to relieve you?—We come away, I believe, chiefly before the time; we meet them somewhere, perhaps, on the road in the shaft, somewhere going up and down the ladders.

3017. If you meet them in the ladders do you get on to one of the levels, or how do you manage?—There are places in going down to stop, and you stop there if you meet. Sometimes we meet them up at grass.

3018. Do the men ever stand on the ladders waiting if it is before the bell rings?—Yes, they lie about rather than go in to get fined; they would rather lie about anywhere.

3019. So that they stand on the ladders?—They stand or lie about on the levels or anywhere, shivering with the cold sometimes.

3020. That, I suppose, is if they have blasted?—Yes; if they have shot they come away up when they have done their corps.

3021. And they must not come to grass before the bell rings?—They must not.

3022. Therefore they wait on the ladders and about the ends?—Yes, anywhere. If it is dark they will come up and lie about anywhere rather than be spaled, as we call it.

The witness withdrew.

A MINER (No. 4) examined.

3023. (*Chairman.*) How old are you?—I am in my fiftieth year.

3024. How long have you been working in a mine?—About 16 years now.

3025. Have you ever suffered from it?—I never felt very much from it as yet.

3026. Are you working now in a mine?—Yes.

3027. Which mine?—Craddock Moor.

3028. Have you ever worked in an end with bad air?—No; I never worked in an end in my life.

3029. Have you been always working at tribute?—No; my work is filling the kibbles or the skips.

3030. (*Mr. Austin Bruce.*) Are you working now?—I have been at work to-day.

3031. Eight hours?—Yes.

3032. Can you do your work heartily?—Not so heartily as I used to do; I find that my age is different; I have caught a cold in rather a damp place, and have felt cold rather.

3033. Have you any cough?—Yes; a little, not much.

3034. (*Mr. Holland.*) Have you a good deal of phlegm?—No, not much.

3035. Does your heart beat much?—Sometimes it beats pretty much; it is beating now rather.

3036. (*Chairman.*) How many fathoms have you to climb?—All sorts; I go from the 96 fathoms, that is the bottom of our mine, and then I take it all through from the bottom to the top; sometimes to the 40th fathom, is the shallowest that I work, from the 40 fathoms to the 96 fathoms.

3037. (*Mr. Austin Bruce.*) How do you find yourself after climbing 96 fathoms?—I find myself weary then after working eight hours.

3038. Do you ever find that it prevents you from sleeping or enjoying your dinner?—No, it does not prevent me from sleeping at all; I sleep rather too sound, if there is any difference.

3039. Does it ever prevent you from enjoying your food?—Yes, sometimes, it is with the climbing; we have very hard work.

3040. Have you a good place to change your clothes?—Yes, very good.

3041. Have you ever worked in a mine where you had not a place to change your clothes in?—No, I never did that.

3042. You began late in life to work?—Yes; that sort of work.

3043. (*Chairman.*) What did you work at before?—In the woods and plantations, that was my rearing up, I had 21 years at it, and I should not care if I had another good situation now.

3044. (*Mr. Austin Bruce.*) You would rather be above ground than under ground?—Yes, at my own calling, that was my calling.

The witness withdrew.

A MINER (No. 5.) examined.

3045. (*Chairman.*) What mine are you working in?—West Caradon mine at present, the last five months, that is all.

3046. Where did you work before?—In the Phœnix mine for three or four months.

3047. What work did you work at, tutwork or tribute?—Tribute at present, but at the Phœnix I was on tutwork end.

3048. Did you ever work in poor air?—Yes, a little, not much.

3049. You say not much, did you give it up?—Stoping was the chief work that I worked at there; we stoped the ground, and it gave better ventilation for the air. On account of the obstruction being in the middle, the air passed up and down through the place; it is not like driving a tutwork end, for I have worked in a tutwork end.

3050. It improved it?—Yes. There was a level driven over and under, so that we put a hole right through, so that in going up it caused a ventilation when we got through. The ground being fair it did not take so long to get all through as if the ground had been hard.

3051. How long were you working while the air was poor?—About four or five months.

3052. During that time did you suffer from it at all?—Yes.

3053. In what way?—In my stomach, and when I climbed the ladders I felt my legs trembling, just like palpitation.

3054. What depth had you to climb in the Phœnix mine?—150 fathoms then.

3055. How long did it take you to go up?—We generally calculate about half an hour, allowing for time to draw breath and just to refresh ourselves a little.

3056. You never suffered in health from working?—No, for no great length of time.

3057. (*Mr. Austin Bruce.*) How old were you at that time?—About 24.

3058. I suppose that a man at 24 suffers less from bad air than a man at 34?—Yes.

3059. Is it good air where you are working now?—Yes, very good indeed.

3060. (*Chairman.*) You come up whenever you like, do you not?—We are not allowed to be up before two o'clock, that is as a custom, if we do we get fined.

3061. Are you fined even for tribute work?—There is not much said perhaps for a time or two, but the captain is generally on the look-out.

3062. (*Mr. Austin Bruce.*) Do you think that the life of a miner is a healthy life?—Not in the least.

3063. What would you do to make it healthier?—I believe that there are a good many ways to make it healthier at times. Some places, I believe, cannot be made better while they are in operation; but in some places a level is driven a long way, and then there is no communication from the level above, which is driving over it; perhaps the ground is poor, and the

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agents do not think, I suppose, that there is a need of putting a winze through; but they may happen to meet with a bed of ore, and then they put a winze through, and then it makes the ventilation good again.

3064. (*Chairman.*) Have you ever seen any artificial means of ventilation?—Yes, what they call air fan machines.

3065. How are they worked?—They are turned with a hook handle.

3066. By a boy?—Yes.

3067. (*Mr. Austin Bruce.*) Then you think that with a little more attention to ventilation the miner's life might be lengthened?—Yes.

3068. Does anything else occur to you?—I believe that the greatest failure is, that the wages are not enough; a man is not allowed enough according to the place in which he works, in my opinion. When a man is working in a poor air place, he is not allowed so much in accordance with what he ought to do.

3069. Would higher wages give him better health?—With higher wages he would not want to rush so quickly into the smoke; when a man has a slight price, he is obliged to rush in quicker than he would if he had more wages.

3070. If there was a good current of air the smoke would be carried away quickly?—Yes.

3071. (*Mr. Holland.*) Would not that be the same thing as raising his wages?—Yes.

3072. With less loss of time he would earn more?—Yes.

3073. I think you said that your stomach had been put out of order by bad air at one time?—Yes.

3074. How long did that illness last you?—Not particularly long; just a week or two. I felt uncomfortable in working; I could not work as well as if I had been working in good air.

3075. How long were you working in poor air before you felt it make you poorly?—About three or four months.

3076. Did your appetite fall off?—Yes.

3077. Had you head-ache?—Yes.

3078. (*Chairman.*) How did you know that it was poor air?—Because when I went to sit down for my comrade to work I got sleepy; that is one reason.

3079. (*Mr. Holland.*) You got sleepy in the mine?—Yes.

3080. You had a difficulty in keeping yourself at your work?—Yes.

3081. Did your legs tremble under you?—In climbing the ladders.

3082. Had you a throbbing of the head?—Yes, heart-beating.

3083. More than in good air?—Yes.

3084. Much more?—Yes.

3085. Did the candles burn dim?—Yes.

3086. Cannot you perceive the air to be bad when it is not enough to make the candle burn dim?—Yes.

3087. You still feel it?—Yes, what they call the cold damp.

3088. That does not affect the candle much?—No, it makes it burn very bright indeed.

3089. You mean that it increases the size of the flame, but it does not increase its brightness, does it; it makes the flame larger?—Yes.

3090. But not brighter, does it?—Not very, it makes more difference in the size of the flame.

3091. (*Mr. Austin Bruce.*) You want more air and, higher wages, and what else to make you perfectly healthy?—I do not see that much more can be done beneath the surface than that, that is the greatest thing that miners require, I believe.

3092. (*Mr. Holland.*) Would you like some mode of getting up from the mine instead of climbing?—Yes, that is one thing; I did not think of it at the moment.

3093. (*Mr. Austin Bruce.*) And you would like a good place in which to dry your clothes, I suppose?—Yes.

3094. (*Chairman.*) The men only work eight hours, do they?—Eight hours.

3095. Are you married?—Yes.

3096. What family have you?—One child.

3097. What amount of butcher's meat are you able to purchase in a week?—At the gettings which we are allowed, we cannot afford more than about 3 lbs. or 3½ lbs.

3098. Is that meat made up into a pasty, or is it taken separately?—It is done all sorts of ways.

3099. (*Mr. A. Bruce.*) Do the young women learn cooking?—Yes, some of them.

3100. (*Mr. Holland.*) Are they pretty good cooks?—Yes; middling, I believe. I have heard that the Cornish cooks excel the most in England for putting a little joint the furthest, as we call it. I would say that I worked at the Phœnix mines, and we had to climb 200 fathoms below the adit; that is 14 fathoms more. Sometimes a man will come away, perhaps, a little sooner by that means, because he had to climb all the way, and it would take him longer to go up, and sometimes we have been very wet. When we got to the surface it would not be time for us to go in to our dry to change, and we were obliged to stop out, and caught colds; and I believe that very often it brings on diseases.

3101. (*Chairman.*) Standing on the ladders?—Yes, and hiding in holes out of the agent's sight; and it is very cold and draughty in some places.

3102. (*Mr. A. Bruce.*) Why did you leave your work before the proper time?—Because we have no guide to go by as to the time more than our candles.

3103. Is not that enough when you get some experience?—Sometimes the candles are not so good as at other times.

3104. How did you know that you were not in proper time when you got to the top? Had not you the same means of knowing at the bottom as you had at the top, whether your time was up or not?—We saw the men who were engaged in landing the stuff, and inquired; that is the information which we get chiefly.

3105. What remedy would you suggest for that?—I am sure I cannot tell much about the time, but with regard to helping men climb up, I think that the man engine is the best remedy that I know of at all.

3106. Should a man-engine be put in every shaft?—No.

3107. Only in the deep ones?—Only in the deep ones, and in some a good deal of trouble would be required to put a man-engine. In the Phœnix mine, for instance, it might be a good deal of trouble, because in one shaft it is downright and on the lay, and in the other it is downright. In some mines again the footways are put in the same shaft where they wem all the stuff, making it very dangerous for a man to pass up and down.

3108. Did you ever know of any accident?—Yes.

3109. Of what sort?—I do not know that I have heard of a man being killed, but some have been injured by the chain breaking when men were going up; some were rather careless, and being rather behind time they wanted to make haste, and thought that they might just slip up in a certain place, and the chain has broken, and the stones have come down out of the full waggon as it was passing down, and have struck them, but not seriously. But it might be better if the footways were in a separate place without any communication with the wem. The kibble is very heavy with the waggon; it goes from side to side, and would smash everything it came in contact with. The mine in which I work now, I believe, is very good for that; there are so many communications, exceptional shafts.

The witness withdrew.

Adjourned to Saturday next at half-past 10 o'clock, at Liskeard.

Saturday, 19th April 1862.

PRESENT :

The Right Hon. Lord KINNAIRD, K.T.	H. AUSTIN BRUCE, Esq., M.P.
The Hon. A. FULKE EGERTON, M.P.	JOHN ST. AUBYN, Esq., M.P.
NICHOLAS KENDALL, Esq., M.P.	P. H. HOLLAND, Esq.

THE RIGHT HON. LORD KINNAIRD, K.T., IN THE CHAIR.

Mr. CHRISTOPHER CHILDS examined.

3110. (*Chairman.*) I believe that you are a solicitor ?—I am.

3111. And you have the management of some properties ?—I have.

3112. The Commissioners wish to know whether a proprietor in granting his sets of ground for a mine could make any provisions with the lessees that they should provide proper accommodation for the men in the way of changing houses above ground ?—Decidedly so.

3113. Do you think that it would be the interest of the proprietor to do so ?—I should hardly, perhaps, use that expression ; I think that it would be the interest of the adventurers themselves to provide proper accommodation.

3114. Would it not be to the advantage of a lord to make some provision by which the health of the miners would be attended to, in order that the expense of poor rates, which would fall upon him should not be increased ?—If you put it in a pecuniary point of view, I should say that it is not of any consequence to him.

3115. You do not think that in consequence of the miners being disabled, either by accident or by bad health, a greater number are put upon the parish, and thereby the poor rates are increased ?—The poor rates of that particular parish may be increased ; but perhaps your lordship is aware that the owner of the soil, as lord, is not liable to be assessed for the relief of the poor, because there is a sort of duplex reservation in the sets which enables him at any time to require rates to be paid by the adventurers themselves, or to relieve them from it as he thinks proper. A relative and friend of mine has required me in the granting of sets to reserve, in the first instance, a portion of the memorial, which is called a dish or dole, with an alternative clause, which he, by notice, can bring into operation, determining the reservation in kind, and providing for a monied payment instead. The reservation in kind is liable to be assessed to the relief of the poor, the reservation in money is not; his object being to compel the adventurers to pay something at least in aid of the rates of the parish.

3116. Supposing that a mine is abandoned, and the company carrying it on is wound up, on whom then falls the burthen of supporting miners, whose health may have suffered in that way ?—That is a question which bears on the poor laws generally I take it. For upwards of twenty years I have practised as an advocate at our quarter sessions, and as such advocate I have been frequently engaged in appeals, and have become well acquainted with the whole question of assessment in this county. The burthen of the maintenance of the poor must, in the first place of course, fall on the parish where the pauper happens to be; if he has resided there, under the first Act, for five years, but now reduced to three, the relief is charged to what is called the common fund, or the pauper has to be removed to his last place of legal settlement. It is much the same with regard to mining property as it is with regard to any other property.

3117. Although the lord would not derive any great advantage from such a provision as I have mentioned, you still think that he has the power to make it ?—Yes ; he has the power of making any conditions he pleases when he grants his set.

3118. And you think it desirable, for the sake of the miners, to make some provision of that sort ?—I say that it is a responsibility of the direct employer, who is the adventurer or shareholder, and I would put it in a familiar way. If you had a valuable horse and got a good day's work from him, either as a hunter or a draught horse, I think you would take care to put that horse in a good stable, and see that horse well groomed. For the working miner, after a hard day's work, when he comes to the surface, no provision of that kind is made, with rare exceptions. I admit that in some parts of the county there are exceptions.

3119. Are good changing-houses the exception ?—Changing-houses are the exception ; there are some "dries," as they are called, which have been very recently put up in this neighbourhood ; they are now being lengthened, and I hope that they will also be further improved. The dry itself does not, I should say, afford a man a decent place for the change of his clothes.

3120. Have any changes houses been put up on the representation of Lords ?—I have known where an improvement has taken place ; but still it is an imperfect one. The dry is there, and the miner may change in the dry or go to his barracks.

3121. A miner who changes in the dry suffers considerably from the dust, does he not ?—I do not say that he suffers ; but it is not a pleasant place to change in ; nor is it decent that men should be stripping naked one before the other.

3122. Is this dry sometimes in the boiler house ?—They are allowed to use the boiler house, as a dry, at times, where they have no dry put up. In some mines they have a dry, as it is called, which is a fireplace with a continuous flue, put up for the avowed purpose of drying the men's clothes.

3123. What do you think that such a building ought to be ?—I rather think that I have already put the public in possession of my views upon that point. I shall be happy to repeat them if it is desired. Perhaps it is right to explain myself. I will commence by tracing the condition of the miner when coming to grass. I find, that among tut-work, men who have done their work below, they are prohibited from coming to grass until the bell has been rung, which would summon them up ; that if a man should come to grass before the bell is rung he would be spaled the sum which the agent inflicts as a fine, and, as I am informed, that is usually 2*s.* 6*d.* I think that it would be far better for the miner, and more conducive to his health, if he were allowed to come direct from his work to grass without loitering either in the levels or in the ladder-ways, and to go to the dry, obtain his clothes, be required to dust them and beat them against the wall outside, and go to his changing house, where he might easily be provided with a tub of water or a bath, if the means of the adventurers would admit of it, which water might be heated by a boiler in connection with the dry, or a pipe from the waste water of the engine-house, put on his dry clothes, and go to a sitting room, and there wait to answer his name when required to do so by the agent.

3124. The men do stand on the ladder-way ?—Yes.

3125. Do they get cold in consequence ?—When I have inquired of the working miners themselves, as tut-work men, I have almost invariably found that their desire to get to grass before the relieving corps comes down, and has command of the ways, is in order that they may take their time in passing through the levels and up the winzes, or whatever they call the footways in the mine, and they remain in the

ladder-ways near the surface waiting for the bell to ring. Above the adit level there is a continuous current of air, and the fact of a man, heated with the exercise of climbing and travelling in the ladder-ways, then sitting there to rest, must of course, be injurious to his health.

3126. Are any means taken to give notice to the men below when the time is up ?—No.

3127. Then they judge only by their candles, I suppose ?—I do not know whether they judge pretty nearly from their candles or from other means which they have of knowing ; but they are not particular about that. If a man has driven his stent he wants to get to grass as soon as he can. The word "stent" meaning the extent of ground which happens to be set to him. I should wish to express my very strong opinion as to ladder climbing. I do not believe ladder climbing, in itself, to be productive of disease. I think that, to a diseased man who is put to climb a ladder, it must, of course, be most injurious ; but I think that it is not in itself productive of disease. The effect of ladder climbing, in the case of healthy men, is merely to produce muscular pain and fatigue. I will endeavour to illustrate that by the circumstance of sailors climbing the mast-head. If you put a man who is fatigued on coming on board, or who happens to be tipsy or ill, to the mast-head, it will be a very severe punishment; but it is no punishment to them—a healthy sailor, in an ordinary state. In mines, I think, I am right in saying that agents have frequently to travel and climb a larger number of ladders than the working miner himself. I hear of no disease among the agents incident to that ladder climbing, and I think that, as a whole, if there has not been disease before they have become agents by working in foul air as miners, a more healthy body of men you cannot find anywhere than they are. I arrive at the conclusion from that fact, that ladder climbing is not productive of disease. I admit that it aggravates disease very seriously in a diseased man.

3128. Ladder climbing not being, in your opinion, injurious in itself, if a man had been working in bad air, and then had to climb, would it not be injurious ?—I believe that it would be most injurious.

3129. Whether he was diseased or not ?—I say that a man directly he inhales bad air is diseased. Of course, I speak with great deference to a medical man, but the object and functions of the lungs are well understood, and the sensations which a miner describes to me, I believe, from professionally having read medical jurisprudence, are indicative of impeded respiration. A miner will speak to you of, what he calls in Cornwall, a creaming or pain about a part of the chest ; doubtless the bronchial tubes there must be full of what is termed azote or nitrogen gas.

3130. Supposing that a miner was working in good air, but doing a very hard day's work, then would the ladder be in no way injurious to him in your opinion ?—No ; I believe that it would be merely additional fatigue to him. I speak of a miner, supposing he has been working in good air and in a well-ventilated mine. I think that the fatigue which he experiences is muscular fatigue of the arms and chest, similar to that which I might experience after a long day's march ; and if I met your lordship, and you were kind enough to offer me a seat in your carriage, I should be very pleased to have a ride home. I can say no more of that as far as the ladder climbing goes ; but I think that it might be made perfectly clear to the Commissioners, in going through this county, that it really is the interest of the proprietors of mines to expend money in sinking shafts and winzes in an economical point of view.

3131. Do you consider that the mines generally are ill ventilated ?—In speaking of mines being ill ventilated, I believe that a mine which has been much worked, and in which there are a number of shafts and winzes, as a whole cannot be said to be ill ventilated ; but in those mines where men have to travel the ends of a level, or to rise in the back of the lodes, there is no ventilation at all.

3132. In the mines with a number of shafts, are there not ends with poor air also ?—Wherever a man passes beyond the point of ventilation, of course he is at once breathing an impure atmosphere.

3133. Will you explain what you mean by an adventurer ; do you mean a shareholder ?—I do ; it is the old-fashioned term in the county ; a mine was called an adventure in olden times, and the miner who worked in it was called an adventurer.

3134. In some of these mines I suppose there are a very large number of adventurers ?—I am sorry to say that the practice obtains now of dividing the shares into a greater number ; some people hold the opinion that it is an advantage for persons having small means to be able to invest their money in what they call good dividend-paying mines; but I believe myself that it is increasing the evils which are found to exist in this county by so dividing the responsibilities, and by such a constant change of shares from hand to hand, that there is almost an inability in certain mines to fix who the adventurers are.

3135. And, therefore, where the interest of the miners is concerned, there is nobody but the agent who is in any way responsible ?—The shareholder for the time being, of course, is obtaining as much money as he can, and if you asked him to spend 4,000*l.* or 5,000*l.* in sinking a shaft, he would rather avoid doing so than make that outlay.

3136. Then a very great evil is the number of shareholders, and the want of responsibility in those who work the mines ?—Yes ; I think that it would be prudent on the part of all shareholders to have such a reserve fund as would enable them to carry out the means of effecting the improvements of which I have spoken ; and I think that it would be eventually found that they would be handsomely paid by the money so reserved for expenditure.

3137. But if the shares are constantly changing hands that could not be carried out ?—No. In almost every Act of Parliament which has been passed for public companies or railway companies there is what is called a fund for contingencies or a reserve fund.

3138. Does the lord in giving off the set ever make a condition that the shares shall not exceed a certain number or amount ?—Very rarely.

3139. It is done ?—I have done it recently ; but it is not done as a rule in the county. I am not aware of another case.

3140. Do you think that it would be a good rule ?—I think that the less the lord interferes with the action of companies the better.

3141. But it would be so far a good rule for the miners ?—I think so. I think that they would work the mines with greater economy.

3142. Then you think that it would be for the interest of the adventurers that proper ventilation should be provided ?—I do certainly, in order that a greater amount of work may be done at less cost. If a man has a piece of ground set to him at a deep level, with no ventilation in the end, it is impossible that that man can do so much work as he could in a level well ventilated; and I think that in many of those cases a very simple remedy might be applied,—at all events, in some instances, if not generally,—namely, what is called having an air soller, by which the air might be forced on from the mouth of a winze to the end of the level. I am speaking of the upper levels ; in the bottom level there is a difficulty, because you have no winze below that ; and nothing but keeping the shafts going with the levels, I believe, will ever remedy the defect.

3143. We have been informed that the air sollers become expensive, as they wear out from the passage of the barrows on the wood ?—When a man's wheelbarrow is getting worn out, the sooner he gets a new one the better ; that is all I can say about it.

3144. Proper ventilation becomes a question of expense, in your opinion ?—Yes ; I do not think that that is a serious answer to it. I cannot positively speak as to the best description of wood adapted to

lying under ground, whether it is exposed to damp, miners themselves know.

3145. With regard to a former question as to the health of the miners, is there any other point upon which you wish to give your opinion to the Commissioners?—No; I believe that the whole matter may be summed up in a very few words—better ventilation, and better provision for the miner when coming to grass and changing his clothes.

3146. (*Mr. Austin Bruce.*) Would you add the substitution of some other conveyance than that of ladders or not?—You allude, I presume, to what is called the man-engine?

3147. No, I do not.—I think that that would not be required, if the mere labour of climbing is taken as a part of the man's work. I do not attribute so much importance to it myself as others do. To a diseased man I think it is a most fearful punishment; to a healthy man, I do not consider it so.

3148. (*Chairman.*) A man works eight hours underground, does he not?—That is including going down and coming up.

3149. If it takes him from an hour to an hour and a half to come up from the deepest mines, that is so much loss to the adventurer?—Yes; and therefore it is the interest of the adventurer to give him more rapid means of coming to the surface. To put it in a plain way, if you have a mason to build a garden wall, to walk to the spot, and 20 miles to walk to go and 20 miles to come back again, he will not do so much work as if he is close by it.

3150. (*Mr. Kendall.*) You talked of certain clauses to be inserted in the lease which should provide fordries and other arrangements for the benefit of the miner. Do you think that if these clauses were to be inserted, if a lord was known to insist upon those clauses, it would be a barrier to an application for sets from him?—I believe that it would be a very great drawback, I will not say a barrier. I think that the lord ought not to be required to do it. I have endeavoured to point out that I do not think that it is any pecuniary advantage to him, but that it is a mere matter of feeling and moral responsibility that somebody ought to do it, and the lord does it, if the adventurer does not. I am entirely of opinion that the sets granted by lords ought to be as free and wide as possible.

3151. Supposing that a lord felt that there was a great responsibility on him, and that he had no right to grant sets to parties who he was not sure would provide for the accommodation of the miners, do you think that he would be less likely to have applications for sets than another lord who was less scrupulous?—I do not, eventually. I am speaking now of the lord doing that act which another person ought to do, and where I found that the mining companies had neglected to do it, and I had no means otherwise of seeing it done, I would, upon the renewal of the set, if I had the opportunity, ask the lord to insist on certain things being done. That is all that I can say about it. I think myself that sets or licences when first granted should be as free and wide as possible, without being embarrassed with any restrictions.

3152. If the miners were to be allowed to come direct to the dry, instead of waiting in the shaft for some time before the right time for coming to the surface, how would you prevent the abuse of that privilege?—By requiring the men to go into a sitting-room, which should be well warmed, and where they might have their own refreshment provided by themselves, and they would be required to wait there until they had answered some roll-call or answered their names to the agent.

3153. Would there be no abuse in that; might not a man, in that case, come up an hour before his time?—He is obliged to do a certain amount of work in the course of the month, or he does not get his wages, and I believe that the tut-work man has very little opportunity of getting more than such wages as the agent chooses to fix. If a miner has driven beyond his stent, and has a soft piece of ground in his end, he will derive little or no advantage from that in the next month's taking, except in this, that he, perhaps, will execute the work in less time, and will have more time at his own command.

3154. According to your idea, a miner should be enabled to leave his tut-work pretty nearly when he likes?—Yes; it is set to him, at per fathom, which he is to drive in the month.

3155. And he may leave when he likes?—Yes. I know not why he should not do so, if a man drives his quantity of ground. I know that the suspicion on the part of the agent is, that a man should not be allowed to run away when he pleases, and therefore he keeps him down this trap hatch.

3156. With regard to the ladder-climbing, you have no objection to the ladder climbing?—None at all. When I say "none at all," I speak with a qualification. Supposing that I am in a healthy condition, and have time to do it, I do not object to ladder climbing; I would as soon climb a ladder as walk.

3157. I understand your reason to be this: that you look at the mine agents, and a healthier class of men you cannot see, and that they have much more climbing than the men?—Yes, I am speaking of days when the agents go down.

3158. As I understand the matter, the miner has to go down to his place of work direct and returns direct, and there is an end of his climbing; but the agent goes much further?—Miles further in a day.

3159. And you say that the agent is a healthy man, and receives no harm?—Yes; it is no punishment to him.

3160. Is there not a very great difference between even a healthy man coming out of an end, where he has been for eight hours, and then having to ascend, and an agent who is shifting his ground almost every five minutes, and who is not coming out into the open draughts and getting near a shaft and then descending in the main shaft and getting cool at all; is not his descending and returning a different case from that of a miner who descends and goes into an end, which may not be very close but still is an end, and where the air cannot be so pure as that which the captain is breathing almost every moment, except a second or two now and then, during the whole time he is below?—I believe myself that the captain breathes very little impure air, he is constantly passing through the winzes up and down, and has a current or air which does him no harm.

3161. Is not his case a different case from that of a man who is in one fixed spot?—Undoubtedly so; the agent comes up in better condition, because he is in constant motion, and his animal heat is kept up, but the miner sits down when he has been perspiring very freely and sustains a check, all of which, in my opinion, does him great injury.

3162. (*Chairman.*) And the miners are in the constant habit of standing on the ladders?—So I am informed.

3163. Do you think that the tut-work men would abuse the privilege which you have suggested that the miners should have?—I think not seriously; if they did not work the quantity of ground they could not get the wages. It is rather an amusing thing if you go underground to see the setting of a stent, the agent himself does not wish to be what he calls baffled by the miner, and if the miner can drive a fathom of ground in a shorter time than the agent sets him, the agent may think that perhaps he may not stand so well in the opinion of his employers as he otherwise would do. The agent's object is, as far as he can, to show that he is clever in his way of setting, and that he has allotted the man a fair amount of work for the two months, supposing he works eight hours; but a working miner can very frequently execute the work in less time, and come to grass, if allowed to do it.

3164–5. (*Mr. Austin Bruce.*) I presume that the agent agrees with the workman as to the price to be

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given for the work, he being himself the judge of the quantity of work?—Just so. There are two ways of doing it; first, there is what is called the setting day, when so many fathoms of ground are set at public auction by the agent; and perhaps in some mines you have seen a bow widow where the agent sits and put up so many fathoms of ground to be driven; he puts a certain price on it, and there is a kind of Dutch auction, and the lowest bidder before a stone is thrown up has the ground set to him—John Crossman and pair, or some such taking. If, before the end of the month, or two months, for which that ground is set out, he has driven the full extent of his ground, the agent, in coming down below, will then make an independent bargain with him for what he drives beyond his stent.

3166. Is it an understood part of the bargain that the miner should remain a certain number of hours at work every day, so as to complete the work within the shortest possible time?—No, it is not, as far as I am informed.

3167. Then why should the agent object to the miner leaving his work at any time he pleases?—Because the agent is supposed to set the quantity of ground which a man, working so many hours a day, should fairly, with his pair, drive.

3168. Is that the only reason?—That is the only reason that I am aware of.

3169. Do I understand you rightly, that eight hours being the time which a man is expected to work that includes the time he takes in ascending and descending the ladder?—Quite so. The change of corps is every eight hours.

3170. You have expressed an opinion, that the mere ascent of a ladder at the end of a day's work, provided a man is not diseased, occasions no injury to him?—No; not beyond the muscular fatigue.

3171. What is the depth of the deeper mines in which ladders are still used?—I am not prepared to give an answer to that question. I do not know what the extreme depth in the county is. I think that Tresaveane may be said to be one of the deepest mines in this county.

3172. Can you tell us the general depth of the deeper mines?—I cannot. I should say 200 or 300 fathoms. In the course of mining an adit level is driven, and it is only from the adit level that the number of fathoms is reckoned.

3173. What is the height of the highest mountain in Cornwall?—That I am not prepared to give you.

3174. Have you any 300 fathoms high?—I cannot tell you. I think that Liskeard is somewhere about 300 feet above the level of the sea.

3175. Do you suppose that an ordinary man, through the whole of his working years, could ascend from 1,200 to 1,800 feet, in what necessarily must be the close air of a shaft, without bringing on injury to himself?—Certainly not.

3176. Is that not the case with miners who are also exhausted by the use of the borer and by other labourer's work underground?—Yes; but where you have winzes and shafts you will find very little foul air; you will find a current, which is a supply of pure air, consisting of oxygen. The miner himself will frequently work in a dark place where a candle will not burn.

3177. Do you conceive that, with any arrangement of the ventilation, the working underground in a comparative darkness, and breathing air necessarily vitiated by candles and powder, as well as by gases, can be as healthy as work in the open air?—There is not the slightest doubt upon that point; it is decidedly not so healthy.

3178. Then work under those conditions must take more out of a man than work in the open air?—Decidedly.

3179. Even supposing that man's health not to be seriously affected, do you think that the addition of an ascent by a ladder of 1,200 or 1,800 feet could be effected without ultimately causing injury to his health?—I should say, that as far as producing disease goes, there would not be more injury than in any other pursuit, supposing the shafts to be well-ventilated.

3180. Does not excessive fatigue bring on either disease or a tendency to disease?—Excessive fatigue is beyond that which a man can fairly bear. If I walk a long distance and walk further than my strength will carry me, no doubt I shall suffer from it. When the word "excessive" is used in that way I should say that it would, of course, be productive of disease; that you are using up the material quicker than you should do. But I think that those questions are rather more adapted for a medical man than for one in my position. I am merely giving you the opnion of a common observer, without my opinion being, perhaps, of the slightest value upon these points.

3181. You have been much in personal communication with working miners?—Yes, constantly.

3182. Judging from your experience of miners, should you say that the majority of the miners at the age of 40, in this district, were affected by the direct results of their work underground?—Yes; I believe that the miner at 40, whose fate it has been to work in bad air, begin to decline and decay at 40, if he ever lives to attain that age.

3183. I do not ask you with reference to the miner who has worked in bad air, but to the whole body of miners generally?—Yes; those working underground, I think so.

3184. (*Mr. Fulke Egerton.*) Do you think that there has been a tendency in the last few years to improve the ventilation below and the arrangements above for the miners?—I do.

3185. Do you think that there is any marked improvement which can be traced during the last 10 years?—Yes. I believe that men may now at times, on application to the agents, be supplied with the means of making air sollers, or may go to the timbermen, as it is called, and have a pipe or tube of wood. At the surface the dries are of very great advantage to the men, and it would be an improvement if they had some little addition to them in the shape of a sitting-room and a changing-room, and the expense would be very inconsiderable.

3186. (*Mr. Holland.*) I think you say that, with the exception of the ends beyond the winzes, the air of the mines is good?—It is not so bad, when you compare the pure atmosphere on the surface with the impure atmosphere below; it cannot be called good as compared with the atmosphere at the surface.

3187. A very small proportion, I believe, of men work in that bad air?—All men working in a rise, which is a vertical level, and all men working in ends work in bad air.

3188. What proportion work in bad air?—I have no idea.

3189. If the miners, as a class, begin to fail at 40 or soon afterwards, and if that failure is produced by bad air, is not that a proof that the air is generally bad?—Yes. In many levels a man is driving an end, and there are tributers in the backs behind him, and they have to throw the ore down into the level, and of course they are choking up the level.

3190. And choking the men beyond them?—And choking the men beyond them. And I may say that I have myself gone a considerable distance (I cannot say miles) where I have had to scramble on my hands and knees, and there has merely been room for a man to pass through.

3191. If there are a good many ends in a mine where a candle will hardly burn, or will not burn, must not all the air in that mine be bad?—No.

3192. Why not?—Because when the slightest amount of pure air or oxygen passes on into that neighbourhood, the candle will begin to burn and the men will feel better.

3193. But it is still bad?—Yes, certainly; anything which is below the proper test of pure air, of course must be bad.

3194. What is the proper test of pure air?—I

should say the surface; for instance, if I take an ordinary candle and put on a receiver, I can almost put out that candle. I could almost destroy a miner in a few moments in that way, and revive him in a few minutes. If you give the slightest supply of pure air containing oxygen, you will find the candle burn again.

3195. Is not the air in which a candle begins to burn dimly not only bad, but very bad?—It is going from bad to worse; as the candle goes out so the air becomes worse.

3196. If you saw the candle in your drawing-room beginning to burn dimly should you feel comfortable?—I should think it time to open the window.

3197. (*Mr. Kendall.*) Your own experience has been more above ground than under ground?—Quite so.

3198. You have been very little underground?—Very little. My visits underground have been more a matter of curiosity then as a vocation.

3199. Have you been down any of our deep mines more than once?—I have not, and I do not intend to go a second time.

3200. Then your own experience underground is very small?—Very small indeed.

3201. And the little which you have seen you do not like; you would not like to go down again?—I have seen quite enough to inform my mind of what the underground workings are, and I could tell you from a drawing precisely what they are, and every working man in the county would corroborate it.

The witness withdrew.

The Rev. JOHN RICHARD PRETYMAN BERKELEY examined.

3202. (*Chairman.*) I believe that you are the Vicar of St. Cleer?—I am.

3203. How long have you been so?—18 years.

3204. When you first came I suppose it was principally an agricultural population?—The majority were agricultural at that time, but a very large proportion were miners. Perhaps three fifths were agricultural, not more than that I should think.

3205. What should you say is the proportion now between those engaged in agriculture and those occupied in mining?—I think it is rather more than reversed. The agricultural population, I thimk, has not increased, and the other has very much increased. I should think that now out of 4,000 there must be 2,500 engaged in mining occupations.

3206. Has it come under your observation that the deaths in the parish in proportion to the increase of the population have been greater during the last few years?—I have not exactly looked into that point. The point which I looked into was comparing the average age at death of the males who had come to an age old enough to go to work. I have taken, for instance, the age of 14, as the age when a boy might be said to be considered capable of getting his livelihood, and I have taken down the ages of all the males at the time of death over 14 whom I have buried. Taking what you might call the working age I find that the difference between the agricultural population and the mining population is very great indeed.

3207. Can you furnish the Commissioners with the results?—Here is the paper which I took out. You will find the ages of those who have worked as agriculturists very high indeed. St. Cleer parish is a remarkably healthy parish.

3208. (*Mr. Austin Bruce.*) Are these agricultural names taken in the order in which the owners of them died?—I have taken them as I found them in the book consecutively, merely entering those who were engaged in mining in one column, and all others not necessarily agriculturists, but agriculturists and others upon the other side.

3209. One column gives the deaths of the male population at a working age exclusive of the mining population?—Yes.

3210. And the other gives the deaths of the male mining population at a working age?—Yes.

3211. (*Mr. Kendall.*) All in the same period?—Yes. I have taken them during the last 18 years; since I came to the parish.

3212. (*Mr. Austin Bruce.*) Your general results are that 82 men of the mixed population, exclusive of miners, lived between them 5,433 years, or an average of 66 years, while 82 men of the mining population lived between them 3,134 years, or an average of 38 years?—Yes.

3213. (*Chairman.*) Do those two tables comprise the whole number of men who are registered as having died in the parish?—Nearly. Occasionally perhaps half-a-dozen have been carried out and buried elsewhere.

3214. But those are all who have been buried in the parish?—Yes. That is an exact copy from the parish register.

3215. Do you consider that the houses of the miners in St. Cleer are in a healthy condition?—No. I think that when a miner takes ill he has less chance of recovery than an agricultural labourer, from the fact that, generally speaking, the miners live in closer rooms.

3216. Is there any attention paid to the draining or the cleanliness in front of their doors?—That is a point in which I think that they are rather deficient. In the year 1849, when there was cholera in England, I succeeded in getting a system of drainage through the village of St. Cleer, with a grating at each door; but we find it very difficult to induce them to keep those gratings clear. They think that it rather interferes with their personal liberty, and that they have a right to throw things where they please. They do not like to be interfered with.

3217. (*Mr. Austin Bruce.*) You have visited of course many sick miners?—Yes.

3218. Do the figures which you have given coincide with the impression which you have derived from your experience of your parishioners from visiting their sick beds?—Yes, I should think so. I would mention one fact which I have noticed. I may almost say that I have never known a case of a miner after he has past 21 or 22 and has come to man's estate, have anything like a severe fit of illness and becoming a thoroughly sound man again.

3219. Do many of the miners of St. Cleer go elsewhere to die?—No, very few indeed; our parish rates will tell you.

3220. I ask this question as I know that it not unfrequently happens that the natives of rural parishes, when no longer able to work, return to their native parishes to spend their last years?—It is a very rare thing indeed with us. I have known very few instances of the sort. I will not say that I have not known any, but they have been very rare. In fact, when they are exhausted, they generally look for assistance from the parish, and then they are unwilling to move. There is always a difficulty in that respect.

3221. Have you known any of the natives of St. Cleer who have gone to the large towns to work, return to St. Cleer to die?—I do not think that I have ever known one.

3222. I suppose that the surplus population of St. Cleer who cannot be employed in agriculture readily find employment in mining operations?—Yes. The parents of a great many of those who are now engaged in mining operations in St. Cleer were agricultural labourers in the parish of St. Cleer.

3223. Do you consider that the children derive any hereditary infirmity from the complaints of their parents?—I am frequently called upon to baptise infants privately oftener of miners than of any others, and I generally find that they are suffering from chest

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disease. What is the cause I will not undertake to say, but still I think it is more than likely to arise from the circumstance which you mention.

3224. Taking miners of between 20 and 30 years of age, are many of them suffering from illness?—I think that after they come to man's estate they are more liable to those attacks than before. I think that if you say from 20 to 30 I should find a difficulty in answering the question. If you ask me from 18 to 25, and then from 25 upwards, I could give you a much more direct answer. From 18 to 25 I think they are generally fine specimens of men, superior in their appearance, and you would judge them to be physically stronger than men of the same age engaged in agricultural operations; but I think that after that they go down the hill much more rapidly, especially if they in any way get any cold.

3225. Do you find them suffering much from colds contracted from their work?—Yes; very frequently. If I see a miner looking ill, and I say, "What is the matter with you?" he says, "The pipes, sir." That is always the answer.

3226. What do you mean by "the pipes"?—I believe that they mean the bronchial tubes. They say the pipes are stuffed. It is there that they suffer.

3227. Have you been underground yourself?—Never.

3228. (*Mr. Kendall.*) Have you ever classified the cases at all as to the mines from which the miners have come?—No.

3229. Have you observed whether there has been more ill-health on the part of men working in one set of mines than in another?—South Caradon, as far as I can see, is the healthiest mine in our neighbourhood. Craddock Moor has a bad name even with the men themselves, and of East Caradon I have heard many complaints of late; that is, on the score of ventilation. Of course upon anything respecting the ventilation of the mines I must merely speak from hearsay. I know nothing of it myself.

3230. When the miners have been ill, and have come under your notice, and when you have been inquiring, you have found that more have come from one district than from another, and you classify them in this way, South Caradon the most healthy, East Caradon next, and Craddock Moor the worst?—I have heard very little of East Caradon until lately, because very many of the men working in East Caradon, I think, are from Linkinhorne and Liskeard. It is comparatively a new mine in its present condition. A miner was speaking to me on Thursday, and he was saying that East Caradon was very bad.

3231. When they have been ill, have they given you their reasons for becoming so ill; have they attributed it to bad air or climbing?—A great many have complained of the air of Craddock Moor.

3232. Do they attribute the causes of their illness to bad air?—They attribute their illness to bad air more than anything else.

3233. Not to climbing?—No; but they have spoken of that as being very fatiguing. The men, I think, often complain of their liability to catch cold after they come up to the surface.

3234. From the want of dries?—Yes; having a great distance to go to the place where they change. A great portion of it is, perhaps, their own fault; they stand and talk about the mouth of the shaft before they go to the dry.

3235. Taking them as a whole, are they careful of their own health, or not?—I do not think that they are as careful as they might be. A man will feel himself indisposed, and instead of seeking medical aid at once, as I have often entreated them to do, he will go on for a week or two longer before he calls in a doctor; they seem to have a great horror of the doctor.

3236. (*Mr. Austin Bruce.*) Are the doctors, as a class, attentive to them?—I do not like to express an opinion upon that point. I have seen some cases of neglect. I think that the great difficulty is that there are not doctors enough; it is too large a district.

3237. Do you think that, as a rule, the doctors take their cases in hand early enough?—I think they take them as early as they are applied to. I have frequently had complaints from the doctors themselves on that point. A doctor has said to me, "What am I to "do with that man; he ought to have been with me "a fortnight ago; it has now fastened on him."

3238. Do you believe, without having specially enquired into the matter, but from your knowledge of the circumstances of surrounding parishes, that the results in surrounding parishes would correspond with the figures which you have given to the Commission?—I cannot undertake to answer that question. I do not know. I have had no conversation with others on the subject.

3239. Do you know anything in the circumstances of surrounding parishes which would tend to make the results different from those in your parish?—I do not.

3240. (*Mr. Fulke Egerton.*) Have you ever heard any complaints from the miners with regard to the distribution of the club money at the mines?—No, I do not think that I have. I have heard the men say that they think that they do not get enough for the money which they contribute to the club; and on one or two occasions where mines have gone down, I have known men to complain, because it is lost in some cases; but that is very unusual. I do not think that the men have made anything that you could call a complaint sufficient to form an opinion upon it.

3241. (*Chairman.*) Should you say that the miners, as a class, save money?—No, not as a class. The men who save most money, as far as my experience goes, are those who were brought up as agricultural labourers, and have gone, perhaps, when they become young men, to work at a mine. Those very often save money. They have been brought up in another school.

3242. Do you think that the miners have food and nourishment sufficient for the work which they undergo?—Their food is of that character that I do not think it can contribute the nourishment which they require, looking at the varied nature of their occupation.

3243. What is the general food of the miners?—Those heavy pasties which they carry with them, and which I think are quite complete engines for the destruction of health, especially in the case of men engaged in the miner's occupation. An agricultural labourer working in the open air can eat almost anything; a miner working in foul air, and his occupation taking more out of the system, is not able to digest the same kind of food. I find very many of them, for instance, who cannot eat fat; the stomach rejects it.

3244. What food does a miner, returning home after work, get when he comes home?—Generally speaking, first there is broth made of a lump of fat, perhaps, put in water, and some vegetables; and then the amount of meat which they have (fresh meat especially) is very small.

3245. What amount of meat in the week should you say that a tut-work miner can afford?—I cannot exactly tell, but you rarely see the wife buy more than seven pounds of meat a-week at the market. That is considered a large supply for a week, and there are, perhaps, a man, his wife, and three or four children.

3246. At a work where a good deal is taken out of them, it is your opinion that there is not sufficient nourishment?—No, I think not.

3247. (*Mr. Kendall.*) Which do you think buys most meat, the miner's wife, or the agriculturist's wife?—The miner's wife buys more meat in the market, but I question whether the agriculturist's wife has not as much at home; because the agricultural labourers are better supplied with bacon and things of that sort than the miners are, and are better able to use it.

3248. (*Chairman.*) The agricultural labourer, you think, has more bacon, which he makes himself?—Yes. It is a rule in our neighbourhood that every agricultural labourer is entitled to a run, as it is called, for his pig; and then there are generally a good many turnips, and things of that sort, which they are allowed to have from the house, and a good deal finds its way to the pig. Then they are allowed to buy their barley at a certain price; and perhaps the pig is killed, if they are in debt for the barley, to pay for it.

3249. You think that the agricultural labourer is better fed than the miner?—Yes; but at the same time I do not think that he has, perhaps, as much fresh meat each week.

3250. Although his labour is not so severe?—Not so exhausting to the system.

The witness withdrew.

Extract from Parish Register of St. Cleer, near Liskeard.

Agricultural, &c.		Mining.		Agricultural, &c.		Mining.		Agricultural, &c.		Mining.		Agricultural, &c.		Mining.	
Name.	Age.	Name.	Age.	Name.	Age.	Name.	Age.	Name.	Age.	Name.	Age.	Name.	Age.	Name.	Age.
W. L.	86	I. H.	52	I. W.	71	C. O.	51	I. J.	79	W. S.	58	I. S.	86	W. S.	11
P. H.	82	E. G.	42	W. D.	62	I. E.	48	C. H.	84	S. S.	52	I. G.	55	H. G.	20
I. W.	30	I. H.	17	I. T.	54	H. S.	20	I. S.	77	I. R.	20	I. R.	80	I. P.	52
T. H.	52	M. T.	54	S. G.	10	I. N.	78	I. L.	62	S. R.	56	H. B.	81	E. V.	33
T. H.	94	W. C.	32	G. T.	84	W. G.	65	I. H.	61	D. S.	72	S. S.	54	I. H.	42
T. C.	77	I. H.	42	S. A.	59	E. H.	58	I. L.	63	P. D.	40	S. K.	71	I. H.	21
I. R.	87	I. W.	39	G. L.	66	T. B.	44	R. H.	64	I. G.	47	W. S.	71	I. P.	19
T. H.	89	I. W.	69	S. G.	36	I. C.	41	W. B.	77	W. B.	28 killed	G. S.	62	I. W.	40
S. W.	52	W.C.B	44	S. S.	75	R. E.	48	I. S.	82	I. C.	29	S. S.	52	H. T.	30
R. S.	72	A. T.	27	W. B.	84	R. F.	28	H. B.	15	I. R.	47 killed	W. H.	87	W. S.	35
W. D.	54	H. H.	24	W. B.	45	I.W.A.	35	W. H.	89	I. P.	52			I. M.	12
H. G.	97	I. H.	55	W. H.	72	I. H.	31	I. S.	22	W. C.	55			S. D.	19
I. L.	64	N. T.	53	I. C.	80	I. E.	32	T. H.	62	S. H.	40			R. O.	22 killed
I. I.	75	S. R.	24	N. S.	70	W. S.	33	R. L.	72	I. P.	14			H. T.	42
I. B.	52	W. P.	53	I. E.	76	I. S.	55	W. K.	88	I. P.	24			I. G.	44
W. S.	13	I. R.	35	I. H.	87	W. W.	11	W. N.	83	N. R.	43			T. M.	33
I. H.	47	P. T.	27	I. N.	70	W. T.	45	T. H.	63	T. M.	25			I. S.	31
R. D.	60	I. L.	29 killed	I. B.	70	I. I.	53	R. S.	78	W. P.	23			I. E.	61
I. B.	73	H. H.	30	R. S.	66	I. R.	50	M. W.	68	I. H.	14			T. P.	61
I. H.	76	W. H.	28	I. B.	43	I. T.	20	S. B.	17	I. B.	45			W. W.	41
I. S.	72	E. R.	55	I. H.	66	I. N.	14	I. W.	72	W. W.	61			H. R.	19
W. S.	74	S. W.	52	I. T.	73	W. R.	42	W. T.	48	I. H.	16				
I. H.	60	S. H.	22	F. B.	75	W. H.	42	I. R.	61	W.H.	25				
I. D.	76	I. G.	16	I. C.	69	G. B.	45	C. J.	70	W. R.	35				

Mr. Andrew Kingston examined.

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3251. (*Chairman.*) I believe you are mayor of Liskeard?—Yes.

3252. You are also a surgeon?—Yes, to several mines.

3253. How long have you practised as a surgeon?—Twenty years.

3254. In Liskeard?—Yes.

3255. And I suppose that among your patients you have had several of the mining population?—Yes.

3256. Have you many cases at this moment?—Not many; our district is remarkably healthy at the present time.

3257. With regard to miners, are the number of miners' cases more in the winter or in the summer?—They are more in the winter.

3258. Can you mention any large mines from which you have had more cases than from others?—West Caradon Mine is my large mine.

3259. Are there small mines which you attend?—Yes; I am the medical man to about ten or a dozen mines; West Caradon, Craddock Moor, Herodsfoot, Ludcott, and others.

3260. (*Mr. Austin Bruce.*) Are you the only surgeon attached to those mines?—Yes. I am not joint surgeon with any medical man, excepting in Phœnix Mine, which is a large one, and there we have a geographical division. I take those men who live south of a certain line, and he takes the north.

3261. You keep assistants, I suppose, to help you?—Yes. We have a very cordial understanding in the town; we all help one another. We are five or six medical men, and we have a very good understanding, so that we have no difficulty if we are out of the way.

3262. (*Chairman.*) Have you many cases of accidents in mines brought under your notice?—We have in the course of the year. We have had rather a large number of gunpowder accidents lately in my district. I have had three within the last three months.

3263. What sort of accident is that?—The holes going off prematurely.

3264. What has been the effect?—Two of the men have lost both eyes, and one has lost one eye; and one accident, which occurred only this last week, was a very trivial accident: the man had a few marks over his face, and his hand was burnt. They almost always burn the hand.

3265. In those cases have you asked the men how the accident occurred?—Yes, I generally do; and it is generally in what they call the picking out the holes. The last accident was in tamping; it occurred as soon as he began to tamp. I said, "Had you nothing soft?" He said, "There was nothing soft there." So that he tamped with a hard material, and the powder exploded immediately; but the powder only just being in, he was not injured much, the burden of the hole was not thrown.

3266. Were these experienced miners?—Yes, all of them.

3267. Are there any regulations?—I believe that nearly all the accidents have been contrary to the regulations, and might have been prevented.

3268. Arising from the men's carelessness?—From their own carelessness.

3269. Are there any direct instructions given to the miners with reference to picking the holes?—Yes. They should all be picked out; but sometimes they bore them out. They put in an iron rod, and beat away; they should be gently picked out. It is done to save time.

3270. Are there any other sort of accidents which have come under your notice?—Fractures; a few accidents from machinery. I have had two accidents where youths have been caught between the rollers that grind up the ore, and they have each lost a leg.

3271. Is there any protection?—There cannot be any protection there. They have slipped back, having forgotten it; you cannot cover up the opening; but while the thing was at work they appear to have

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forgotten it; they suddenly stepped back, and put their leg between.

3272. Could there be no protection?—No, nothing could prevent that.

3273. About what age were they?—Fifteen or sixteen.

3274. Was this exposed to the weather?—No, under cover.

3275. Will you state to the Commissioners what your observations are with regard to the diseases of miners?—The bulk of them are affections of the chest.

3276. How, in your opinion, are those diseases caused?—I think by three things: poor air, occasionally working out of light (they are a long while out of light), and climbing.

3277. We will take first the poor air; that is in driving an end, and there is a want of ventilation?—Yes.

3278. How does that affect them?—They lose colour and they waste; and they complain of general lassitude, and sometimes of giddiness in the head, and shortness of breathing with it.

3279. Do they come to you at once?—No; a man does not come until he finds that he is a good bit incapacitated. He would not apply to his medical man for that.

3280. Not until he finds himself unable to work?—Perhaps before that, but still not until he is affected a good bit.

3281. When he finds himself not so strong and able for his work?—Yes.

3282. Added to that, you state the working out of light?—Yes.

3283. Do you suppose that the air is bad there to a certain extent?—In most mines there must be ends where there is poor air, because they are driven a long way from shafts, and they have not winzes through. They get winzes through as fast as they can, I believe; but sometimes they are many weeks and sometimes months driving in poor air. Then they suffer from the effect of powder smoke and candle smoke.

3284. With regard to the poor air, what do you mean by poor air?—I mean air where there is a difficulty in a candle burning; that is the criterion here. There is, no doubt, a deficiency of oxygen in it.

3285. Is the rest of the mine affected at all by the powder smoke and the candle smoke and this air from the end?—It will only just affect that end of that level. It would not affect the bulk of the mine.

3286. When it escapes up an up-cast shaft the other part of the mine is not affected by it?—It is then, I believe, got rid of.

3287. But any one working in that shaft would suffer?—They are below it. They are working in the bottom of the shaft; they are not working on the sides of the shaft.

3288. You have alluded to climbing; what is the effect upon the miners of climbing?—The act of climbing first of all produces a very violent action of the heart. Then they have to breathe more hurriedly, and I believe that they get what is termed emphysema of the lungs, which I can explain. (*The witness made a sketch.*) Supposing that to be a bronchial tube, and these to be air cells influenced by the violent breathing of bad air for a series of years, these air cells, instead of being very small indeed, become large, so that the lungs are always full of air, but yet they do not get a proper quantity of fresh air. We have a number of men in the mines from one time to another who come to us, and they are failing, and they look as if they were consumptive, and we examine them, and cannot find any trace of consumption at all. We strike them on the chest, and their chest is much more resonant than it should be; and I believe that it is owing to this emphysematous condition. We have had several such men from time to time, and there are some about now, I think. They cannot make any exertion. They are well up in flesh, and some of them look the picture of health, but they cannot work at all, and they are home for months and months. Then these cases often terminate in consumption.

3289. Would they terminate in consumption if the men did not go back to the mine?—I have found a great difficulty. I believe that many of them would not. I think that if they did not return to the mine they would live on for many years. I recommend some men not to go underground, and they immediately turn round and say, "What shall we do, Sir?" I say, "Do anything; work with a farmer." They say, "The wages are not enough." Then they apply to the mines, and there is not surface work on the mines for them to do. They have a great dislike to agricultural work after they have worked at a mine.

3290. And therefore they return to the mine?—Yes; and after a little while the difficulty is added to until they get thoroughly incapacitated.

3291. And it generally ends in consumption?—Yes.

3292. (*Mr. Holland.*) What they call consumption?—Yes.

3293. (*Chairman.*) What would you term consumption?—I think that many of the cases are proper phthisis.

3294. Is the heart affected?—With many of them.

3295. In your opinion is that brought on by climbing the ladders in combination with working in bad air, or would it be brought on by climbing the ladders if they did not work in a bad end?—I think that it is brought on more quickly by climbing with occasional poor air, because they cannot help powder smoke and candle smoke. They must have that if the mine is a hard mine using powder, whatever good air else they may have.

3296. So that though the air is not poor the breathing of the candle smoke and of the powder smoke, and the climbing, tend to produce the effect which you have described?—Yes.

3297. Are the liver and stomach affected in the first instance?—Very little. We are not troubled with affections of the stomach or liver with the miners. They are a very temperate class of men, so that we do not get any affections of the liver from drink. There is very seldom anything of that sort.

3298. The men on coming up from the mines after working in poor air, we have been told, complain of loss of appetite, and of not being able to eat. Does that arise from the state of the stomach, or from the inhalation of poor air?—I do not hear any complaint of that kind, but I have no doubt that after working in poor air they cannot eat so well.

3299. Has it come under your observation that they have caught cold, or that what they call their pipes have been affected from catching cold?—They often come as other persons do, and say, "Well, I have caught cold, Sir." We hear that from them in common with other persons.

3300. Do they say that their pipes are affected?—They do. They say that very frequently. They say that they cannot breathe; that they have a difficulty on their pipes.

3301. (*Mr. Holland.*) Do they use that expression generally for their lungs?—For the whole concern.

3302. What we should call the bellows?—Yes.

3303. (*Chairman.*) And they believe that to be from catching cold?—They often say so. They say, "We have caught cold."

3304. Is it your opinion that that arises from their work?—I believe that they have caught cold, and then the lungs being a little impaired in their functions it puts them to more trouble than an ordinary agricultural labourer would experience.

3305. Are there any special reasons why a miner is subject to catch cold more than other persons?—I think that the character of his employment would be very likely to induce cold more frequently than in other persons, because the miners are working in a warm temperature, and they come up into a cold one.

3306. Where do they come up to?—They come up

from a shaft, and there is generally a dry on the mine.

3307. Have you ever visited any of the changing houses ?—Yes.

3308. Are they warm and comfortable ?— Those that I have been in have been warm.

3309. Do the men experience any inconvenience or injury to health from the amount of dust in those changing houses ?—I think that where there is plenty of dust it is a disadvantage to them.

3310. If they change where the clothes are dried are they liable to be subjected to much dust ?—Yes. Dust comes off their clothes. I do not think that they would feel it much if they were all right otherwise.

3311. But being somewhat affected, as you say, that would tend to increase the inconvenience ?—Yes; it would tend to irritate their chest.

3312. In your opinion, are miners more subject to disease than the agricultural population?—Yes ; much more so.

3313. To the extent of shortening life ?—Yes.

3314. (*Mr. Holland.*) They are older men at the same age ?—Yes ; they look very much older ; a man of 30 looks 40.

3315. (*Mr. Kendall.*) How long have you been practising in a mining neighbourhood ?—All my lifetime. I never practised in any other neighbourhood.

3316. As I understand from you, a miner, generally speaking, is averse to applying for medical aid till he becomes seriously affected ?—No ; I would not say that ; but I do not think that he would apply till he found a good bit of inconvenience, if he was able to work.

3317. If the complaint, on account of which he applies, were taken in an early stage, you think that it would be well met ?—Yes.

3318. It has been stated, that if a miner is once taken ill, he scarcely ever gets a strong man again ; is that your view ?—It is not my view at all.

3319. When you go into the miners' cottages, you are of course in the habit of being there at all hours, and seeing them at their meals ?—Yes.

3320. You likewise see agricultural labourers at their meals ?—Yes.

3321. Taking the food of a miner and the food of an agriculturist, which is the best of the two, generally speaking ?—The miner's is a great deal the best.

3322. Does the miner use more meat than the agriculturist ?—A great deal more.

3323. A great deal more beef ?—A great deal more beef.

3324. A great deal more mutton ?—Animal food.

3325. The agriculturist sometimes kills a pig ?—He does.

3326. That is not very general, is it ?—Yes ; I think that the agriculturists generally kill a pig a-year ; almost all of them. So do a great many of the miners ; but the miners do not do it so much as the agricultural labourers.

3327. Taking the advantage of the agricultural labourer over the miner, as far as keeping a pig goes, has the miner then the advantage as far as food goes ?—Yes ; much the advantage.

3328. Do you not think that the miner has more than twice the animal food in his house in the year that the agricultural labourer has ?—Yes ; I expect that, or much more. The miners live well.

3329. Do they use as much pastry in the way of pasties as the agricultural labourers ?—I should think not.

3330. (*Chairman.*) Does not a miner, considering the work which he has to do, require more animal food than an agricultural labourer ?—Yes.

3331. Should you say much more ?—Much more ; and he has much more.

3332. Have you any idea of the quantity of meat which a tut-work miner is able to afford out of his wages to his family?—No. A tut-work man's wages are more regular than a tributer's. The tributer, no doubt, gets put to a shift very tightly, because, if the speculation turns against him, he sometimes only gets a very small sum.

3333. Do you think that the miners generally have sufficient animal food to make up for the loss which they sustain by the hard work wich they undergo in hot places ?—I believe that they live very well.

3334. (*Mr. Austin Bruce.*) Do you attend agricultural labourers as well as mining labourers ?—Yes.

3335. Taking the two classes, do you observe much difference between the state of an agricultural labourer at 40, and of a mining labourer at the same age ?—A very great difference.

3336. What is that difference ?—You find that the miner looks the older man of the two ; that he would look 10 or 15 years older than the agriculturist.

3337. How soon generally does a miner's health begin to fail him ?—It depends on how early he goes to work. Some go very young to a mine, at 10 or 11, and work underground as early as that.

3338. When they begin early, does their health usually fail sooner ?—I think that, at between 20 and 30, you will find many of the miners look thin and sallow, and their muscles are not well up.

3339. Do you think that they fail earlier in proportion to the early age at which they enter the mines ?—I think so. I think it is a great disadvantage to a little child of 10 years of age to go underground.

3340. You stated that one cause of the weak health of the miner was the absence of light from his work ?—Yes.

3341. And also the presence of the smoke of candles and powder ?—Yes.

3342. The absence of light is of course inevitable ?—Yes.

3343. The evils arising from smoke, whether of powder or of candles, might be, to a great extent, removed by a free current of air, might they not ?—Yes, if you could get the current of air ; but in a long end you cannot get any air ; at least so I am told.

3344. Have you ever traced the illness of any miner to the mere fatigue attendant upon the ascent of a deep mine ?—No, never.

3345. I gather your opinion to be that it rather aggravates than causes disease ?—Yes, it aggravates it much, I think.

3346. Do you attend mines in which there are any other means of ascent than by ladders ?—No.

3347. Have you had any opportunity of comparing the health of miners working in mines where there are man-engines, with that of miners where there are only ladders ?—No. We have no man-engine near ; not in our district. I hear those who work in mines where there is a man-engine say that it is a great relief to them.

3348. Do you despair of seeing the general health of the miners improved in this district ?—I do not see how the health is to be improved, unless the climbing be lessened and the ventilation improved.

3349. If you were called to the counsel of agents, could you suggest no means of improving the general health of the men ?—Yes, I could.

3350. What would you suggest ?—A man-engine to relieve the climbing ; and ventilation of the most perfect kind which could be afforded.

3351. The latter suggestion would be made upon the belief that the most perfect ventilation is not in use ?—I believe that they do what they can. I know that there is very great difficulty in ventilating an end which is a long way from a shaft, where there is a single shaft.

3352. You also know that difficulties are made to be overcome ?—Yes, I know that.

3353. And that many difficulties hitherto considered insuperable have been overcome ?—I have no doubt that ventilation might be much improved ; but I do not see how poor mines are to be developed.

3354. Then it is a question between the lives of men and the development of poor mines ?—You cannot get over this difficulty, that in mines where they have only one shaft the ventilation, as of course must

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be obvious to any one, cannot be perfect; if you put down two shafts you stop the mines at once.

3355. Then you distinctly say, as within the experience of your medical practice, that men working in mines having but one shaft are, as a body, more unhealthy than those working in mines with more shafts?—I have known in some mines, in my experience, where they have had only one shaft, that the men have complained that the air has been very poor, and that they have suffered from it.

3356. And have you observed that they did suffer?—Yes, most assuredly so.

3357. Can you remember, in the case which you have last mentioned, what per-centage of men affected by the bad air came under your treatment?—A very small proportion; very few of the men. We have not any large number of men ever under treatment who are complaining of bad air.

3358. Even in the cases of the worst ventilation?—No, certainly not.

3359. Taking the mining population of the ages between 20 and 30, is there, in your opinion, any considerable proportion of them affected by the air in which they have worked?—Yes; they have not the free action of the lungs that agricultural labourers or persons working at other employments have. I never remember being called to attend a man very ill from poor air; it is the combination; he takes some inflammatory attack.

3360. (*Mr. Fulke Egerton.*) It is in fact a case, I suppose, of weak lung, arising from various causes?—Yes.

3361. From bad air, and from muscular exertion?—Yes; and atmospheric causes.

3362. (*Mr. Kendall.*) Are the cases very rare which you have been called to attend, of men suffering exclusively from having worked in a badly ventilated end, a badly ventilated rise, or a badly ventilated pitch?—They are few. From the general mining work, they are not in the good condition in which other men of between 20 and 30 are.

3363. From the information which you have been able to get from miners whom you see, are you not of opinion that in the majority of mines in this district the natural ventilation, *quoad* ventilation, is good?—I am of opinion that it is good, decidedly.

3364. (*Mr. Austin Bruce.*) Is not the word "good," so used, a relative term?—No, I should say not.

3365. Do you mean that the ventilation in most cases is so positively good as that a man may continue to work in it without bad effects to his health?—I was once under ground, and I know that the climbing hurt me a good deal. I climbed 100 fathoms, and was very glad to sit down every 10 fathoms; it made my heart beat so violently, that it almost jumped out of my side.

3366. Do you consider the greater part of the bad health, which you have described as being almost universal among the mining population, as compared with the agricultural population, to be the effect of bad ventilation, or of fatigue arising from mounting ladders?—I believe that both combined have an influence; but I think that the climbing a long distance has a very prejudicial effect. The heart beats so violently, that the blood is thrown in upon the lungs, and you are obliged to breathe much more rapidly; and a long continuance of that, year after year, acts very prejudicially.

3367. The long practice that a Cornish miner has in climbing, of course makes him bear the exertion of climbing more easily than if he were less practised?—Yes.

3368. Do you suppose that if that climbing were performed in the open air, it would be as injurious to the miner as if it was performed in the mine?—No.

3369. Then the want of ventilation would appear to have a direct effect upon the health of every single miner who descends into a mine?—Most assuredly the want of ventilation has.

3370. Then a miner pursues his occupation, apart from the climbing, under less favourable circumstances than the out-door labourer?—Yes.

3371. Therefore, any large and general improvement in the means of ventilation would improve the general health of the whole mining population?—Yes.

3372. You have stated that many miners have told you that the air in which they worked was all that could be desired?—I have asked them this question frequently, "Are you working in poor air?" "Oh, no, Sir." And some say, "We have too much air, there is a draught." Again, others say, "We are working in very good air;" and others say, "We are working in poor air."

3373. Where the ventilation is well managed, I presume there would neither be poor air nor a draught?—That is the great difficulty to get ventilation of that kind. You find in almost every room, that if there is ventilation at all you have a draught.

3374. But not a cutting draught?—No; there would not be a cutting draught.

3375. Poor air itself is a relative term?—Yes.

3376. Would you not say, if you had to live in the ordinary air that is breathed in a mine, that you were living in poor air?—No. I should not consider that I was living in air equal to what it was on the surface. But that is not what I understood from the miners, or any one connected with a mine, to be poor air.

3377. Poor air, in miners' language, means very bad air, does it not?—It means close air.

3378. (*Mr. Holland.*) In which a candle will hardly burn?—Yes; they put the candles on the level, horizontally.

3379. (*Mr. Austin Bruce.*) Is there not, in your opinion, a great deal of air in a mine which would be unhealthy, although it would be far short of what the miners call poor air?—Yes.

3380. Do you despair of seeing ventilation in mines so improved under ordinary circumstances as to make mining a more healthy occupation than it is at present?—I hope that it will be improved; and I do not despair.

3381. Have you looked into the question of ventilation?—No; it does not fall within our province.

3382. (*Mr. Kendall.*) You have been very little underground, I believe?—Never but once.

3383. (*Mr. Holland.*) Of course there are a great many bedrooms in this country which have no chimneys?—Yes.

3384. And very often the people shut up their windows and doors, and after they have slept in the room the air in the morning is close and nasty?—Yes.

3385. In your opinion, is such a room anything like so close as a mine?—Yes; I should think that the room was closer than any of the mines.

3386. Would the quantity of oxygen be diminished in anything like the same proportion as in a mine; in such a bedroom as I have described, the oxygen would not be diminished one per cent.?—I cannot say. I know that I often go into bedrooms before the doors and windows have been opened, and the air is very impure.

3387. But such air, although sickening to the sensation and very injurious, has not its oxygen reduced by a half per cent.?—That may be so.

3388. It has been given in evidence, that in parts of the mines the oxygen is reduced three per cent. Is it not probable that in other parts of the mine it may be reduced by a much larger per-centage than one per cent?—I cannot say.

3389. It is a well known fact in chemistry, that a candle will burn without any perceptible dimness in oxygen which is reduced from 21 per cent. to 15 or 16 per cent.?—Yes.

3390. It has also been stated in evidence, that in many parts of the mines a candle will burn very dimly; so that it must be reduced nearly to that amount; and that would be seven times as much as in the bedroom we have spoken of?—I cannot speak to that at all. I am not cognizant of the fact.

3391. What is called the miners' complaint is not common consumption, is it ?—It is a sort of asthma.

3392. And a sort of bronchitis ?—Yes, as well.

3393. And also the symptoms of tubercular consumption, all mingled together ?—Yes.

3394. Sometimes one, and sometimes the other ?—Yes.

3395. I dare say you know that the proportion of deaths from consumption among young miners is less than the average ; or are you aware of that ?—No.

3396. Have you noticed that young miners die of consumption in a larger proportion than the young men of other classes ?—No.

3397. At what age does the excess of consumption appear ?—I should think between the ages of 30 and 40.

3398. Not later than that ?—It possibly may be so.

3399. Not between 40 and 50 ?—I should think 50 was late, speaking of those who have fallen under my notice.

3400. Among other persons, not miners, the deaths from consumption occur early ?—Yes.

3401. If a man survives 30, his chances of dying from consumption are reduced ?—Yes.

3402. Is not that a strong argument to show that the miners' consumption is not the same disease as common consumption ?—I do not think it is. Those men who die of miners' consumption are generally ill for years before.

3403. Does emphysema of the lungs, especially if combined with chronic bronchitis, assimilate very closely to consumption ?—Yes ; you would not distinguish them till you came to examine the persons.

3404. Have you had many opportunities of making post mortem examinations ?—No.

3405. Is not the miners' consumption slower in its progress than common consumption is generally ?—Yes, it is.

3406. It lasts three or four times as long, does it not ?—Yes ; they are home with cough and expectoration for two or three years.

3407. In common consumption, considerably more than half of those who die die within a year of the first attack ; is that the case with those who suffer from miners' consumption ?—No.

3408. Do not considerably more than one half of those who die live for two or three years ?—Yes.

3409. And many for ten years ?—I have known them live for five or six.

3410. And occasionally for as many as ten ?—I think it is very likely ; but no one has fallen under my notice that has lived for 10 years after the disease has commenced.

3411. Do not a considerable number of persons who have had pretty sharp attacks of miners' consumption recover, if they leave their employment and go to places where they breathe purer air ?—I should hardly call it miners' consumption then ; but if they get to another employment, they wonderfully improve, and live on for years and years.

3412. Do not a number of miners who, from their symptoms, appear to have consumption, if they leave their occupation, recover and get pretty well again ?—Yes.

3413. Is not that a proof that a great number of cases that appear to be consumption are not consumption ?—They are not, I believe, although a stranger looking at a man would say that he was consumptive; but if they examined him, they would think that he was not in consumption, but had that condition of lung that if you took him away from the mine and gave him out-door employment he might recover. We have had some elderly miners appointed as agents, and they have improved and got quite fat, and everything that one could desire.

3414. The Commissioners have been informed that the miners are very much annoyed by the dust ?—I never heard one complain of the dust in one of our mines.

3415. (*Mr. Austin Bruce.*) You do not think that any disease has been produced by that cause ?—I never heard of such a thing. I was not aware that we had dust in our mines.

3416. You have never heard that the dust is stated to be one of the causes of the miners' disease ?—Never.

3417. Referring to the dust caused by the use of the borer ?—I never heard one of them complain of the dust in my life.

3418. Have you never read any reports upon that subject ?—I have never seen any report of miners being injured by the dust.

3419. But have you never read any medical report in which it has been stated, that the dust is one of the causes of the miners' disease ?—I do not remember ever reading of any dust at all ; and I never heard a miner complain in 20 years about the dust.

3420. (*Chairman.*) If they inhaled dust, would not that be injurious to them ?—Yes ; it is self-evident.

3421. (*Mr. Kendall.*) In your experience of 20 years, you never heard the men complain in this district of the dust ?—Never.

3422. (*Mr. Holland.*) Have the miners much cough before they begin to spit ?—Yes ; they cough for years with very little expectoration.

3423. In those cases, is there much emphysema ?—Yes, I think so.

3424. Is not the emphysema produced by the quick climbing ?—I think it is.

3425. If a man has been breathing very poor air his blood would be deprived of oxygen, and he would, therefore, stand in need of it ?—Yes.

3426. Would not such a man be more likely to suffer than if he had been breathing pure air before ?—Yes.

3427. And be, therefore, more liable to suffer from emphysema ?—Yes.

3428. In a large proportion of the cases of miners' consumption, is there emphysema ?—I believe so ; but I have not had an opportunity of examining them.

3429. Is there very great resonance of the chest ?—Yes.

3430. You have stated that there was very little stomach complaint among the miners ?—Yes.

3431. Is there not a good deal of weak digestion among them ?—They do not complain much of that ; cases of that kind do not fall under our notice.

3432. In ordinary life, one of the commonest causes of weak digestion is poor air, especially among young children ?—Yes ; but we do not have them come in to us with anything of that kind.

3433. (*Chairman.*) Do you ever have an opportunity of making post mortem examinations ?—Never; I think I can hardly recollect a case, except through the coroner. I have tried very hard on one or two occasions, but I have failed.

3434. (*Mr. Kendall.*) Have their friends objected to it ?—Yes; they have. There are some cases that would be very interesting, and that one would like to examine.

3435. (*Mr. Austin Bruce.*) You have stated that the medical men of this district are on the most friendly terms with each other ?—Yes, they are.

3436–7. You have, doubtless, had frequent communications with them, as to the causes of the special diseases from which the miners suffer ?—No, I do not think I have ; it is much more in assisting one another in attending to the cases ; not more than there would be in conversation, I think, as to the causes.

The witness withdrew.

Mr. ROBERT DUNSTAN examined.

3438. (*Mr. Austin Bruce.*) With what mines are you connected ?—With no mine in Cornwall now.

3439. Have you had the management of any mine ?—Yes ; as many as 13 at a time.

LISKEARD.

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3440. In what neighbourhood ?—In this neighbourhood.

3441. How long have you been engaged in mining operations ?—Forty-five years.

3442. In what capacity did you begin ?—As a working boy. I worked at the dressing floor at nine years old.

3443. How long did you continue working ?—For 27 years.

3444. Since then you have been an agent ?—Yes.

3445. Have you observed any improvement since that time in the health of the miners ?—Not much improvement as respects the health of the miners.

3446. What should you say was at this moment the condition of the health of the miners, as compared with the health of the surrounding population ?—A miner cannot enjoy his health like other people.

3447. For what reason ?—From the nature of the employment.

3448. What is there in the nature of their employment that makes the difference ?—Climbing particularly.

3449. Is there anything else ?—Yes ; the foul air that they breathe, and that they are obliged to work in.

3450. In our opinion, can the climbing be got rid of ?—It is got rid of in some instances.

3451. Could it, do you think, be got rid of in more instances ?—Yes.

3452. To what extent do you think it could be got rid of ?—We consider that in an established mine, the man-engine should be employed for lifting the miners up.

3453. Have you ever thought of any other plan than that of the man-engine, and which would be more convenient ?—Yes ; but I do not think that any other plan would be applicable in Cornwall.

3454. Do you think that a man-engine would be too expensive for small mines ?—I think not. I think that a man-engine could be employed very inexpensively.

3455. What do you mean by the terms "an established mine" ?—I mean where a mine has been discovered to contain minerals of sufficient quantity to admit of its being worked to any extent. There are many mines that are very ephemeral.

3456. In all such cases, you think that a man-engine might be employed ?—I think it should be employed.

3457. In your opinion, that would get rid of a great deal of the sufferings of the miners ?—Yes ; the climbing is the great bane of the miner.

3458. Some mischief would still arise from imperfect ventilation ?—Yes.

3459. Has the ventilation been much improved within your recollection ?—Yes.

3460. Do you think that the ventilation is capable of further improvement ?—Yes, in many instances,

3461. Is the best ventilated mine that you are acquainted with as well ventilated as it might be ?—I should say that it is as well as it might be, conveniently to all parties concerned.

3462. But what do you mean by the word "conveniently ?"—It is impossible to have the mines always ventilated. You are probably aware, that there are certain shafts sunk, and the levels have to be driven to some extent before any other communication can be made ; but they must be driven to a certain extent. We sink winzes, and that gives further ventilation; but then the miners do suffer, and they must of necessity suffer, from the point where they drive off from the bottom of the shaft until they meet another point where the winze is brought down to communicate with the level they are driving, to give them ventilation there.

3463. When winzes are driven, is good ventilation supplied ?—Yes.

3464. Could no intermediate means of ventilation be applied ?—It might be done, and it is sometimes done with machines.

3465. Apart from the close ends that you have been describing, do you think that the current of air in the mines that are considered to be well ventilated is as great as it might be, or as would be consistent with the highest state of health attainable by a miner working underground ?—The current of air in well-ventilated mines is quite sufficient. Sometimes we are obliged to put doors, for it is too strong, very often; where we have several shafts in a mine, the current of air is very strong.

3466. Do you think that the majority of the men working at tribute-work are working under as good conditions, with regard to their health, as might be desired ?—Yes ; as far as the air is concerned and ventilation.

3467. Your exception applies to the absence of man-engines ?—Yes. The climbing is the most injurious, I have found it so. I have been climbing ladders now for forty-four years, and I always suffered most from that.

3468. In the case of an ordinary mine, what number of men are usually engaged in work which, in itself, you consider unhealthy ?—That would be the tut work men, generally. The tributors get the healthiest part of it; they are always working, or in ninety-nine cases out of a hundred, between communications, and where there is plenty of ventilation. It all depends upon the productiveness of the mine In some mines the tribute system preponderates ; in poor mines the tut-work is more general, because there would not be ore in sufficient quantity to employ tributors. It varies according to the quality of the mine, as well as to the extent of it.

3469. Within what limits does it vary ?—I do not think that there is any rule for it. I was in Fowey Consuls for eighteen years, and that was one of the most productive mines in the county at one time. We were 1,100 men there, and I should think that 500 out of the 1,100 were tributors. In the West Caradon Mine, that I managed for eleven years, we had 500, and about 200 of them were tributors.

3470. In each case the majority consisted of tut-work men ?—Yes, I think so. It must be a very good mine where the majority are tributors.

3471. Of the tut-work men, how many were working in places which, in your opinion, were more or less unfavourable to good health ?—That varies, because if I commenced to drive a level to-day from a given shaft, the further I depart from the ventilation, and from the pure into the impure air, I create impurities, I destroy the oxygen ; and the further I go, the worse the air is.

3472. The moment you leave the best ventilated part, you begin to suffer, however small that suffering may be ?—Yes, you continue to grow worse.

3473. How many tut-work men, in your opinion, are working in places less favourable to health than those in which the tribute men are working ?—All the tut-work men.

3474. You think that all of them are working, more or less, in places unfavourable to their health ?—Of necessity.

3475. You say "of necessity;" that means, I suppose because they are not reached by the ordinary means of ventilation, which is adopted in the district ?—They are reached by the ordinary means.

3476. But not to the same extent as the tribute men ?—No ; because the tributor is working between two chimneys, as it were, or between the channels of communication.

3477. (*Mr. Holland.*) In your mine, do all the tut-work men work in such air that you would improve it if you could ?—Yes, except those who work in an immediate draught; I mean all those who are working at a distance from a communication. A man may be working in pure air to-day, and a communication may be made by means of a winze, and he will be in a better part to-morrow ; and another, who was in the best air six months ago, may now be breathing impure air.

3478. (*Mr. Austin Bruce.*) Do you consider that if the condition of the air in which the tutwork men

are now working were a fixed condition that means would not be taken to supply them with as good ventilation as the tribute men enjoy ?—Yes; it could be done.

3479. And the reason why they are not so well supplied is, that their condition is constantly changing ?—Yes.

3480. Do you consider that all the means have been exhausted by which ventilation can be provided for the tutwork men ?—No, certainly not.

3481. Even in the best ventilated mines ?—No.

3482. What would you do to improve the ventilation of the closed ends ?—You could erect an engine, if you pleased, to drive air to them.

3483. Do you believe that in most cases that could be done at an expense which would not be injurious to the adventurers ?—It is done now in many instances.

3484. Then is it from a want of an intelligent appreciation of their own interests that these ventilating engines are not employed by the adventurers ?—I should not very well like to answer that question, because I should be, as it were, condemning the intelligence of those parties.

3485. Do you believe that a good system of ventilation would be as much for the interests of the employers as the employed ?—Yes, and more so. No man can do half the work where the air is bad; not one quarter of it.

3486. Do you think that good ventilation is nearly in all cases within the reach of the employers ?—Yes.

3487. And, therefore, if they neglect it, it is from want of understanding the advantages of good ventilation ?—I think that if the adventurers generally understood practical mining better, they would, to secure their own profit, adopt means to promote the interests of the miners.

3488. Do you think that agents are often interfered with by the adventurers in their plans for the improvement of ventilation ?—I never was.

3489. Do you think that other agents are ?—I cannot think for others.

3490. In the mines in which you have been engaged were there no close ends that were insufficiently ventilated ?—Yes. I have worked in places where I have been obliged to keep the candle six feet behind me, for a man can breathe where a candle will not burn.

3491. Can a man breathe where a candle will not burn without injury to his health ?—Certainly not.

3492. (*Mr. Kendall.*) As I understand you, the tut-work is very different from the tribute-work ?—Yes.

3493. Tribute-work is all ventilated; tut-work is not ?—Yes.

3494. But in well-conducted mines, is not the air generally forced where it is required into the tut-work ?—Yes.

3495. But that is generally very inferior, is it not, to natural ventilation ?—Yes.

3496. Your experience leads you to think that, with reference to ventilation, there is sometimes false economy, and a want of due consideration for the miner's health ?—Yes.

3497. And great improvements are required ?—Yes.

3498. (*Mr. Holland.*) Do not the adventurers always object to every expense they can avoid ?—No.

3499. (*Mr. Kendall.*) As far as your experience goes, do not the adventurers listen to the advice of their agents ; and have you ever known a case in which, when the men complained of bad air, and it was ascertained that there was bad air, the agent has refused to do his best to remedy it ?—Never.

3500. Is it the common habit to say to a man, "If you do not like to do that, we will find somebody that will" ?—Never.

3501. (*Chairman.*) Suppose that the men complain of poor air, what does the agent do ?—He takes steps to remedy it.

3502. In the meantime does he stop the work ?—Sometimes he is obliged to do it.

3503. But not always ?—No.

3504. What steps does he take to introduce better air ?—He employs some of the machines that I have spoken of; sometimes a fan machine; at other times it is worked by a box.

3505. Then the work must be stopped, must it not, until he has provided those means ?—Yes.

3506. Do the tut-work men receive any pay when the work is stopped ?—Sometimes they have none, and sometimes other places are provided for them in the meantime.

3507. But sometimes they have no pay to receive ?—No.

3508. Do you think that the men who are dependent for their livelihood on their labour would rather go on driving in poor air than leave off ?—They would rather go on as long as they can.

3509. As long as their powers would permit them to do so ?—Yes.

3510. You have said that the levels must be driven until you come to where you can either put down a winze, or come to another shaft ?—Yes.

3511. What means would you use there to introduce air ?—The best means is a waterfall, where you can command it.

3512. But suppose you could not command it ?—Then you must drive a machine, either by manual labour or by an engine.

3513. Do you mean an air machine attached to the main rod of the engine ?—Yes.

3514. Does that exhaust the air, or introduce fresh air ?—We like to drive fresh air in.

3215. Do you convey it through iron pipes or zinc pipes ?—Zinc pipes are the best.

3516. Do not zinc pipes corrode very much ?—No. Wood is porous, and that takes up a great deal of air.

3517. Can you mention any mines about St. Austell, or in the neighbourhood of Redruth, where these engines are at work ?—They are, more or less, at work in every mine.

3518. Have you any mines where we could see the machines at work pumping in the air ?—No.

3519. How long is it since you visited any of those mines ?—I am constantly visiting them ; but not with a view to look after that part of it. I go to inspect the mines, to see what they are worth.

3520. For the brokers ?—No ; for the adventurers.

3521. And then you report to the adventurers ?—Yes.

3522. When you are sent to inspect a mine by any adventurer, do you report to him as to the ventilation and the working ?—Yes ; I report upon the whole working of the mine.

3523. As well as the value of the mine ?—Yes.

3524. In your experience, as a captain, do you think that the health of those who are working in the mines is worse than the health of those who work above ground ?—Yes, certainly ; always.

3525. By what, in your opinion, is that caused ?—It is caused by three things. Principally it is caused by climbing the ladders ; a deep mine is very injurious for that ; and it is caused by breathing impure air ; and it is caused also by taking frequent chills and colds. When a miner gets to work his work is very laborious, and he gets very hot, and he then, of course, cannot continue at it; he gets into a very high state of perspiration, and goes back to rest himself, and then there is a cold chilliness in all that is about him, and he takes cold. Miners are seldom free from colds, and that brings on an affection of the chest ; and there is a complaint which is peculiarly known as the miner's consumption; it brings on an asthmatical complaint, and an affection of the heart, and two or three things altogether, which seem to cause a peculiar miner's complaint.

3526. You say that they catch cold from waiting ; do they ever stand upon the ladders before they come up ?—They are obliged to do that, for no man can climb 100 fathoms right away.

3527. Do they wait above the adit level on the

ladder ?—Yes, some do ; but that is their own fault. They are not allowed to come up generally. There must be discipline where there are 400 or 500 men.

3528. But they do come up and wait there, do they not ?—Yes ; I have done it myself.

3529. That is because they would be fined if they came to the surface ?—Yes.

3530. By what means does a miner ascertain what the time is ?—He can tell by his candles.

3531. Is no signal sent down to him ?—No.

3532. When a miner has completely blasted his holes, which I suppose he does generally near the end of his time, where can he go ?—It is a great folly to detain him. If a man is working in a close place he blasts his holes, and then the place is not fit to go into for hours, for it would be very injurious to breathe the hot powder smoke. It is, therefore, great folly to force a man to do it when he can help it. I could overcome that by giving men a fair price for their work, and let them get as much as they can get.

3533. Might not a miner be allowed to come above ground, and go to some place and wait ?—He would not want to wait ; he might come up and put on his clothes, and go home ; there is no object in keeping him waiting.

3534. But what security would you have that a miner did the full extent of the work he had undertaken to do ?—You do not want any security if a man is not paid for more than he gets. We have what is called stent ; and the meaning of that is, that a certain portion of work is set to a man, and he has a certain amount paid to him for doing it ; so whether he does it in six hours or eight hours it matters not to the miner.

3535. Then why do you suppose that the rule is so very general that the miners are not allowed to come to grass ?—I have no supposition upon the point ; I know it.

3536. But why should it be so general ?—I can hardly tell. I never could conceive the reason for it. I know that there is no good in it.

3537. Is it not injurious to the men ?—Yes.

3538. (*Mr. St. Aubyn.*) The men are not paid by the time, but by the piece ?—Yes.

3539. Then what is the object of fining them for not keeping time ?—I suppose it is just this, that if you have a very expensive mine with three or four steam engines going, and there are agents and a whole staff of people to be supported, that amounts to a certain amount of dead weight upon the mine, and you want to get out of the men as much labour as you can ; and it is always the case that men differ from one another ; some men are not very industrious. Suppose, for example, we had four engines working, and burning 1,200 tons of coal in a month, then there would be agents to the extent of 50*l.* a month, and all the other expenses to meet, and machinery to keep alive. You would want some labour to be done ; and suppose the men did not labour at all, but made it an object always to do this, sometimes they might come to a change in the ground, and they would wait ; they would not want to go through that piece of ground, as it would want an increase of the price.

3540. Because it was more difficult to work than they expected ?—Yes.

3541. While the men are paid by the piece is it not more profitable for the adventurer that the men should do their work quickly rather than slowly ?—Yes.

3542. Then what security would you have that the men while underground were working, and that they were not sitting down idle ?—None whatever ; but a practical miner can tell whether the proper amount of labour has been done.

3543. For example, you could tell nearly what a man ought to do ?—Yes.

3544. (*Chairman.*) That is the business of the underground captain, is it not ?—Yes.

3545. (*Mr. St. Aubyn.*) But if he is not present how is he to prevent a man sitting down for the last half hour that he is down ?—The common rule is, when the agent comes in, for the men to sit down ; they never work while he is there ; he would want to look at the lode, and see what the work was worth ; and the common practice is, that the miners, who are a very civil class of men, as soon as the agent comes in, stop their working, and they go back for him to examine the work.

3546. (*Chairman.*) Suppose there was half an hour or a quarter of an hour's law given before they were allowed to come up, do you think that would be abused ?—It would amount to the same thing precisely. I see no good whatever in keeping a man from the adit between the adit and the surface till the bell rings ; there is little good in it ; it is not carried to the same extent as it used to be.

3547. But it is carried out to some extent ?—In some mines I dare say it is.

3548. (*Mr. St. Aubyn.*) Self-interest will generally induce a man to work as long as he can, will it not ?—Yes ; and the great point is to give a man as much work as he can do in a month, and a fair price for his labour ; that is all that is necessary.

3549. You stated that a rule was adopted to restrain as far as possible any idling in the bottom of the mine ?—In the best regulated mines, where the agent is not cramped by the adventurer, and where the agent is an intelligent man, he gives a fair price for the work that he has to let, and gives a man as much work to do as he can during the month. Then a man, if the system of what is called the monthly allowance is not adopted, thinks that he may get 4*l.* or 5*l.*, and there is no restraint upon it ; he is allowed, by dint of his own skill and manual strength and industry, to do what he can, and then he pursues his labour with a greater degree of interest. But the other system, where the monthly allowance is made, entirely destroys that.

3550. Will you be good enough to explain what you mean by the monthly allowance with reference to tut-work ?—The monthly allowance is of this kind. When a man comes into a mine and asks for work, he also says, "What do you allow ?" "We allow 3*l.* or 3*l.* 5*s.*" Then if the adventurers are close upon the agent, the agent is not expected to allow a man to get more. And I mean that that system destroys the energies of the men, because the miners are a calculating body of men, and a miner says, "I must not get more than 3*l.* or 3*l.* 5*s.* I may as well get it easy as hard." But if the captain or the manager is unshackled, and he is allowed the full exercise of his own judgment in conducting the whole of the operations of the mine, he would do as I have said. I will just give the Commissioners my own history upon this matter. When I have been asked this question, "What do you allow ?" I have said, "Nothing ; I make no allowance. I fix the price upon the work, and you may get as much out of it as you can. You may get 3*l.*, 4*l.*, or 5*l.* ; there is no stint to your getting." Then a man goes to work, and uses his best skill and his best energies.

3551. What is the price per fathom that is paid to the pairs ?—I have known it vary from 7*s.* 6*d.* to 30*l.* a fathom, according to the hardness of the ground.

3552. And nothing else ?—Yes ; there are other circumstances. For instance, poor air would come into consideration ; but the hardness is mostly the cause.

3553. (*Chairman.*) If the miners are working in poor air is that taken into consideration, and is a larger allowance made to them ?—You must give them more, or they could get nothing. They could not do half the work that they otherwise could do.

3554. Then it would be clearly for the interest of the adventurers that a mine should be well ventilated in order that the men might do more work ?—Yes ; but take what care you can, the men must of necessity be exposed to foul air.

3555. (*Mr. Fulke Egerton.*) I think you stated that you thought it would be advisable in all old established mines that there should be man-engines ?—Yes.

3556. Is not the expense of the kind of man-engines to which you have referred very considerable ?—I am not aware that it is.

3557. Do you happen to know what the expense of a man-engine is in a mine, such as there are in the West, 300 fathoms down ?—No ; I do not know the expense of a man-engine to that extent. It does not require great power, I think.

3558. (*Chairman.*) You are probably not aware that the cost has been stated to the Commissioners to be 2,000*l* ?—I should not think it was so.

3559. (*Mr. Austin Bruce.*) Do you consider that the wire rope of the usual engine employed in collieries could be adopted in this district ?—The wire rope is used in this country already.

3560. But it is not used, is it, for drawing men out of a mine ?—No.

3561. (*Chairman.*) Do you know of any mine in this district where skips and wire ropes are used to carry the men up and down ?—No ; I know of no such thing in this county.

3562. Do you know the South Francis Mine ?—I do know it.

3563. Do they not use them there ?—If so, it has been a very recent introduction, and the men may ride up in it ; but I inspected the mine a short time ago—at all events some two or three years since—and they had not got it then.

3564. (*Mr. Fulke Egerton.*) Do you know any reason why those engines and the wire ropes should not be adopted in most of the mines in Cornwall ?—I do not think that our shafts are adapted for them.

3565. Is that because they are not wide enough ?—No ; I do not know that. Our perpendicular shafts would be wide enough, but they have never been constructed for that purpose.

3566. (*Chairman.*) Have you ever visited any collieries to see the way in which the men go up and down in skips ?—No ; I have been mostly after lead and copper.

3567. A man-engine, I presume, is only applicable where the shaft is perpendicular ?—Yes ; but it might be used diagonally.

3568. But not where there is a curve in a shaft ?—No ; it must be straight.

3569. Are there mines in which they have followed the lode ?—Most of our shafts are like where they follow the lodes, and the lodes are crooked.

3570. In those cases a man-engine could not be very well used ?—No.

3571. Some expense must be incurred in order to adapt the shaft for the use of a man-engine ?—Yes ; but I think that when a mine is opened, and there is a sufficient prospect of the mine becoming a lasting and productive mine, it would pay handsomely to sink a shaft for the purpose.

3572. Have not many of the large mines been opened for some time, and yet are not productive ?—Certainly; but there are very few men employed comparatively in the unproductive mines. A man-engine should be always put into the productive mines.

3573. In a young mine, after the shaft has been sunk and the men are driving a level, do you think it would be advisable to put up another shaft, or how would you provide air ?—By a machine for the purpose attached to the engine.

3574. When the late workmen are boring a hole, how many holes can a pair drive in hard ground ?—I have seen rock of such a kind that it would take two men the whole of eight hours to bore 12 inches.

3574*a*. In some kind of rock would it be possible for a man to drive as much as three holes ?—Yes, and six holes.

3575. But if the air was bad what number of holes could he then drive ?—If the air was very bad he might go in and bore two before he blasted, and when he had done that he might leave.

3576. In changing the cores at the hour of changing may the men leave their work below, before the other men go down ?—Yes, and they do. They generally calculate to blast on leaving, and then of course there would be an hour before it would be fit for any person to go in again, and then the pair manage to come up, and the other pair would be going down.

3577. Do you consider that the miners do suffer in their health generally ?—Yes, and they are badly paid too as a body.

3578. Are the miners badly paid ?—Yes, as a body they are.

3579. Do you think that they get sufficient food, considering the work they have to do ?—No, I do not, very often many of them.

3580. Many men are working in low levels in a hot temperature, but they do not get sufficient food to make up for the waste ?—Nor do they get the food that their appetite requires, because miners have very delicate appetites.

3581. What do you think that arises from ?—From the foul air.

3582. So that they are not able, even if their wages allowed it, to take sufficient nourishment to supply the loss ?—Yes, they would ; but it must be a better class of food than what the labouring people get generally. If a man has a family the wages allowed generally are not equal to the price of provisions.

3583. What do the tut men receive after all deductions are made ?—I suppose they get from 3*l.* 5*s.* to 3*l.* 10*s.* a month, which would be a fair average.

3584. What is the amount of the house rent which they have to pay out of that ?—That is daily ; the firing is daily ; and they are exposed to a great deal of imposition in many ways. They are only paid once in a month, and they go in debt to the little shopkeepers, and they pay the dearest for everything.

3585. Are they not one month in arrear ?—Yes.

3586. And a man just commencing to work must work for two months before he receives his pay ?—Yes.

3587. During the first month does he have credit ?—Yes.

3588. In some mines they allow subsist money, do they not ?—Yes, in some mines.

3589. If not, the miner must deal on trust at the shop ?—Yes.

3590. You have stated that the men catch cold ; do they take cold on account of the bad changing houses ?—I should think not ; they are generally pretty well provided.

3591. Are their changing houses good ?—I think so, generally. In large established mines we have drys, and men are put there to dry the clothes for the miners.

3592. Are those drys attached to the engine house?—Certainly not.

3293. Do you think that there are no instances of that kind ?—There may be isolated cases ; but generally there are drys built for the purpose.

3594. (*Mr. St. Aubyn.*) You stated at the beginning of your evidence that the climbing up of ladders was one of the principal causes of the bad health of the miners ?—That is the great cause. I have known men in West Cornwall who died on the ladders. They have come up to the top of the ladder, and then dropped down dead suddenly from disease of the heart brought on by climbing.

3595. In your opinion would the adoption of a man-engine, wherever it was practicable, entirely prevent that one cause of illness ?—From that particular source.

3596. The obstacle in the way of adopting the man-engine, I think you said, was the expense ?—No.

3597. Then what are the obstacles in the way of adopting a man-engine ?—I think it is for want of preparing for it in the outset of infant mining. It requires a given condition of shaft ; and if the adventurers were wise as they ought to be, they would prepare for that in the outlay of the mine.

3598. It being necessary that the shaft should be straight ?—Yes.

3599. Where the shaft follows the course of the lode, and there are curves, I suppose it would be impossible to have it ?—No.

LISKEARD.

Mr. R. Dunstan.

19 April 1268.

3600. Do you think it would pay if you were to sink a shaft straight down, and drove levels from it merely for the purpose of having a man-engine?—Yes; and I could give statistics that would show clearly that it would in any mine of any considerable extent, even now, pay for itself in 12 months, from the amount of labour that would be saved.

3601. You are acquainted of course with many mines in this county, and you know a great many mines where there are not at the present time man-engines?—Yes; there are very few in the county.

3602. Where you think there might be?—Yes; there ought to be man-engines in all this district.

3603. In the case of sinking a shaft in a new mine, at what depth from the surface should you think it necessary to adopt a man-engine?—I think that a miner ought not to be required to go further than 100 fathoms down without a man-engine.

3604. Why do you fix upon that particular limit?—I suppose it is mostly from this: I know from my experience, having begun mining so soon, that we did not call 100 fathoms very hard work to get up, but I know that I should find it so now.

3605. Would it not be less hurtful to a miner if he had a man-engine, even at a smaller depth than that; for instance, even at 60 fathoms?—Yes, quite so; or at 50 fathoms.

3606. You would think it a good thing, and that it would pay, to have a man-engine at so small a depth as 50 fathoms?—Yes.

3607. (*Mr. Fulke Egerton.*) You think that the best way of working a Cornish mine would be to do as they do in the coal districts; that is, to sink a shaft, and take the men up and down by some mechanical means instead of by ladders?—Yes, to bring them up; the going down does not hurt them.

3608. (*Mr. St. Aubyn.*) Do you know of any mines where the men are brought up by the means either of kibbles or of skips?—I do not. The men have a great objection to come up in kibbles.

3609. Might not some kind of basket or chair be made which they could be drawn up in comfortably?—I dare say it might be, but I should prefer a man-engine. I should not like to trust myself in a skip. I would rather come up by the ladders.

3610. Why should you mistrust the skip?—The chains break so very often.

3611. Are you aware that the chains are used in mines in other parts of England?—Yes.

3612. Do you think that they frequently break?—Yes.

3613. Do you know that as a fact?—Not from my experience; but the papers show me that there are many accidents; but we have fewer accidents in Cornwall than anywhere else.

3614. (*Chairman.*) Are you aware that in some instances, when man-engines were first introduced, the men were afraid of going up in them?—I think it is very likely they were.

3615. But when once they had tried them, their dislike ceased?—No doubt of it.

3616. (*Mr. St. Aubyn.*) If it were proved, after a certain time of trial, that the skips were not dangerous, do you think that the men would then object to going down in them?—They would get accustomed to it, no doubt; men get inured to danger. But the great point is to provide the means; not to cultivate the nerves to enable a man to face danger, but to protect him from danger.

3617. How long does it take to bring the men up in a man-engine?—Not many minutes. I should think that a man would come up in ten minutes in a man-engine; whereas it would take him two hours by manual labour to come up the ladders.

3618. Have you ever made a correct calculation of that?—No.

3619. What length of time does it take a man to come up by the ladders in any mine that you are acquainted with?—Par Consols is something about 240 fathoms deep, and it takes them an hour to come up; no man ought to come up 220 fathoms in an hour; it ought to take him an hour and a half.

3620. How long would it take him to come up by a man-engine?—Ten or fifteen minutes.

3621. And that would be done by no kind of risk or fatigue?—Yes.

3622. How far does he come up each lift?—Twelve feet.

3623. (*Mr. Fulke Egerton.*) Is there any danger of any kind connected with man-engines?—I think not; there would be danger if a man put his head back, and did not stand in his proper position. If he was caught under the chamber he must be crushed.

3624. (*Chairman.*) It would be necessary for a man to be very attentive to what he was doing at the time?—Yes.

3625. Do you think it desirable that any provision should be made when the women are working on the surface to enable them to work under cover?—They are generally under cover; but there is some work that they have to do when they cannot be under cover; but generally they are under cover.

3626. Have they any room to go to to eat their meals in, or should any provision be made for that purpose?—That might be done; but then they have generally a place to go to.

3627. Are they not obliged to go to the smith's shop, or to some place where the men are?—They are not obliged to go there.

3628. Generally speaking, in mines, you say that there are some places for them to go to?—Yes, in the mines that I have managed.

3629. And also in the mines that you have inspected?—Yes, in the mines that I have inspected as well.

3630. Is there anything objectionable that you see in the employment of women on the surface?—I think it is very desirable to get better employment for them; but they are very useful to us, and it is much better employment for them than they would get in the factories; they are very well taken care of, they are well paid, and generally are well behaved.

3631. Do you think that they are well-conducted?—Yes; I know that they are, as a body, well-conducted.

3632. I suppose it is only in youg mines that there is but one shaft?—Some mines are worked to a considerable depth without more than one outlet; but it is never safe to do so. In well-conducted mines we do not allow the men to travel through the shafts; there is a private footway on purpose for them.

3633. When there is only one shaft, it is divided between that and the ribbles, is it not?—Yes; and then there is an engine working up and down which makes it dangerous for the men to travel through. All mines should have a private footway apart from all the engines.

3634. So that if any obstruction happened in that one shaft the men would have a way to retreat?—Yes.

3635. Are the shafts lined with wood?—Yes; but some of the footways in them are very bad. The ribbles falling away knock away the casing, and make large holes, which render it very dangerous.

3636. That is, if any material were to fall down and break through the division, it might endanger life?—Yes; many men have been killed by it.

3637. Is there any security that the ladders are in good condition?—Sometimes the ladders are injured by the falling away of the kibbles.

3638. Is there any periodical inspection of the ladders?—Not that I know of.

3639. All the bars are made of iron, are they not?—No; they are made of wood.

3640. If made of wood, are they not liable to rot and to break?—Yes; they wear very thin, and then break.

3641. Then, of course, that is very dangerous for the men?—Yes, of course it is; and men fall off the ladders sometimes.

3642. How does that happen?—We can hardly tell that. Perhaps one or two of the staves are broken,

and a man coming down, and not holding on to the stave above, has a sudden jerk and goes away.

3643. Do you not think that there should be better security, and that the means by which the men go down or come up should be improved?—I think that the footways are very often neglected.

3644. (*Mr. St. Aubyn.*) Is it not the business of the underground captain to look after the ladders?—Yes, it is; but when you have only one shaft for the engine-cradle and the kibble, there is not sufficient room, very often, to make it a good and a safe footway.

3645. (*Chairman.*) You would recommend in any mine that there should be always a separate footway?—Yes; there should be a separate footway; a mine is not safe without it.

3646. Do you suppose that many of the shafts and footways in the mines of this county are in bad condition?—I know some that are.

3647. And those ought to be specially inspected?—Yes, they ought to be inspected.

3648–78. Do you think it is desirable that the Commissioners should enquire into that point?—I do not know the object of the Commission exactly, but it is for the safety of the men that it should be enquired into.

LISKEARD.
Mr. R. Dunstan.
19 April 1862.

The witness withdrew.

Adjourned to St. Austell, at Ten o'clock on Monday next.

REFORM CLUB

ST. AUSTELL.

Monday, 21st April 1862.

PRESENT:

The Right Hon. LORD KINNAIRD, K.T.
The Hon. A. FULKE EGERTON, M.P.
NICHOLAS KENDALL, Esq., M.P.
H. AUSTIN BRUCE, Esq., M.P.
JOHN ST. AUBYN, Esq., M.P.
P. H. HOLLAND, Esq.
RICHARD DAVEY, Esq., M.P.

THE RIGHT HON. LORD KINNAIRD, K.T., IN THE CHAIR.

Mr. WILLIAM WALE TAYLER examined.

3679. (*Chairman.*) You are a Fellow of the Royal College of Surgeons, and a Licentiate of the College of Physicians of Edinburgh?—I am.

3680. You have resided for a long time in this district?—Twenty-four years.

3681. And you have been in the habit of attending miners for how long during that period?—During the whole of that period.

3682. Will you state to the Commissioners your observations with regard to the health of the miners during that period?—In the early portion of that period there was a great deal of sickness among the miners; there was a great deal of heart disease and consumption.

3683. Of what mines are you now speaking?—The Fowey and Par Consols mines. But of late years sickness has very much decreased; in fact, I promised to bring two persons here to-day who are suffering from consumption, and those are the only two decidedly bad cases which I have found in the whole district. They are not able to attend; they are too ill; they are confined to their bed.

3684. Out of what number of miners is that?—I should consider that on the average my district comprises about 350.

3685. In the two mines?—Yes. There is another mine, the West Fowey Consols, which is a very small mine at present, I should call the number 350 altogether.

3686. Are these men working underground?—Yes, all underground.

3687. Are you the only medical practitioner who attends at those three mines?—No; Dr. Pace has a greater portion of them than I have. I attend about 350, and I suppose that he attends about 550, or something like that on a rough calculation.

3688. How are they divided?—Into separate districts; the surgeon of one district does not at all interfere with another.

3689. It is according to the district in which the miners reside?—Yes, a line is drawn between the two.

3690. Without regard to which mine they work in?—Yes; it is divided into the east and the west district.

3691. With regard to the state of disease in the first period to which you refer, was that consumption, or heart disease, or stomach disease?—Principally disease of the lungs. I should say that there were double the number of cases of disease of the lungs to heart disease.

ST. AUSTELL.
Mr. W. W. Tayler.
21 April 1862.

3692. In your opinion, by what was it occasioned?—A great deal of the disease, no doubt, was hereditary; a great deal of the disease was also from the nature of the employment from climbing ladders. The Fowey Consols mine was in some parts very deep indeed; I think nearly 300 fathoms deep, and very hot. Another thing is that the men were in the habit after climbing, frequently almost in a nude state, of running across the ground to the changing house, and then walking four or five miles to their homes. Since then they have for the most part resided in the immediate vicinity of the mines.

3693. You say "running across to the changing-"house," are the changing-houses of these two mines to which you have referred, at a considerable distance from the footways?—Not a considerable distance. I forget about the changing-house then, because there has been an alteration. I suppose that the changing-house then was very near the principal shaft; the new shaft for the man-engine, as it is termed, has altered that. I suppose that it is at a little distance from the changing-house.

3694. Have you been into the present changing-house?—I do not think that I have.

3695. Do you consider that the nature of the changing-house has at all to do with the health of the men?—No, I do not think that it has.

3696. You do not think that in changing where it is open and exposed to the weather, it would be liable to give them cold?—It would if it were open and exposed to the weather. I have seen the changing-house at Par Consols; I do not think that that is open to the weather.

3697. Supposing that there was a changing-house where the roof was very low, where instead of windows there was nothing but openings, where it was exposed to the draught, and where it was badly ventilated, would it, in your opinion, be likely to affect the health of the men?—I should think that it would certainly be likely to give them cold.

3698. Would they be affected at all in their health by the dust from their clothes?—No, I think not; but there is one point which I forgot to mention, and I think that it is a very important one, namely, that

the miners, in working, necessarily inhale a great deal of small particles of copper.

3699. That is to say, that when they are boring at a dry end you think that they inhale the dust from it?—Yes, and that is injurious. A miner was telling me that he suffered so much in that respect, that he used to avoid opening his mouth, and breathed entirely through his nostrils, and he found a quantity of dust accumulated in his nostrils through doing so, which would otherwise, as he imagined, have gone down his throat.

3700. Is that miner in the district now?—Yes, he suggested that it would be a very good thing if the miners were all to wear moustaches, that it might very much prevent the dust from entering the throat.

3701. Do none of them wear moustaches as a general rule?—I think that some of them do so, but not as a general rule.

3702. And you think that it would be the means of preventing dust from entering the throat?—Yes. It is very odd that the miner's breath should seem to be so strongly impregnated with copper; you can smell the copper as distinctly as possible; at times I have noticed it in the surgery, so that they must inhale a great deal of it.

3703. And it must be injurious?—Highly injurious, and it produces greatly bronchial affections.

3704. (*Mr. St. Aubin.*) That comes from the breath, and not from the clothes, I suppose?—Not from the clothes at all.

3705. You are sure that it comes from the breath?—I am sure of it.

3706. (*Chairman.*) You say that the heat at the bottom of the mine is very considerable; I suppose that you have no means of knowing the highest temperature at the bottom of those two mines?—I have no means.

3707. But would working in that heat in itself be injurious?—I do not think that it is, because I will show you two men, one of whom is 66, and the other is 57, and they can speak for their comrades; they have worked in the deepest part of the mine for many years, and they do not seem to consider that it is injurious.

3708. Working in that temperature, I suppose, must be attended with loss of weight?—Yes, a great loss of weight.

3709. Have you ever known or have you any information as to what has been lost in weight by a man working in that way?—No, I have no idea of the amount; I have never had an opportunity of ascertaining it.

3710. I suppose that they require an additional amount of good food to make up for the loss of that weight?—Yes.

3711. Do you think that what the miners working in that depth are able to earn is sufficient to provide them with an amount of animal food to make up for the loss sustained in working in those hot mines?—I think that, as a general rule, a miner's wages, that is to say, the wages of a tributer, are very uncertain; it must be so from the nature of his employment; it is a speculation.

3712. Therefore when he is not earning he must have less food?—He must have less food.

3713. With regard to the tut-work men, do they work in that hot temperature?—I suppose that they are not exposed to so much heat as those who are working in the deep passages, or whatever they may be termed; but I do not know much of the interior of a mine.

3714. In examining any of your patients, have you ever put the question to them as to the amount of food which they have; whether it is sufficient to keep up their strength; and can you tell us the amount of food which they obtain?—The miner unfortunately does not eat much animal food,—not the quantity which he ought to eat,—because the diet of the country is principally pasties; they make almost everything into what is termed a pasty, and they prefer that.

3715. Will you describe what the pasties are composed of?—Pasties are composed of a crust of flour and various kinds of vegetables, potatoes, and onions, and apples, and a very little meat, all combined together very frequently.

3716. In your opinion has that description of food sufficient nutritive qualities in it to make up for any great loss of weight by the exertion incident to working in a hot mine?—I think that they ought to eat more animal food, but I do not think that you could prevail on them to do so. I think that they prefer the food which they have been in the habit from their childhood of partaking of; whatever their wages might be, I do not think that they would alter their diet. I have often remonstrated with them upon the small quantity of animal food that they consume.

3717. In your opinion, they do not consume a great amount of animal food?—No; I should say not one-half so much, taking the average, excepting in some very bad labouring districts, as the agricultural labourers, not, for instance, the Dorsetshire labourers, or some others, who have been prominently brought forward; but taking the average, I do not think that they consume so much animal food, and in fact they do not wish to do so.

3718. When they return home after working at the mine, from your own knowledge, can you say what they have then?—That is their principal meal; they are very fond of fried bacon and eggs, then they have what is called a supper, and they generally do not eat pasties at that time; it is more miscellaneous, broth and vegetables and bacon, and of course some meat.

3719. That is their principal meal?—That, I should say, was their principal meal decidedly on a week day.

3720. And it does not comprise much meat?—The meat is very small in proportion, it is not so much as it ought to be.

3721. Can you give the Commissioners any information as to how we could ascertain the amount of meat which ordinary miners, as a general rule, consume?—I think that it could be ascertained by taking the butchers in either of the towns, and by making a calculation of the number of butchers, and the quantity of meat which they sell, and the number of men; I made a rough calculation once, and I was quite astonished at the small quantity of animal food, considering the population.

3722. But your opinion is that, considering the work which miners do, it would be very desirable that they should have more animal food?—Yes.

3723. With respect to the air, do you think that working in a bad end with poor air is a cause of the illness of the miners?—Undoubtedly, that is one cause.

3724. What effect does that produce?—It lays the foundation of disease; it affects the lungs, and no doubt produces consumption.

3725. Has a miner ever described to you the effect on his feelings of working in poor air?—No, I cannot say that I recollect any instance of it.

3726. Another cause which has been stated to the Commissioners as being injurious to the miners, is the climbing of ladders; what is your opinion upon that point?—That is highly injurious, and that, I think, is the principal cause.

3727. Is a man climbing a ladder differently affected if he has been working where there is plenty of air, than if he has been working in a poor end; does he feel a different effect?—I can hardly answer that question.

3728. None of your patients have made any statement to you upon that point?—No; I think that there are two men who will be able to answer that question much better than I can.

3729. What is the general effect of climbing a ladder?—It is calculated to produce enlargement of the heart.

3730. Does it produce any other effect—does it affect

the lungs, for instance ?—Yes, it also lays the groundwork for consumption in many instances.

3731. Have you ever had an opportunity of making a post-mortem examination ?—I never have. I have been very unfortunate in that respect; it is very rarely that it is to be obtained.

3732. Will you state to the Commissioners how you judge that the effect of this climbing is on the heart—does it produce disease of the heart ?—It gradually produces it. Of course, if you tax any muscle beyond its proper strength it must produce disease, and the muscles of the heart being exercised beyond their proper power, become diseased.

3733. How does that extend to the lungs ?—Sometimes it does not extend to the lungs ; sometimes it causes disease of the lungs separately.

3734. Sometimes they are suffering merely from heart disease ?—Yes ; and we have had a great deal of it ; but since the introduction of the man-engine it is greatly on the decrease.

3735. Have you had cases of sudden death occasioned by heart disease ?—Very few.

3736. Do you know of any case where, after you have had a patient brought to your notice affected in the way you state, by heart disease, it has been perfectly cured by leaving the mine ?—Yes, they have been perfectly cured, and have resumed their occupation at the mine.

3737. And was their return to work attended with any recurrence of the same symptoms ?—There is a man coming here who had extensive heart disease. He ceased from working for several years and resumed his labour at the mine, but he found that he was getting worse—that his old disease was recurring, and he gave it up.

3738. Is he now perfectly cured ?—I should say that there are still the remains of the disease; but he does little light jobs at the mine, and works as a gardener.

3739. But he has difficulty in breathing ?—Some slight difficulty is still experienced, but very slight.

3740. You say that, compared with the amount of suffering experienced by the miners some time ago, there has been a considerable alteration for the better? —Considerable. I recollect that there used to be from 15 to 20 persons receiving permanent pay from the mine on account of heart disease and consumption, and now I do not think that there are above five or six, if so many, in consequence of the substitution of the man-engine.

3741. Then you attribute that change entirely to the substitution of the man-engine for the ladder ?—Yes, entirely. I ascribe that diminution of heart and lung disease to that cause.

3742. Have you any cases of consumption, not heart disease, at the present time ?—Yes, there are two cases, and then there is a case of miners' consumption; that man could attend to-morrow.

3743. Will you explain what miners' consumption is ?—Some people are of opinion that a line ought to be drawn between miners' consumption or between bronchitis and the consumption arising from tubercles in the lungs.

3744. What is your opinion upon that point ?—The majority of my cases are decidedly arising from tubercles of the lungs, but I term my other cases bronchitis, so that it is really nearly the same thing after all.

3745. Do you think that there was any cause where the man was working to create the bronchial affection? —Yes ; I think that the various things which I have mentioned are quite as likely to cause the one as the other.

3746. The poor air ?—The poor air.

3747. The dust ? — The dust and the climbing. Miners are also very incautious about drinking water, and washing in cold water. They are very fond of doing that, and can hardly be restrained when they are in a state of heat.

3748. Where do they wash ? Is it above or below ground ?—There is sometimes water turned off in a level for some purpose. A miner in a violent perspiration, when quite in a nude state, will plunge himself almost into this water.

3749. Is there any provision when they come to the surface for washing with warm water ?—There is at Par Consols.

3750. And you think that is very desirable ?—I do.

3751. Do you think that the bronchial affections arise, not only from these other three causes, but also from catching cold ?—Yes.

3752. Either on coming to the surface or from standing in draughts below ?—Yes. Last year we had in one portion of St. Blazey parish nearly 200 cases of typhoid fever; or as it is now, I think, called, intestinal fever ; and it is very desirable that some means should be adopted for having houses of accommodation. The cottages are built without any water-closets, or any accommodation whatever, and the consequence is that all the secretions are thrown about, and there is no doubt that they propagate fever to a most serious extent. Whether there could be anything done in that respect is a question. A miner is very fond of building a house, but he never builds the necessary accommodations with it.

3753. In front of the houses and about the houses there is not sufficient cleanliness observed ?—There is not.

3754. Does this produce fever or does it in your opinion have any tendency to produce the miner's disease ?—It has no tendency to produce the miner's disease, but I mean to say that when fever does arise in a district it is propagated by reason of the want of this proper accommodation.

3755. By the want of proper sanitary measures ? —Yes.

3756. That affects the general health ?—Yes.

3757. Does not it become the duty of the parochial authorities, or other parties, to see that the ground about the dwelling is properly clean ?—I do not know, very little has ever been done, we have had boards of health, but they have all died away, and at the present moment I do not think that we have one either in St. Blazey or in Tywardreath.

3758–9. Would it affect the health of a miner going down if his residence is in an unhealthy state ? would it render him more liable to take the miner's disease ?—No, I should say not.

3760. Then the state of his dwelling would not make any difference in that respect ?—Supposing a man is in the early stage of consumption, it would be very desirable that he should be in a well-aired room, instead of that the probability is that it is quite otherwise, they always stuff up the chimneys, and perhaps several persons are sleeping in the room.

3761. Then in the case of a person in the incipient stage of consumption it would aggravate his disease ? —Yes, in fact in the incipient stage of consumption everything is against the miner, very frequently he cannot obtain proper food. The parishes are very willing to listen to any recommendation, but they have so many claims upon them that if a miner has not been economical and he has to come to the parish, of course he must fare badly.

3762. Have you ever recommended miners who were your patients to get better food ?—Yes.

3763. Supposing a miner not to be able to provide for himself, would it be your duty to give notice of that to the parish ?—I am a parish officer as well, and I have the power of recommending food.

3764. Do you find that your recommendations are complied with ?—Yes, they are complied with, but still it would be very desirable if any means could be adopted by which a miner in the early stage of consumption could be removed somewhere where he could really have the proper quantity of food ; because, supposing that we order three pounds of meat a-week, the probability is that some of that food will go to the support of the family, and that the miner would not reap the entire benefit of it.

3765. We have had it in evidence, that though

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often given gratuitously, yet, in some mines, a warm basin of soup was provided on the men coming up; would that be conducive to health, and do you think that the miners would take advantage of it?—Some miners might, but I think that the great object would be to get home.

3766. (*Mr. Kendall.*) You have stated that you have about 350 men under your care?—Yes.

3767. And that out of those 350 men you have now two cases of consumption. Have you traced those two cases at all?—One case is hereditary disease, the brother died of consumption a very few months ago, and the mother died of consumption a few years ago.

3768. Have you seen the young man from his youth up?—Yes.

3769. Was he always delicate?—No, I could not say that he was.

3770. Did he attribute his illness at all to the working in bad air?—No, he came to me with the usual symptoms of consumption, and I advised him to give up working; but, as is the case in 99 cases out of 100, he got a little better and he resumed his labour, and he has not been ill, I suppose, above eight months altogether; I do not think that he will live another month, his brother died in precisely the same way. That is what I call acute consumption.

3771. But you do not attribute that to bad ventilation?—I do not.

3772. Have you traced the other case of the two?—I cannot say much about the other case, because the man has been at Cuba, and his constitution was severely injured there.

3773. Then he was a weak man before he came to work at a mine?—Before he came back to work.

3774. Did he work in the deep levels, or not?—He worked at Par Consols.

3775. But you are not aware whether he worked in deep levels or not?—No.

3776. With regard to the dust, you spoke very positively; you said that you had not only seen it but had smelt it?—Yes; that is my decided impression.

3777. From the breath?—Yes.

3778. More than once?—More than once.

3779. Have you ever had more than one complaint about the injury which a man has received from the dust?—They do not consider that they receive so much injury, but they consider that they do inhale dust.

3780. But do you consider that injury arises from their inhaling that dust?—I think so, partly.

3781. With respect to the miner's food—you know what their wages are—are the average gainings of the tut-work men and the tribute men such as to enable them to buy the food necessary for their hard work?—Yes; they have the means to buy sufficient food for their hard work.

3782. But you fancy, from your experience, that they do not eat animal food enough?—They do not.

3783. They have too much liking for the pasty?—Yes.

3784. Do you know much of the agricultural labourers as well as of the mining population?—I do not.

3785. You have not medical intercourse with them?—No; but I know that the men engaged in the railway consumed about three times as much animal food as the miners.

3786. I suppose that a navvy eats about six times as much as you could eat?—I do not know; I consume a good deal.

3787. Are you aware that a navvy will eat as much as three pounds of meat a day?—Yes; I am aware that they eat a good deal.

3788. Are you, or not, much mixed up with agricultural labourers?—No.

3789. Then you can hardly enter into the comparative diet between the agricultural labourer and the miner?—No; I do not know that I am competent to give an opinion upon that point; but I consider that the miner does not eat so much animal food as he ought to do.

3790. He takes his pasty underground, and it is not a healthy food in your opinion?—It is not a healthy food, and the quantity of meat in it is very small.

3791. But when he comes home in the evening he has his grand meal?—That is his principal meal.

3792. And then he indulges in fried potatoes and bacon?—Yes.

3793. Does he consume much fried potatoes and bacon?—Yes, an immense quantity; he is very fond of fried potatoes.

3794. The potatoes are boiled first of all, are they not?—Yes.

3795. And are then fried in fat?—Yes.

3796. And they eat them with bacon?—Yes.

3797. Is that a wholesome food or not?—I think it is wholesome and nutritious; it seems to agree with them very well. Potatoes are considered very nutritious.

3798. I understand from you that in your experience you think that much more disease arises from climbing than from badly ventilated ends?—Yes, I think so.

3799. In the Par Consols and the Fowey Consols, and in very deep mines, have you heard the men complain much of working in bad air?—No, I cannot say that I have.

3800. Are you led to suppose that without complaining they do work in bad air?—I have never been down.

3801. But do you suppose that they do work in bad air?—I cannot say that they do; the majority of the miners that I have spoken to upon the subject say that it is much better than in other mines.

3802. Do you think that if a miner worked in bad air he would be afraid to say so to you?—Certainly not; he would tell me so if he did work in bad air.

3803. Is the miner an independent man or not?—He is an independent man.

3804. He would not be afraid to tell you that he worked in bad air if he did so?—Certainly not.

3805. He would enter fully into the whole matter with you?—Yes.

3806. And as a general thing you have not heard the miners complain of working in bad air?—No; I have heard miners say that the Fowey Consols are better ventilated than other mines to which they have alluded in the west.

3807. You have referred to the cottages, and you say that there is not drainage enough?—I mean that there is not a proper house of accommodation.

3808. There is no privy?—There is no privy, that is all. I do not mean to say that every house is without one, but I think that the majority are.

3809. There is a great lack?—Yes.

3810. And a great lack of pure air in consequence?—No, I did not mean it in that light; I meant that when a fever arises in a district it is propagated by the filth which is accumulated. Supposing that a case of fever happened next door to the heap of filth, the probability is that that heap of filth would cause the fever to spread.

3811. Take the ventilation of the mines *per se* on one side, and take on the other side the act of climbing, the want of privies at home, the fact of the men sometimes having bad changing houses, and being exposed to cold and other want of accommodation, and perhaps in some cases not having quite food enough, which do you think is the most injurious to the miners, the ventilation or the other matters?—The climbing, I think, is the most injurious.

3812. Do you think that the illness which arises from imperfect ventilation is a small item as compared with the others, as far as you know and have heard?—Yes, as far as my experience goes, because there have not been great complaints made about ventilation. There may have been complaints, but not great complaints.

3813. I want to draw two lines: I take ventilation

as one, and I take as the other the climbing, the want of proper changing houses when the men come above, the want of care on their own part, and the want of privies and free air at home—which do you think does most damage to the miners?—The climbing and the other things which you have connected with it, decidedly.

3814. (*Mr. Davey.*) You say that there is an improvement in the miners' condition to your knowledge since you have been in practice?—Yes.

3815. Do you attribute that entirely to the man-engine, or to the improvement in ventilation?—Very great changes often take place in mines which I am not capable of explaining, but which a miner could explain very well. The mine itself, from various causes, various openings, and so on, may have greatly improved. None but a miner could exactly explain that.

3816. Did you formerly get any complaints of ventilation?—I think that years ago there have been complaints made respecting ventilation, but there are very few now.

3817. Do you consider that if a man climbed a ladder cautiously as any person might do, without racing, he would feel any effects from it?—They all complain if they have many ladders to climb.

3818. We have heard some witnesses say that the men race from the bottom to see which can get up first?—Yes, they are very fond of doing so.

3819. Do you not think that by that act of indiscretion they injure themselves more than they would otherwise do?—Undoubtedly, but even supposing that they did not race, and climbed the ladder very cautiously, if any man had the slightest indications of heart disease or lung disease, there is no doubt that the climbing would be very apt to bring that disease forward.

3820. Does the dust which you speak of go under any kind of decomposition in the stomach, so that you can smell it?—I do not know.

3821. Is it a rare instance that you smell it?—I have noticed it, I do not think it so very rare. I think that the breath of a miner has a very copperish smell very frequently.

3822. Those people who complain of the dust are only isolated cases?—Yes, it is not a general case.

3823. Do you not consider that the miners generally when they get home eat more broth than they do the other food which you speak of?—There is a great variety, there are the potatoes, and there is broth, and there is some meat; it is a miscellaneous meal.

3824. Potatoes having been comparatively dear, they have substituted other things?—Yes, but the miners grow a great many of their own potatoes; the miners employ their time after their hours of work in growing potatoes.

3825. Those people who grow potatoes generally have a pig also, have they not?—Yes, the great majority keep pigs.

3826. Therefore they would have a larger proportion of animal food?—It greatly depends upon whether the miner is provident or improvident; the provident miner keeps a pig and does tolerably well, but the improvident man who expends a great deal of money in drink and so on, cannot do so.

3827. (*Mr. St. Aubyn.*) You say that you have had very few complaints of the ventilation?—I have had very few.

3828. How many mines have you been engaged in?—Only these three mines, except when I was surgeon to an iron mine. I allude to the Par Consols, the Fowey Consols, and the West Fowey Consols; my experience is quite limited to those mines.

3829. You do not speak of the state of ventilation in other mines except those three?—No.

3830. The whole of your information, I presume, refers to the mines with which you are connected?—Entirely, I have had no experience in any other mines.

3831. We have had very conflicting evidence with regard to the dust; I think that you mentioned that as one of the causes of complaints among the miners?—I think so.

3832. A medical gentleman on Saturday told us that he had never in his life heard of anybody being affected in any way by dust. Are you aware whether the injurious character of the dust is in consequence of the nature of the lode?—Yes, no doubt it is.

3833. Is a mundicy lode likely to be more injurious than when they are driving through the simple stratum?—Yes, it is from some fine particles of mundic or copper; mundic, I believe, contains arsenic to a certain extent.

3834. When you spoke of the smelling of copper from a miner's breath, did you mean that it arose entirely from the dust, in your opinion?—Yes.

3835. And therefore, to produce that smell, the miner must have inhaled a quantity of dust which must afterwards have decomposed in the stomach?—I suppose so.

3836. You say that you do not consider that the state of the miners' dwellings has any influence on the disease which they are likely to contract in the mines?—No.

3837. But will not a bad state of drainage lower a man's condition?—As a general rule it would be considered so, but I do not think that that is so, as regards the miners, because some have been very healthy although residing in most dirty localities.

3838. Generally speaking, not only speaking of miners but of other people, the living in a bad atmosphere will lower a man's condition, will it not?—Yes, undoubtedly.

3839. Will not it predispose him and render him more liable to contract other diseases?—As a general rule it will.

3840. And therefore, as a consequence, he would be more likely to be affected by any bad influences with which he might meet underground by the bad state of the dwellings above?—I wish to correct an impression, which I see you have, with regard to the dwellings of the miners; I only allude to very few which are in this bad state. I suppose that you would find no cottages neater or cleaner than a miner's cottage, as a general rule, but I speak of some which are badly drained.

3841. I ask you with reference to those?—I should say that it is injurious; it is considered to be so; but to what extent I cannot say. I do not think that those men who live in dirty localities appear to be worse than those who live in very airy and clean houses.

3842. Your experience does not tell you that those who live in badly drained houses suffer more from disease than those who do not?—No; except an epidemic, like a fever, breaks out, and then the consequences of living in those dirty houses are seen.

3843. Have you been much underground?—Never.

3844. (*Mr. F. Egerton.*) I understood you to say, that you thought that the health of the miners had much improved during the last few years?—Very greatly.

3845. You attribute that, I think, to the use of the man-engine?—Principally to the use of the man-engine.

3846. Do you know at all whether the condition of the mines generally, in regard to ventilation, has improved in the last few years?—From conversations which I have had with miners, I am informed that from some change underground, which I am not capable exactly of explaining, purer air has in some way or other entered the mine itself; a change has taken place underground, I presume; it is not so cold and damp in places.

3847. What is the length of your experience in this district amongst the miners?—Twenty-four years.

3848. Have there been a considerable number of man-engines erected in this district?—Only two that I am aware of.

3849. Then your observation, I suppose, only applies to the condition of the miners who have used those engines?—Entirely.

3850. (*Mr. A. Bruce.*) You have stated that

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among 350 miners whom you attend, there are only two decided cases of consumption?—Yes.

3851. I presume, after the definition which you have given, you mean tubercular consumption?—Tubercular consumption.

3852. But taking it in the wider meaning ordinarily attached to the miner's disease, will you state how many patients you have suffering from the symptoms of the miners' disease?—Not any at Par or Fowey Consols mines; but there is one case of a miner which I am attending, on the parish account—only one—he did not work at the Par or at the Fowey Consols mine.

3853. How many patients are you attending at this moment at the mines?—You mean adults?

3854. Yes?—I do not think that there are above four or five.

3855. Is that an unusual state of health, or the ordinary state of health?—I think that they are very healthy, except when some endemic or epidemic is raging.

3856. Do you believe that the average of their lives is as long as that of agricultural labourers?—Certainly not.

3857. Then how is it that you consider that they are healthy?—There is a great deal of hereditary disease.

3858. Do you consider that a general average of health is consistent with short life?—It would not appear so. Hereditary disease exists to a very great extent in Cornwall, and consequently they die younger; and they are not ill very long. Most cases of consumption which I have are what I term acute, where the patient goes off in a few months.

3859. There are very few cases of acute consumption, and one out of the two which you have appeared to have been incurred at a distance from Cornwall. I am now speaking of the average state of health, and what I ask you is, to explain to us what you mean by the admission on one side, that the average of the life of miners is short, and by the statement on the other, that their general health is good?—Their general health is good, certainly.

3860. And their average of life is short?—And their average of life is short. It is an apparent contradiction, but it is so.

3861. These men are slow to complain, are they not, before disease is very decidedly developed?—I think that they are.

3862. Do you think that that possibly may be one explanation of the apparent contradiction?—It probably is.

3863. You have stated that in your belief not only the larger, but by far the largest portion, as I understood you, of cases of ill-health arises from causes other than bad ventilation?—Yes.

3864. You judge of the sufficiency of the ventilation not from your own experience, but from the general statement of the workmen?—Yes.

3865. Have you ever been underground?—Never.

3866. Have you ever inquired whether, in talking of good and bad ventilation, the workmen were using positive terms or merely relative terms?—I think positive terms.

3867. You believe that very few of the workmen in these mines are working in air where the circulation is languid?—I believe very few; but I have not had an opportunity of obtaining much decided information.

3868. When you attend a patient I presume that you usually inquire as to the causes of his ill-health?—One of the first questions which we ask is as to the air, whether there has been much gunpowder smoke. The purity of the air is one of the first questions which naturally arises.

3869. What has been the nature of the answers of your patients with respect to the air?—Generally satisfactory, as far as my memory goes, of late years.

3870. Have you of late years had any cases arising in your opinion from a defective state of ventilation?—I cannot call to my mind any decided case.

3871. You have spoken of gunpowder, and I presume that to gunpowder I may add the smoke of candles?—I do not think that the smoke of candles is injurious.

3872. Would not the smoke of candles be injurious in an air otherwise somewhat close?—They do not use many candles, I believe, underground; of course it would exhaust the air.

3873. You are aware, I presume, that even in the best managed mines it is impossible that the ventilation should be equally good everywhere?—I am aware of that.

3874. You are aware that where a man is driving a close end it is rare that the air there is as good as it is in the main levels?—Yes, I am aware of that.

3875. Do you not think that the smoke of candles in the close ends is an aggravation of the want of air?—I suppose that it might be in a slight degree; but I have never been underground, and do not know how many candles they do burn, but very few, I believe.

3876. They work by the light of candles?—They work by the light of candles, but, I believe, very few.

3877. In a mine otherwise dark?—They only use candles just in the part where they are working. I do not think that many candles are used underground In one small level which you describe I do not think that there would be above two candles.

3878. Have you ever inquired into the ill effects arising from hastening into close ends before the effects of the explosion of powder have passed away?—No, I cannot say that I have.

3879. You have stated that in your opinion working in places unusually hot does not affect the health?—I think that it does not affect the health to the extent that is imagined, it may affect the health in some delicate constitutions.

3880. Will you be good enough to assume entire ignorance on the part of the Commission, as to the question whether it does or does not affect the health of the miners, and to state positively in your opinion how far it does affect their health?—The miners who have worked underground the longest, and have worked in deep places and in hot places, do not complain; they do not think that they suffer. There is a man who is coming here to-day who has had very great experience; he has not only worked himself, but his sons have worked; he is 57, and he does not consider that working in a hot place is at all injurious.

3881. A miner of 57 is rather an exceptional person?—Undoubtedly.

3882. Therefore that man must have had a wonderful constitution?—He has been a cautious man, he has lived well.

3883. But if the age is unusual his good health must arise from other causes than mere caution on his part?—I think that a great deal depends upon caution. There is another man coming who is 66, who has also worked in hot places.

3884. As a class the Cornish miners are a temperate race of men, are they not?—The majority are undoubtedly, but then a great many are very intemperate, and those are the men who suffer most from working in hot levels and otherwise.

3885. Do you think that a man can work in a great temperature with all the consequent perspiration, and then move into far colder air without certain risks?—There is a risk.

3886. Do you not think that work carried on in a place of great heat must exhaust the frame?—It is calculated to do so.

3887. And in a state of exhaustion is not the frame much more susceptible of illness from other causes?—Yes.

3888. You have stated that although you have from time to time, as I understood you, many cases of heart disease, they rarely terminate in a fatal manner suddenly?—Rarely suddenly.

3889. What usually is the immediate cause of the death of a person who is suffering from heart disease? They frequently become dropsical, there is dropsy of

the whole system ; one of the first symptoms is that the legs begin to swell.

3890. Then they would be stated to have died of dropsy ?—No, I should return the case as having died of heart disease, and in the death certificate it would be stated as "dropsical" as well. Supposing that a man died of heart disease and had disease as well, both would be stated, one as the immediate cause, and the other as the proximate cause.

3891. When does the health of miners begin to fail obviously ?—I think after 40.

3892. Not sooner ?—Not sooner, as far as my experience goes.

3893. Do you think that the majority of miners work long after 40 ?—No, I should think not the majority certainly ; not long after 40.

3894. Taking 200 miners as the number working in a mine, how many of them should you think would be working after the age of 40 ?—I am not capable of answering that question without referring.

3895. I gather that you have stated that in your opinion miners might lay out their money more wisely than they do in providing themselves with food ?—Yes.

3896. You say that they would not eat so much as a railway labourer ?—No.

3897. Do you think that they work as hard ?—No; that has been proved ; they are not capable of doing the same amount of work in so many hours as the railway labourer.

3898. Why should they not be able to work as hard as a railway labourer ?—Because I think that a railway labourer consumes more animal food.

3899. The labour of the miner is very exhausting, is it not ?—No, not so very severe. In some respects I understand that it is not such very hard work.

3900. As a class, do they not perspire a great deal ? —That is in the hot levels.

3901. Is not the act of climbing itself one which leads to a great deal of perspiration ?—Of course, if they climb fast, which they will do.

3902. And may not the same be said of driving the borer ?—I suppose that that is laborious.

3903. And sinking shafts ?—I do not think that their work is so very laborious.

3904. Did you ever stand at the mouth of a shaft and see the workmen return from their work ?—No.

3905. You are unable to say whether or not they usually return from their work streaming with perspiration ?—I am unable.

3906. If you have satisfied yourself that the miners' work does lead to great perspiration, should you not think that they require a good deal of food to supply the exhaustion ?—Undoubtedly.

3907. Do you think that one reason why they consume less than a railway labourer may not be that their appetite is affected by the nature of the work which they perform ?—I think that there is something in that ; I think that it may be partly ascribed to that cause.

3908. Do you think that there may be a good deal in that ?—Not a good deal, but I think that that is one cause of it ; they complain that their appetite is not good ; they cannot eat underground.

3909. Have you ever heard a man complain that his appetite was not good before he came into your hands as a patient ?—Yes.

3910. To what do you attribute that want of appetite ?—There are a great many causes ; but one cause, perhaps, would be that certainly working underground to some constitutions is injurious, particularly to the agricultural labourer who has abandoned agriculture for mining.

3911. But it is not so injurious in your opinion as to bring many into the doctor's hands ?—That is my opinion.

3912. (*Mr. Holland.*) Is your knowledge of miners confined to those working at the Fowey and Par Consols ?—Almost entirely now. Some years ago I was surgeon to an iron mine.

3913. You cannot tell us whether your miners are much different from other miners in health ?—No, I should imagine that on the average they are pretty much the same. I believe that it is understood that granite mines are more injurious to the constitution than what are termed killas mines.

3914. Why ?—I only go by what the miners say, that the air is more cold and damp in the granite mines than in the killas mines.

3915. Do you mean by "cold and damp" that they have a great deal of cold damp in the mine ; that they cannot keep themselves warm, or that the air simply is cold ?—I suppose it is the air, but that is a question which I am not capable of answering positively.

3916. You have said that you have two cases of consumption out of about 350 men working underground ?—Yes.

3917. What cases of miners' consumption would there be altogether ; bronchitis, emphysema, and so on ; I mean what is popularly called consumption ? —It so happens that at the present time there is only one other case, but that is very unusual.

3918. You said that five or six men are now receiving pay for lung and heart disease ?—Yes, but they are not all attended by me.

3919. Those are not out of the 350 ?—No, that is out of the whole mass.

3920. Do you mean that there is only one per cent. of the whole number now ill from heart disease ? —It so happens at the present time.

3921. Is that usual ?—No, it is not usual.

3922. What is the usual proportion ? did you ever know 20 or 30 ?—No, never.

3923. Is there no such thing as one-third of the men, or anything like it, being ill of lung disease and heart disease ?—Never in these mines.

3924. Nothing like it ?—Nothing like it.

3925. I think you told us that a miner when above 40 was considered an old man ?—He is not considered exactly an old man, but it is soon after that period that the health of many begins to fail.

3926. We were told on Saturday that a miner at 40 was as old in constitution as another man at 50 ? —I should think that he was undoubtedly so, taking the average.

3927. How do you account for the fact ? what disease is there which shortens a man's life so much as to make the difference of ten years ?—There is no other disease but consumption in all its varied forms.

3928. Is it not possible that there are a considerable number of cases of illness among these men which do not come under your care ?—No, not among the miners in my district.

3929. Is it not common for men to be ill a long time before they come under your care ?—No, I do not think so. It is a very curious fact that just at this time there is very little sickness.

3930. I speak of generally ?—Generally ; of course, we have more cases of consumption and heart disease than there are now. What there were twelve months ago I cannot tell without referring.

3931. They do not die suddenly, do they ?—No.

3932. And they do die ?—They do die. There are two cases of heart disease at the present time, and those three cases of consumption, making five.

3933. But that is very much less than the average of the population ?—It is so at the present time ; but it may be very different twelve months hence, or it might have been very different twelve months ago.

3934. In your pamphlet published nearly 12 years ago, it is stated that out of a population of 6,400, 230 died in two years ; that is at the rate of 19 per 1,000 per annum ?—Yes.

3935. And of those deaths 39 were from small-pox ? —Yes.

3936. Omitting those, there would be only 15 per 1,000 per annum ?—Yes.

3937. That indicates a very healthy district for St. Blazey, does it not ; 15 in a thousand is a low death rate ?—Yes.

3938. You also state that at that time 64 of these deaths were from consumption ?—Yes.

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3939. Is that anything like the case at present, that a quarter of the deaths are from consumption ?—No; but some of those deaths from consumption were infants, and many infants die now. I think that two or three died in the last month or two.

3940. A while ago you said that the miners' consumption was to a large extent hereditary ?—I think so.

3941. Do the women suffer from consumption as much as the men ?—No.

3942. Not nearly ?—Not nearly.

3943. Do they suffer half as much ?—Not half as much.

3944. But, supposing that it is hereditary, would they not suffer as much ?—No; because supposing that the disease is lurking in the system, it is developed much more quickly in a miner than it would be in a woman who is leading a quiet life.

3945. But do you not know that in the general population of England women suffer much more from consumption than men?—Yes; but it is not so in Cornwall.

3946. But in the mining population the women suffer much less ?—Yes. I do not say that it is entirely from hereditary disease.

3947. Is it not likely that the difference between the liability of males and females to consumption in a mining district is not from the disease being hereditary ?—Yes. Supposing that a person had the seeds of consumption in the system, it would, of course, be more likely to be developed by working underground than by working as an agricultural labourer, or at any other employment.

3948. The difference of employment of miners and other males of England makes the difference between the respective death rates from consumption ?—Yes.

3949. (*Mr. Kendall.*) You have stated, as I understood you, that the average life of miners is short, and that their average health is good ?—Yes; that is a contradiction.

3950. But, as I understand, you state this with the exception that there are many cases of hereditary disease ?—Yes.

3951. How do you account for that hereditary disease ?—Very frequently it is in this way: that a miner, when in the last stage of consumption, may beget three or four children, and the probability is that the majority of those children (in fact, I think, that by a good deal of research you could prove it) would be consumptive.

3952. In olden time was much less care taken than is taken now, and did men in consequence become consumptive much more frequently than they do now ? Was there much care as to the dries and the mode of ascent, and so on, in your experience ?—I cannot say much one way or the other.

3953. Were there more cases of consumption in olden time than now ?—Undoubtedly; I think that the men are more careful of themselves.

3954. And that the mode of ascent is better ?—Of course the mode of ascent is better. I lay great stress upon the man-engine; I think that that is the salvation of the men.

3955. As regards the work of a navvy and of a miner, do you think that the agricultural labourer, who is in the open air, could at all compete with the navvy in work ?—I do not know; I am not capable of giving an opinion upon that point. I know from conversing with miners, that they were astonished at the great amount which the navvy did, and that they could not do so much work in the same amount of time.

3956. Do you think that if you put the navvies underground they could do as much work as miners ?—No, perhaps not; it is a different sort of work.

3957. Does the agriculturist eat at all like the navvy ?—I cannot say; I have never seen; I know very little of the agricultural labourer. I imagine that the navvy was enabled to perform so much more work because he consumed a great deal more animal food, and was enabled to digest it.

3958. (*Mr. Holland.*) And he was also able to use up that animal food by breathing well ?—Yes.

3959. Is it not understood in physiology that a man's force depends a great deal upon his breathing power ?—Yes.

3960. The amount of food which he can breath up ?—Yes.

3961. Therefore if a man were to eat more food than he could breathe he would get no strength by it; you have not considered that point, probably ?—I have not.

3962. (*Chairman.*) At what age do you consider that the miner's disease generally developes itself ?—I think soon after 40, except in cases of hereditary disease.

3963. You have stated that many of the miners beget children with the hereditary disease; does not the disease of a miner's son develop itself till he is nearly 40 ?—In those cases I think that it is developed very early. In those cases, of what we term acute consumption, where the patient dies very rapidly, it is hereditary disease.

3964. But it does not develop itself until the man works in the mine ?—No; very frequently not until after the age of puberty.

3965. Do you see that in the children dying off ?—Yes, frequently.

3966. Then a miner working, whose father died of consumption, is likely to go off sooner with the same disease than one whose father has been healthy ?—Yes, undoubtedly.

3967. Have both the mines of which you have spoken man-engines ?—Yes.

3968. Have you had any accident arising from the man-engine ?—Never.

3969. Have you had any cases during the last few years from accidents of any sort ?—Yes, we have had several; we are always having accidents.

3970. What do they arise from ?—From blasting underground.

3971. From any other cause ?—Sometimes by ground giving way and crushing a man at once.

3972. (*Mr. Kendall.*) Though you only attend these two mines, yet these two mines within your recollection have proved the largest mines in the county of Cornwall, have they not ?—Yes.

3973. They employ more men than the others ?—I think so; I do not know of any mine which has employed a greater number.

3974. (*Chairman.*) But you only attend about 350 ?—Yes, and Dr. Pace attends about 500 or 600; but the average number employed for many years has been about 1,000 or 1,100, and sometimes as many as 1,200.

3975. Unless they come to you as patients I suppose you never examine them ?—I do not.

3976. Do you think that any of those 350 men are now suffering from incipient miners' disease ?—There is one man whom I consider so, and I have advised him to give up working, but he will not do so. He is now taking cod liver oil.

3977. Have you any other cases under treatment of men who are still working in the mine ?—That is the only case, I think, of any consequence. Of course there are some who have little coughs and colds; I do not suppose that out of these 350 every one is well, there may be some trivial cases, but what I have mentioned are the only cases of any consequence.

3978. And you think that those trivial cases are not likely to lead to serious results ?—I do not think that they are.

3979. (*Mr. A. Bruce.*) What is the entire number of men engaged in these two mines who have a right to medical attendance ?—I should think on a rough calculation from 1,100 to 1,200; about 1,100 now.

3980. How many of those are under your medical supervision ?—I suppose nearly 400.

3981. That includes miners and non-miners ?—Yes, everybody.

3982. Do you suppose that all those men come to

you as their regular medical adviser?—I have no doubt that they do.

3983. Do Cornish miners show what I have observed in other mines, namely, a tendency to avail themselves sometimes of the advice of what may be called irregular practitioners?—Yes, they are very fond of taking quack medicines.

3984. Do you suppose that any considerable portion of your miners may be taking quack medicines, or having recourse to other persons for whom they may have a fancy?—I am not aware. From inquiries there are no acute cases of disease at the present moment, I am pretty certain; there may be some chronic or stomach complaints, or various things. I wish to mention that what I have stated might convey an erroneous impression; it is not to be supposed that all the 350 or 500 are adults, because a great many of them are not aboye 13 or 14, or perhaps 12 years old, but they are all put down as miners; they go underground and are entered as such in the club.

3985. (*Mr. St. Aubyn.*) You stated that hereditary disease prevailed among the miners and their families to such an extent that their children were carried off in great numbers by it?—Yes, a good many are.

3986. Do you mean to convey to the Commissioners the impression that when a miner dies of consumption it is rather owing to hereditary causes than to the nature of his employment?—I think that in the majority of cases if the matter was sifted out it would be found to be the case.

3987. In other words, that if they had not been employed in the mines they would equally have died of hereditary consumption?—Yes, the majority; but then everything must have a beginning; the first case of consumption of course was not hereditary.

3988. (*Mr. A. Bruce.*) Then how do you explain the fact that women do not die of consumption?—I do not say that none do, but not in such numbers; there are some who die of consumption. Cornwall is a county where consumption prevails amongst all classes.

3989. Surely not to a great extent?—Yes; I suppose that there are few counties where there is more consumption than in Cornwall.

3990. (*Mr. St. Aubyn.*) In other words, your opinion is, that where a miner dies of consumption, it is not owing in the majority of cases to the nature of his employment so much as to hereditary causes?—Just so; I think that there is more consumption in Cornwall than in any other part of England. I am at this moment attending two cases of consumption in private practice.

3991. You say that in the majority of cases it would be rather owing to hereditary causes than to the nature of the employment?—That would, I should say, be a very slight majority.

3992. Would it be half?—The probability is that it would be half.

The witness withdrew.

Mr. John Pearce examined.

3993. (*Chairman.*) You reside at St. Austell?—Yes.

3994. I believe you have the medical charge of some of the mines in this neighbourhood?—Yes.

3995. What mines are you engaged in?—I have Polgooth, part of East Crivvis, part of Par Consols, West Fowey, Cornubia, Cuddra, Great Crivvis, East Polwear, West Polwear, West Par, Dougas, and Crow Hill. I have the entirety of these except East Crevvis, Par, West Fowey, and East Polwear.

3996. You have heard the evidence given by Dr. Tayler?—Yes.

3997. Will you have the goodness to state to the Commissioners the points upon which you do not concur with him?—I concur in most of Dr. Tayler's general statements, but there are some points as to which my experience varies from his.

3998. In the first place, do you agree with Dr. Tayler as to the general health of the miners, and their average longevity being low?—I do not think that the miners, taking them as a class, are so healthy as agricultural labourers.

3999. What do you say as to their average longevity?—That is low, but there are other causes besides disease that will, in some degree, account for that.

4000. Will you now be good enough to state the points upon which you do not agree with Dr. Tayler?—His examination has extended to so many questions that I cannot very well recall every point, but with reference to one part of his evidence, I may state that I never noticed any smell from the breath of miners working in copper mines, nor can I conceive how any smell could be produced, even if they inhaled the dust, because a chemical change would have first to be undergone, and the sulphur would have to be liberated from the copper. Even granting that they did swallow much dust, and I believe that they do swallow some, I think that before any smell could be produced by it, there would be a decomposition of the mineral take place, and if that were the case it would equally apply to the Fowey mines where free arsenic would be liberated, and we might have poison from arsenic, and that we never see. Therefore any injury that might be derived from dust would be rather from a mechanical cause, than from any chemical alteration being produced.

4001. What is the next point as to which you differ from Dr. Tayler?—Dr. Tayler was asked whether he had heard the miners complain of any symptons that were produced by working in bad air. I believe that our mines are, generally speaking, as well ventilated now as they can be, perhaps some more precautions might be taken; but it often happens that where the air is bad it is in an and where the men are driving to come to a shaft coming down to give them air, or they are putting up a rise, and very often I have heard the men say that their heads have become light and giddy, and that they have had a ringing in the ears which is produced by a bad supply of oxygenated blood to the head. Then again with regard to diseases of the heart, as far as my experience has gone, I have observed a great deal of enlargement of the heart, and that enlargement would necessarily be permanent, and there is hypertrophy of the heart induced by the extra action which the heart is called upon to perform when the men have been climbing from great depths, an increased pulsation of the heart is then caused and increased respiration, and hypertrophy, which is a thickening of the heart. Sometimes there is more functional derangement from which the miners may recover, as is the case with others. Another thing that has struck me forcibly is that miners have not suffered, if at all, more than an equal number of the population in any other class, from phthisis or tubercular consumption, of which there may be perhaps a slight average against the miners; but, as a general rule, I should say it was not so. The disease of the miners which is called consumption, in my opinion, is decidedly nothing more than bronchitis, having the general symptoms of tubercular disease, but those symptoms being very different in their stethoscopic character. I particularly agree with Dr. Tayler as to the state of the dwellings of the miners, that they have been the hot-bed of disease for any epidemic that may occur. I believe that the want of ventilation in their houses, and the want of cleanliness about their doors, have been a very fertile source of disease when any infectious epidemic has broken out. With regard to their being supplied with soup after they come from underground, my opinion is that giving persons food when the nervous system has been ex-

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hausted by climbing or from hard work, is not advisable, and I think it would be better for them to go home, and have their meals quietly. As to the difference in the health of agricultural labourers as compared with miners, I think that a great deal depends not only on their employment, but also on the management of their wives in their houses. I think that the wives of agricultural labourers are much more provident than the wives of miners, and I think as a rule, when I go into the different miners' dwellings, I can almost tell at once whether the wife has been a bal girl, or whether she has been taken from respectable service as a servant girl. With regard to the way in which miners are able to speak of the bad air in the mines, their practice is to notice their candle in burning, for where the air is very bad it will go out. As to their appetites, I believe that although the miners, as a class, smoke a great deal less now than they did formerly, yet I think that that may be one cause why their appetites are not so good as compared with an equal number of men who do not smoke. With regard to the navvies eating so much and doing so much more work, when they go to work, I do not believe that at first they could sustain the work so well as they can after a continuance of it. I think that the continuance of any kind of labour enures the system to that kind of labour which men may adopt. I also agree that although a miner would not be able to do the hard work that a navvie does, on the other hand the navvie could not work in the cramped places that the miner can, and that each is peculiar to his class. I do not think that you can draw a fair comparison between them. With reference to what is termed the miners' disease, and which I consider to be bronchitis, I think that the climbing up of ladders often carrying tools, and the increased action of the heart and respiration on coming to the surface in an exhausted state, and their sudden exposure to the cold, are also another source of their disease. They come up from different kinds of atmospheres, and the atmosphere varies in different kinds of mines, some being better ventilated than others ; and also the air in some close granite mines is much more damp and heavy than it is in killas mines. I might refer to Beam mine, where, some years since, nearly all the miners suffered from miners' consumption ; it is now abandoned.

4002. Where was that mine ?—It was in this neighbourhood. They suffered very badly, and I would account for that by the ventilation not being so well attended to there, as they had not so much necessity to drive out the smoke from the powder, there was very little blasting, and the ground being easy retained the damp to such an extent that the timber would often become loaded with fungous growths, and all the atmosphere would be dead and heavy. The men in those days were in the habit of drinking more in that district, and they would often go down half drunk, and sleep underground ; but the Beam mine was observed to be one fertile source of the peculiar disease called the miners' disease.

4003. (*Mr. Austin Bruce.*) How long ago was that ?—About 20 years since ; but many of the men lived there, and I suppose some even live now who have this miners' consumption ; we can see it for years before it takes such a hold of a man as to incapacitate him for working. A man may continue to work, although the disease has already begun to form in him. I notice that they were all old men in Beam mine at the age of 40 ; but I should not call all our miners old at 40. In Beam mine it was the case, they looked like old men ; in fact, in riding through the district, if you saw them, you would say, "that is a Beam man." I have also made this memorandum that the men very often rush into hot-air ends after blasting a hole with powder, they rush in too soon. I have been told that they are anxious to see the result of the blasting, and that hot air has immediately produced coughing ; and this disease, which is called miners' consumption, although it is not tubercular consumption, is just as certain in its results ; it has all the general symptoms of phthisis, and is as certainly fatal in its termination as is consumption I can compare Bucklers Charleston mine with Beam. It is an unusual thing to find miners' consumption formed in Bucklers Charleston mines ; it is not very deep, and it is very well ventilated. I speak of the former working. I do not attend there now, and all the mortality among the Charleston miners I consider is produced in the first place by accidents which are unavoidable in many instances, and one of the greatest sources of injury to the miners is their blasting with open powder, putting it into the holes in that state instead of in cases ; that is a frequent source of accident.

4004. (*Chairman.*) What do you mean by the word "open" ?—The miners will bore a hole and put the powder into that hole, without putting it into a case, and I think that no case of an accident from blasting has occurred where a proper tube has been used, and the powder has been put into the tube to be put into the hole ; it is for this reason that the men in putting in their powder very often leave grains of the powder adhering round the hole and round the mouth of it ; whereas, if it were put in in a case the powder would not be loose, and there would not be the same chance of fire getting to it as there is when it is put in in a naked state. I think also that it is not so liable to explode in the tamping, and another cause of accidental explosions is this, as I have often said to a miner, "You have been using the mallet again," instead of holding the bar in one hand and beating it with the hammer himself, when he would feel what resisting power there was ; one of the miners will hold the bar, and another miner take the hammer, and beat it with two hands as if they were boring. That is prohibited by the agents, but the miners frequently do it.

4005. (*Mr. Austin Bruce.*) That might lead to the ignition of the powder ?—Yes, by concussion, by more violently striking the tamping rod. Another cause of the low mortality is that the young men who go underground for some time come up very fast, racing one after the other to see who can come up the fastest ; and another thing that should be attended to is as to closing an old shaft. I have known men fall down into an old shaft which had been left open after it had been abandoned, and when they have been reworked again those old shafts have not been known, and they have been allowed to remain open. I, therefore, think that every shaft when it is abandoned should be hedged in so as to protect the public. It often happens, I believe, that the constitution of miners is impaired by a number of persons sleeping in the same room, because there is not sufficient air for them to breathe in their sleeping apartments. I think also that the changing of their clothes on the boilers is bad, and that the substitution of dries which are now properly constructed would be a very great benefit to them if carried as far as possible, and that their illnesses would be considerably lessened compared with what they are at present. Then with regard to the hot ends, after the miners have been working in them, I have heard them complain ; at the mines I have been engaged in I have not had many of them, but I have heard them complain of them, they became very pale ; but the hot air ends I do not believe always depend so much upon ventilation as on the chemical change that is going on in the contents of the lode, for the one there might be a remedy provided, but not for the other. Another cause of the low mortality among miners is the loss of life which results from the men going in too soon after a hole has misfired ; it sometimes happens that it misses, and they go in to see the cause why, and the powder in the hole then explodes, and they are injured in that way. I also think that it is a matter of importance that upon mines being abandoned the parties concerned should be compelled to give plans of them, so that if the adjacent ground is worked there should be no danger of holing into an abandoned mine, which was the case in this neigh-

bourhood some time ago when two or three lives were lost in consequence.

4006. Do you mean that there should be a registry kept of mines?—I mean some means by which, if, for example, half of this room had been worked, and I was in the other half which was about to be worked, we should be able to see how far the ends had gone on here.

4007. You mean that there should be a registry of mines?—Yes; another cause of the miners' disease, I think, is their coming out after the firing of a hole, and sitting down for some time before they go in again in the cold, and perhaps they touch a pipe, or eat a bit of cold pasty which they take with them underground, and during their work I do not think that cold pasty is an advisable thing, or that digestion and the exercise of the nervous power in working should both be going on at the same time. I think that if the miners, after blasting, were to go and turn a fan instead of sitting down and doing nothing, and if all those close ends were supplied with the means of sending in air, which they might easily work, they would probably clear away the smoke much more quickly, and obtain a better atmosphere from it. In my opinion the man-engines are the best things that have ever been introduced for the benefit of the miners, and for the reasons that I have already given, from the exhausted state in which I have seen the miners come up off the ladders, and the quiet way in which they appear to come up by the man-engine. I remember standing at a shaft at Fowey Consols, and I saw some men come up by the man-engine apparently as little fatigued as possible, whereas before, after coming up the ladders, I have seen the sides of their chest heaving, and the men were breathing as quickly as possible, but now you do not see that when the miners come up by the man-engine. At the same time I think if they could be induced to climb up more slowly it would be less injurious, or as an old doctor once said, if the miners spent half an hour more in coming up, and half an hour less in bed, they would have a benefit both ways. I think it would be desirable if some statistics were collected, which we cannot give you, showing the difference between the longevity of the tutwork men and the tribute men; I believe that one is longer lived than the other.

4008. (*Mr. Kendall.*) The men employed at tribute work being longer lived?—No; the tutwork men being longer lived, and my reason for saying so is that the tributor is down underground more hours than the tutwork man. I do not believe that the tutwork man works so hard as the tribute man, nor do I believe that the tributor's living is so certain and regular as the tutwork man's.

4009. The tribute man has more air to breathe, has he not?—As a rule I should say that he has.

4010. (*Chairman.*) Should you think that good living has something to do with the state of health of the miners?—Yes; but I should say that it is not so much that, as that what they have, I think, is better managed. The miners are a different class altogether from agricultural labourers. I have made a note that something might be done as to the wood which is used in some places, and which gets covered with fungous growths. I think that if the wood was prepared in some way it would not be so deleterious to the atmosphere.

4011. (*Mr. Kendall.*) Do you mean kyanized?—Yes; only in particular places where we should see that there was a tendency to fungous growths. I think that wooden air pipes are very bad for use in a damp state, for the wood absorbs a great deal of the air that has been driven into the mines. Then with regard to the miners' clubs I have often observed when mines have been abandoned that the men who have been permanently injured there have had no means of getting their club money after the mines have been abandoned; notwithstanding that the mines may have produced a large sum of money which has been placed in these clubs, it has been taken by the purser or the secretary, or otherwise disposed of, and I would suggest that the money when old mines are abandoned should go into some general fund, and be disposed of for the benefit of those who have been permanently injured.

4012. (*Mr. Austin Bruce.*) Are the clubs usually registered under Mr. Tidd Pratt's Act?—No, none of them, and when a man is injured his means of support are cut off in that way, and they have to find other resources, and very often I believe they want, whereas if there was a general fund for mines, when suspended or abandoned, for the men to pay into, I think that the miners would be very much benefited.

4013. (*Chairman.*) Have you ever been underground?—Yes.

4014. Have you been underground at any of the mines in which you superintend the health of the miners?—Yes, I have been down to a great depth.

4015. When a miner who suffers comes to you in a state of ill-health, do you ask him where he has been working, or at what description of work he has been employed?—Yes, very generally.

4016. If he says that he is suffering from working in poor air, do you inquire as to the nature of that poor air?—Yes. I say to him, "How long have you "been in poor air?" He answers and says, perhaps, "We are driving in an end with the object of getting "down a rise or putting one up." I do not think, as a rule, that they do work in bad air long together. As soon as they have finished any work in this bad air they come, and they seem to have the notion that they might have such a thing as an emetic to throw off the foul air; they say, "We have been working in "bad air, and we want some medicine to throw it "off."

4017. Have they ever complained to you of swallowing the dust in the mine?—Yes.

4018. Have you ever seen them spit?—Yes. I have seen them spitting up the powder smoke.

4019. Any other dust?—I do not remember that I ever saw them spit up any other. When they are laid up with illness we do not see it. I do not believe that any mechanical body remains in the mouth or throat.

4020. You have stated that wood is deleterious, do you know of any case where decayed wood has been deleterious to any patient of yours?—Yes. I speak now particularly of Beam mine; we found that the wood there was very commonly covered with wet fungus after being in there a short time from the damp heavy atmosphere.

4021. And not from the want of proper ventilation?—That mine was not so well ventilated as others, for this reason, that they did not feel the necessity for it as they had not so much powder used in blasting, and therefore not so much smoke.

4022. Is the principal object in trying to ventilate mines to get rid of the powder smoke?—That is one object, but it is not the principal one. All mines must be ventilated, and there must be a means of throwing in air, either mechanically or by arrangements. I believe that the ventilation of our mines is very much better now than it was formerly.

4023. Do you know of any other mine where wood has been deleterious?—Certainly not as a rule. I remember one case of a young man who suffered from ague, and he attributed it to holing into an old shaft where the wood was very much decayed, and he said that he noticed a smell from the old wood, and he attributed his attack of ague to that. I, of course, cannot say that such was the case, but that instance just occurs to me at the moment.

4024. When any patients come to you, saying that they have been suffering from working in poor air, do you report that to any person?—If I were to see a case the miner would not hesitate to tell me anything that he thought was not right, it is very unusual to hear any such statement made; but if any such statement was made to me, and I thought there was any truth in it, I should take the first opportunity of saying to one of the captains, "Such and such a place is found to be,"

so and so, "and if it could be altered it is very desir-
" able." There would be no difficulty in my making any such statement, nor should I hesitate to make any such statement.

4025. But are there cases where, in your opinion, poor air cannot be avoided ?—Yes, in cases where the men are putting up a rise to get air ; I think that in those cases there may be a difficulty.

4026. You have stated that you think that a miner working in poor air for some weeks would be likely to suffer in his health ?—Yes, he necessarily would suffer.

4027. How long do you think a miner could work in that kind of air without suffering ?—That depends upon the degree of impurity that there is. In some cases such rises are nearer to another rise than in other cases ; it depends upon circumstances, they judge of it by the way in which the candle burns ; if the candle will not burn unless it be turned down, or even then that it would go out, I should say that the air was very bad. If the candle burned steadily on its side, then it is considered that where a candle will burn a man can live.

4028. Is it your opinion that where a candle will go out when it is held upright, but will burn on its side, the air would be very bad ?—Yes.

4029. The air would be bad if the candle would only burn on its side ?—Yes.

4030. Therefore you would recommend any patient of yours not to return to that same kind of work ?—The work must be done, or they could not get the ventilation for further working. I think the agents do not keep the men at it ; if the men have been put up on a rise and they have got on with it, probably the men would not have to do that for months again, and they could not get the natural ventilation without.

4031. You would recommend a patient of yours not to go back to the same kind of work ?—Yes ; but they do not complain immediately of this ; they may come and complain of lightness in the head, but they do not complain of the miners' disease immediately.

4032. If a man came and complained of lightness in the head, should you then advise him not to go to the same description of work again ?—That would depend upon the extent of it ; he might be laid up for a day or two, or more, and then he would go to work again at the end of the week, and in a week or two the natural ventilation would take place.

4033. But suppose it did not take place for more than a month, would you in that case recommend your patient not to go back again ?—Under such circumstances, if he was so bad as not to be able to work he would be laid up, but if he could go to work he would probably go back to the same place. If I saw him suffering from tightness at the chest, I should say, "You must tell the captain," so and so. "I do not consider you fit to work there," that I have often done.

4034. Still you say that the work must be done, and if that man did not do it somebody else would do it ?—Yes.

4035. That is to say, if one man's health will not stand it another man must try ?—Yes ; but it is for so short a space of time.

4036. Are you able to speak from experience upon that ?—Yes ; I know something about these matters. I have been an adventurer as well as a medical man in the mines.

4037. How long has it taken to get through the work in your experience ?—That depends upon whether they sink from below, and that they would do if the air was very bad ; it depends also upon the character of the ground, whether it is very hard or not.

4038. May there not be occasions when it would take some time before they could complete the work and obtain the ventilation ?—Yes, it might be two or three weeks.

4039. During that time if one man suffered from the poor air, and was laid up, another man would have to take his place ?—Certainly.

4040. You stated, I think, that the disease from which miners most suffer is enlargement of the heart ? —Yes, hypertrophy, we do not generally find the heart so much dilated as thickened.

4041. How are you able to judge of that ?—By the stethoscope.

4042. Have you ever had any opportunity of judging from post-mortem examinations of one of these cases ?—Yes, I have seen them, but not particularly to trace hypertrophy of the heart ; it is so marked a case that we do not require to do it.

4043. Are you of opinion that that, generally speaking, is the commencement of the miners' disease ? —No ; I should not say so.

4044. What is the commencement of that which is called the miners' disease ; how does it show itself ? —I think it is caused by the foul air.

4045. How does it show itself ?—The first thing is that for many years before it has the effect of incapacitating a miner there is a shortness of breath, and a catching and hesitation. I have noticed that particularly in their speaking, they talk for some minutes, and then they breathe apparently with difficulty, that is the first thing that I notice in them, and I have often said, "I think it would be an advantage to you " if you could work on the surface for some time."

4046. At that time have you observed any cough ? —There is very little in the beginning.

4047. When you do observe it in a patient, do you advise him if possible to leave the work he is at ?—Yes. I advise him to do so. I should say, "You " must get on to some of the upper levels. You must " not climb so far, and you must get into good air."

4048. Although you appear to think that the air below is not poor, yet is it so good as, in your opinion, to be conducive to the miner's health ?—No ; and besides that, there are so many changes in those places to which they are exposed ; there are great draughts in some places, and in others the air is more confined, in some places it is cold, and in other places, it is much warmer, and then there is always a change on coming to the surface.

4049. That change of air and going into draughts in the mines at the commencement would be injurious, would it not ?—Yes, decidedly.

4050. If a man feels ill, does he, on all occasions, apply to the doctor ?—These men are very susceptible to cold, and if they get cold they get more cough, and then they come and complain of tightness in the chest.

4051. But many of the men may work on for some time without complaining ?—Yes, for many years. There was one poor fellow who has just died, and I knew him to have symptoms of the disease from which he died, 15 years ago.

4052. Was he then told that there was a chance of its terminating in the way it did ?—I had often said to him, "I will give you something to relieve you, " but yours is the miners' disease, and we cannot " alter that state of the chest."

4053. What was his reason for going on working after that ?—I suppose it would have been difficult for him to get anything else to do.

4054. He was compelled to work on for his livelihood ?—Yes.

4055. Does not it end in the formation of tubercles on the lungs ?—Decidedly not. I am positive upon that point.

4056. This peculiar disease does not end in tubercles ?—It is not tubercular disease, but it has all the general symptoms of phthisis, but it is a different thing from tuberculosis.

4057. Therefore it is more like bronchitis than tubercular disease ?—Yes, the stethoscopic symptoms are quite different.

4058. Will you be good enough to state to the Commissioners the difference between common consumption and the other disease, called miners' consumption ?—In a case of phthisis we have deposits

of solid bodies in the structure of the lungs, not in the air tubes, but between them. That is its first condition, and it goes on to produce ulceration in the cavity, that is phthisis, but this disease of the miners is, in my opinion, a low kind of inflammation which is set up at first in the air tubes, and which occasions a thickening of the parts from congestion, and then the vessels relieve themselves by copious expectoration, like all other diseases from impurity of the blood; all the other symptoms of phthisis go on just the same as if it was tabercular disease.

4059. You have stated that it was the opinion of an old medical man here that if a man took half an hour's less sleep and half an hour longer to come up it would be better for him?—Yes.

4060. But does not the time that the men take to go up and down depend upon themselves?—Yes, they may take what time they please to come up, and I never heard any fault found because they were not in their place of work at a certain time.

4061. But they would be complained of if they came up before a certain time, would they not?—Yes.

4062. Is it not natural that a man, after he has done a hard day's work, should like to get up to the surface as quick as he can, and go home?—I do not think that the men are anxious to get home. I have very often seen them chatting about the boiler house.

4063. Would not a man, after he has fired a shot, have to wait somewhere?—Yes.

4064. Might he not catch cold by waiting in a draught down below on the ladders?—Yes; and I have suggested that if he had a little wheel to turn in order to drive in air to his own end, instead of standing still, it would improve his atmosphere and do him good.

4065. Do they not generally contrive to fire a shot a short time before the time arrives to come up to the surface?—I understand that it is so.

4066. Therefore, when once a man has fired his shot he might leave the place, and, if so, he would only be ventilating that working for the man who succeeded him?—That is true, but they do not shoot their holes in the middle of their cores perhaps more than once.

4067. And on those occasions you would suggest that the man should work a fan in order to drive in air?—Yes.

4068. You have stated that the effect of the bad air is to make the men look old?—Yes; the blood is not renewed, and the parts are not so well supplied as when there is the necessary quantity of oxygen, they have to consume a greater amount of air to obtain the same results.

4069. Should you say that the miners do generally look old?—They have a pallor, and there is a peculiar appearance about them as a class, but they are very wiry men, and capable of enduring a great deal of fatigue, and they also appear to have a great deal of muscular power. I have seen them working under ground, and I have seen them hard at work boring, and I have been surprised to see the way in which they will go on for ten minutes beating the borer, without ceasing, calling not only the chest into play, but the muscles of the abdomen.

4070. That kind of labour must take a good deal out of them which ought to be replaced by good food?—Yes; but I do not think that the good food they want is food that would fatten them.

4071. But they want something to replace the loss they have sustained?—Yes.

4072. Did you not state that you considered a pasty a bad thing for them?—Yes, it is indigestible, and not only that, but I think that the men eating such indigestible food as cold pasty, and at the same time requiring their nervous power for muscular action in their work, they want that nervous power for digestion at the same time, and, therefore, instead of doing them good, I think it does them harm.

4073. It has been stated to the Commissioners in evidence that in former times it was not the habit to take the cold pasty down with them, but that since it has become the habit to take food down with them the miners have become more healthy?—Some time since I made this a leading point with the men. I believe that they used to smoke a great deal too much, and I said that if instead of smoking so much tobacco they were to take crib with them, which means a piece of bread, if they could not afford meat, it would do them more good, that they would be better if they did that instead of smoking so much.

4074. You think that if they took down with them some good wholesome food, and ate it in their intervals of rest, it would be advantageous to their health?—Perhaps to a limited degree, for I cannot consider that a man who is working hard should load his stomach with food.

4075. Light food would be more advantageous than heavy food?—Yes, to a limited degree.

4076. You have also stated that the men suffer from catching cold when they come up to the surface?—Yes; I think that when they came up before there were any man-engines they did so. I refer only to mines up which they climb on ladders when they come up heated, and have nothing about them but a loose flannel covering, and that only just on the shoulders; the sudden exposure to the atmosphere would render them more liable to bronchial disease.

4077. Then it would be very desirable, would it not, to have a changing house as near to the footway as possible?—Yes; but I think that the great thing that would obviate that state of perspiration would be some means to enable them to come up more easily. I believe that that is the great thing the miner wants; it is not necessary in very shallow mines.

4078. You have heard it stated that miners are apt to wash in cold water, and that they suffer from that?—I think that they very often get warm water to wash in, when they come to the surface.

4079. Do you not think that that is very desirable?—Yes, and they may have it if they like; there is plenty of hot water always running away from the hot air cistern. It is at the mouth of the shaft, and they may take it if they please, and my impression is that they very often do take water from there.

4080. But is it conveniently placed for them when they come up?—There is no difficulty in their taking their pan, and taking some water out of the hot air cistern.

4081. But would they not have to go in the cold air to fetch it?—No, they most frequently come up inside the shaft.

4082. Is the changing house generally near the engine shaft?—Yes, but it is not at all mines that they have a changing house. It is more generally adopted now than it was formerly; they used to change on the boilers.

4083. Do you think that is a good system?—No; there is plenty of dust there, and the steam is blowing out, and there is the danger too, although it very rarely occurs, of an explosion.

4084. Therefore it is desirable to have a changing house?—Yes.

4085. Do you think that the changing house should be the same as the drying house where there is a good deal of dust?—It would be the better course, but we must look in some degree to the building of these places. There is no question that it is far better for a man to breathe the clear atmosphere than where there is plenty of dust.

4086. Therefore it is essential to the man's health in some degree that there should be warm and convenient changing-houses?—Yes, I think that they are very likely to be a great benefit to the miners.

4087. Are there any men who have met with accidents now under your care?—Yes, several.

4088. What number of cases have you on your hands now?—I am now attending four men who have been injured by blasting.

4089. How were they injured?—By the sudden explosion of the powder in the hole.

4090. What is the nature of the injuries they have sustained?—They are generally about the face.

4091. Do the men sometimes lose their eyesight?—Very frequently.

4092. Will you be good enough to state how the accidents to which you have just referred have occurred?—They occurred in tamping. There was one case in which a man was looking into a hole on the naked powder. I do not know for what cause, but they often come to the hole before they put in their tamping and look down, and I have a notion that if there is a fraction of powder present, or, in fact, any powder containing sulphur, that free sulphur is thrown out, and that may be the means of carrying fire down to the naked powder. Hence, I have strongly suggested that the powder should be put in cases, and put into the holes in that way. In two of the other cases the accidents resulted from putting in what they call their first laying of tamping, and there they were using mallets, that is, one man was holding the bar, and another was beating it in. In the third case the accident also arose from putting in the tamping on the powder.

4093. In the latter cases the accidents arose from the men's own fault?—Two of them did, but in the other two cases it did not appear to be so, as the men were tamping in the ordinary way.

4094. Were these the first and only cases that have been brought under your notice?—No; I have had, I dare say, 40 or more cases; and I remember some time back, where the Charleston mines were being worked the last time, that they used to shut the cracks, and put in a very large quantity of powder, and most fearful accidents resulted from that practice. It could not be from tamping, but the men would look over their cracks with a candle and the powder would go off, I cannot say how, but I have there seen it; I recollect one case in which a man was brought up in a bag, he had been blown literally to pieces, his arms in one place, and his legs in another. But such fearful accidents do not occur where there is simple shooting in the ordinary way.

4095. Are there not strict rules and regulations laid down for the observance of the men?—The men are forbidden to go in after a hole has missed fire; they are forbidden to go in again during that spell, and they are told that if any accident occurs from their using a mallet, as I have just spoken of, they shall have no benefit from the club; but still they do it.

4096. Have any accidents come under your notice of late years?—We frequently have accidents when the ground falls away upon them.

4097. Do any accidents occur from falling away from the ladders?—Yes; I have known many cases of that kind.

4098. How have those accidents occurred?—Sometimes from a man thinking of one thing and doing another; perhaps he is speaking to another person, or there may be a defective bar.

4099. Are the bars of iron or of wood?—They are of both; some ladders are made entirely of iron staves, some have wood and iron; I have seen them made all of wood, but that is rare.

4100. When the miners fall from the ladders are they generally killed?—As a rule I should say no.

4101. What precautions are taken to see that the wood of which the staves are made does not get into a decayed state?—They are passing up and down every day, and the agents can observe it if it is

4102. Still they may break away?—Yes.

4103. Is it not desirable to have all iron staves?—I should say so myself.

4104. Do you know whether any accidents have occurred from a shaft being imperfectly protected, and from the footway being in one part of the shaft, and the woodwork between the two being broken away by any material that has fallen down?—I have never known an accident occur from that.

4105. (*Mr. Kendall.*) With regard to any injuries arising from the copper dust, do you think that any injury does arise?—I do not believe it in any other way than mechanically. I do not believe that copper dust would be worse than any other kind of dust.

4106. You have laid great stress upon the men climbing up the ladders, and you seem to think that a great deal of danger arises from their climbing so much as they do?—Yes, decidedly.

4107. Since the introduction of man-engines, do you think that the danger has been diminished?—Yes; and I have no doubt that it will be observed in the neighbourhood of St. Blazey that diseases of the chest will be much less in the next 20 years than they have been in the past 20 years.

4108. For how many years have man-engines been employed at Fowey Consols?—I cannot tell; but I should think for 15 or 16 years.

4109. Are the Commissioners to understand that you attribute the miners' disease more to their climbing and their exposure to the cold after they come up to the surface than to their working in what is called bad air underground?—I think that the climbing and the alterations in the temperature are two of the predisposing causes of the miners' disease, but to show that bad air is another cause of the the miners' disease, I may instance the Beam mine, where the ventilation was so badly attended to; but in the mines where I have been so much employed there are not so many cases of miners' disease as there were in the mines that are now abandoned.

4110. Do you think that the cases you have seen have arisen principally from the climbing and catching cold, or from working in bad air?—I think that all of them may tend to produce the disease.

4111. One cause seems to be bad ventilation; but I will set against that their rushing in to see the effects of the blasting; their moving rapidly up from below, their having to go frequently to the changing room, and being exposed to the cold, and their not over good diet. Now do you think that the miners' disease is more owing to the latter causes combined than to the want of ventilation underground?—I do not see how you can separate them; in the one case you predispose the miners to disease by bringing on inordinate action, and then you disturb the balance of the system, then again the men having to breathe impure air, that would tend to produce the disease.

4112. In those mines in which you are now extensively employed, is there much bad air?—No, I think that the ventilation, generally speaking, is very good.

4113. Are there many bad ends?—No; now that our agents have paid great attention to ventilation, I do not think that there is nearly so much bad air as there was formerly, and I do not hear it so frequently complained of.

4114. You have stated that the men being eager to effect a communication rise sometimes, and sink in others, in order to make a communication as rapidly as possible, but that notwithstanding that, some time will elapse before they can effect the communication. In that case do they resort to artificial means for the purpose of supplying air?—Invariably.

4115. They force in air?—Yes.

4116. Until natural ventilation is effected?—Yes, that is the case.

4117. Then does not great danger sometimes arise from the men having a long way to go to the changing houses, for example, in an extensive working where the labour is being carried on at a distant part, the old changing houses are allowed to remain in order to save expense, no fresh ones being erected near to the men as they ought to be?—That is the case sometimes; they could not be always building changing houses for every shaft that is put down.

4118. When the men quit their ends do you think that in well-regulated mines the men congregate in the open shafts near to the surface, and there remain until the bell rings, not mounting upwards for fear of being fined?—I do not think that that is the case,

not to accumulate in large numbers. I believe that they sometimes come up, and if they find they are a little before the time they might wait, but not in great numbers together.

4119. In large mines is there a debtor and creditor account kept as far as the miners' club goes?—Yes.

4120. Generally speaking how does the account stand, in favour of the miners or in favour of the mine?—There is always a surplus, in every case with which I have been acquainted, in the fund.

4121. You have drawn a very clear distinction between bronchitis or miners' consumption and true consumption; but I suppose that if a medical man came from a distance unacquainted with the miners' disease, he would be very apt to mistake the miners' consumption for real consumption, judging by the appearance of the men?—Yes, I had a long correspondence with a very celebrated consulting man in the West of England with regard to a case of the kind. He came and saw the case with me, and he said, "Surely this is a case of phthisis—the symptoms are" so and so. I said, "No, this is a case of what we call miners' consumption." He examined the case, and he could find nothing but the general symptoms of bronchitis, judging by the ear; but the next morning he was so satisfied that it was a case of real consumption that during my absence down stairs he actually discovered in his own imagination a cavity. He came down stairs, and he said, "I knew that there was a cavity in that man's lung," referring to the expectoration. I said, "I beg your pardon, there "is no cavity there, I have examined the man from "day to day, and whatever you may have heard "there is no cavity, come back with me and let me "hear it myself," but he could not it find afterwards. He was so convinced that it was a case of phthisis that he brought his stethoscope to hear what did not exist, which he admitted. I think that that shows strongly the view that a medical man might take who was not accustomed to these diseases, or accustomed to the stethoscope.

4122. (*Mr. Holland.*) Is it of common occurrence to mistake one disease for the other?—I think that these cases are very commonly called cases of phthisis.

4123. (*Mr. Austin Bruce.*) You have stated that you have often heard complaints made by men engaged in working upon a rise of ringing in the ears?—Yes.

4124. Are those workings in portions of the mines which are reached for the purpose of ventilation by artificial means?—Yes.

4125. If sufficient ventilation were supplied there would be none of those painful sensations felt?—No; but as I have stated before they very often use wooden pipes to carry in air, and those wooden pipes become damp, and there is a difficulty then in throwing in pure air, as it takes in too large a quantity of moisture, and in a close place where there are men breathing and candles burning there is such a consumption of the atmosphere that you cannot have it so pure with regard to the oxygen as by natural ventilation.

4126. Have you had any experience in mining in addition to your medical experience?—Yes.

4127. But only as a shareholder?—No.

4128. Do you often go underground?—No; I have not been underground for years past.

4129. Do you believe that in all cases the close ends are ventilated artificially?—I speak from my own experience here in the mines, and I know that that is the case, that means are always adopted where they can be to do that, perhaps a little more attention might be necessary, for they know the means, and they have it in their power to adopt them if they please, and if the men complain much I think the agents would be sure to do it.

4130. You have described very graphically the exhausting labour of boring, and the great muscular strength it requires?—Yes.

4131. Do you believe that where that kind of work is pursued the supply of air is always as much as it ought to be for the men so engaged?—In many places the air, I believe, is as good as it is here where that operation is going on.

4132. You say "in many places?"—Yes.

4133. But when you say "in many places" you exclude other places?—I cannot speak of mines in other parts, but I have no doubt that the same means are carried out in other parts as are carried out here; but I meant in many places in the same mine. In the rises I do not believe it is possible with our present knowledge of ventilation to get the air there, as it is possible in other places where a current of air is carried in from the end of the shaft.

4134. You have stated that a man may work on for some years while the miners' disease is establishing itself?—Yes.

4135. To the best of your belief are there any men under your charge at this moment in whom the miners' disease is forming?—I have no doubt there are; but in answering the question off-hand I cannot at once recall cases to my mind. I have two men who are now home suffering from it, but they are advanced cases. I have no doubt that I could find many incipient cases of the miners' disease.

4136. Men whom you would gladly treat if they had the prudence to come to you and describe their symptoms?—Yes; but they are not sufficiently ill to lay up from work; they do not like taking medicine unless they get a little cold, and then we give them some medicine.

4137. They are not sufficiently ill to be induced to come to you, but are they sufficiently ill to induce you to advise them to come to you if you were fully acquainted with their condition?—If they did perhaps I should order hygienic treatment which they would not adopt.

4138. But still some treatment would be necessary?—I should advise them not to work in poor air, or not to go down too deep, and not to climb.

4139. You stated that you believed that some of the bad effects arising from working in the close ends were due to the chemical action of the gases?—No; I beg your pardon, I stated that the air was heated in the ends from the chemical action going on in the lodes as well as from a want of ventilation.

4140. You stated that there was, in your opinion, no remedy for that chemical action?—None; of course if you carried in more air you would take away the excess of heat.

4141. A larger supply of air would neutralize the ill effects arising from the chemical action?—Yes; it would make the hot atmosphere colder by its obtaining an equilibrium.

4142. Supposing the thing were feasible, it is the duty, is it not, of those who conduct the ventilation to apportion the amount of it to the state of the mine, and the danger incurred by the workmen?—That I believe is pretty well attended to, I do not think that there is much to complain of as to that in our mines at present.

4143. If the effect of these chemical changes could be neutralized by a larger supply of air, and they were so neutralized, would not the danger then disappear?—What I say is this, that there is a chemical action going on in the lodes where there is an end driven into them, and the chemical changes that take place in it will go on whether there is ventilation or not, and those chemical changes are one of the sources of the hot end; it is not merely from bad ventilation.

4144. You will, I presume, admit that the evil effects of such chemical changes may be neutralized by a liberal supply of fresh air?—As far as the cooling of the end goes.

4145. Only so far as that?—Yes, there are no gases thrown out which are injurious by decomposition in the lodes.

4146. Do you believe that the cooling of the air in those places is necessary to health?—Certainly; the men would rather work where the air was moderately warm than where it was excessively hot.

I should say decidedly that it would be better for the men if they were working in a more equal temperature.

4147. Upon the whole, do you think that the tributors suffer more in their health than the tutworkmen ?—I have suggested that there should be statistics prepared upon that subject. I think that one would be found to be shorter lived than the other, but I cannot say that such is the case.

4148. Your reason for thinking so probably is, that the tributors usually work for a greater number of hours ?—Yes.

4149. I suppose it may be assumed that, as a general rule, they work in better air ?—I should say so, decidedly.

4150. You have made an excellent suggestion which was that after the men have fired a shot and retired, they should occupy themselves by turning a fan, instead of standing still and catching cold ?—Yes.

4151. Have you ever known that done ?—No, but I cannot say that it is not done. I believe that they very often have a boy who drives those fans to send in the air, and then they come out, and they take the opportunity to sit down on a little bench for a time to eat what they have, or to smoke.

4152. In those cases you would suggest that they should employ themselves by turning the fan in order to keep themselves warm, rather than for the sake of supplying air, which is already done by the boys ?—Yes, but I think that a man would turn it better than a boy.

4153. You have stated that the labour of a miner is one which requires a generous supply of food ?—Yes.

4154. And you have further stated that the sort of food the miners require is not of a fatty kind ?—I mean not to generate fat. I should say that they do not want a quantity of exuberant fat about them.

4155. What kind of food would you especially recommend for them, within the limit of their means ?—I think a limited quantity of animal food, but the great defect with regard to the miners, I think, is not in the character of their food so much as in the careless way in which it is cooked for them.

4156. Have any efforts been made to bring to the knowledge of the miners the kind of food that is best adapted for them, considering the nature of the employment ?—I am not aware that there have been.

4157. Do the miners attend lectures ?—No ; in fact it is only recently that they have had an opportuntity of doing so.

4158. But they have opportunities now, have they not ?—Yes, to a limited degree, but they do not attend to any great extent.

4159. Are they, generally speaking, sufficiently well educated to follow a lecture that is delivered in simple language ?—Not the kind of lectures that are usually given, which are generally more adapted for men who have been previously educated.

4160. I understood you to say that the habit of climbing made the men much more sensitive to the effects of any bad air ?—I should say that anything that breaks the circulation, and affects the lungs, which it must necessarily do, where there is increased respiration and circulation at one time, and then they fall down to the ordinary level afterwards ; from the sudden alterations in the structure, a man would be more predisposed to any disease arising from the breathing of bad air or deleterious gas.

4161. I presume that the bad air would render the climbing more injurious ?—Yes, as the bad air acts and re-acts the man's lungs would become contracted in a degree, and he could not take in so much air at a time, and he would have greater trouble in breathing.

4162. Upon the subject of clubs, do you think that generally speaking the money that is deducted from the wages of the men is either funded or that an accurate account is kept of it ?—Yes ; in all the mines. I would not say that in every small mine, where perhaps there are only a few men, there is such an account kept as there might be, but as a rule I think that all the books in the mines with which I have been connected as to the club account are very justly kept.

4163. Have you thought of any plan for preventing the consequences which you have mentioned, upon a mine being abandoned, and funds being still due to the miners ?—My own notion is that yearly all mines should send in a statement to a central board—say to the Vice-Warden's Court in Truro, or to any other place that might be determined upon—and that a debtor and creditor account should be given of all the mine clubs, and that upon the work in a mine coming to an end any monies that might be left in hand should be redeposited or vested in a committee, and that upon the certificates of the medical men and agents saying that so-and-so has been injured, they should receive a certain amount of money, that is to say, the men who were not provided with the means then of working.

4164. That is to say, that the men who had been working in a mine that had stopped should have a claim upon the fund that remained at the time the mine was closed ?—Yes, and that all mines that closed should contribute to a central fund, and for this reason, that the men who have been working in a mine that is abandoned to-day have worked perhaps in a dozen mines before they have contributed to their clubs.

4165. (*Mr. Holland.*) You have given us rather a long list of mines with which you are connected ?—Yes.

4166. Are they all in this neighbourhood ?—Yes.

4167. Are the dwellings which are occupied by the miners on the whole a tolerably good class of habitation ?—Yes ; the fact is that our miners are very well housed here—we have several mines that have ceased working.

4168. You have made a very good suggestion, viz., that inquiries should be made into the health of the tutmen and of the tributors—do you think that that could possibly be done ?—Yes.

4169. Do the same men continue as tutmen or tributors for any lengthened period of time ?—Yes ; but the tribute man does not like to work at tutwork, and the tutwork man is not competent, although sometimes the tutwork man is obliged to work as a tributor, but not from choice.

4170. Do you think that the two classes could be separated ?—Yes.

4171. You have stated that in your opinion the miners' complaint is not the same as tubercular consumption ?—Yes.

4172. But I suppose there is some tubercular consumption among them ?—Yes, but I do not think that the miners, as a class, are much more subject to tubercular disease than other classes of people.

4173. Do you not think that they are less subject to tubercular disease than other men ?—In giving an answer without having made any previous calculation, I should say that they were about the average.

4174. Do you happen to know that the age at which common consumption is most frequently fatal is under 35, and that there is less consumption among miners than among other males in England of the same age ?—Since I came into this district I have heard questions put as to the miners dying from consumption. I have been reflecting upon the subject, and my present notion is that I do not observe phthisis at all more, if so much, as amongst other classes.

4175. It is a statistical fact that a smaller number of miners die of consumption below the age of 35 than of other males of the same age. May it not therefore be presumed that the miners suffer less from tubercular consumption than other males ?—Yes, decidedly. I have not a doubt about that in my own mind, nor as to the nature of the miners' disease.

4176. You have stated that miners' consumption is generally bronchitis ?—Yes.

4177. Do you not think that it is often emphysema? —Yes; we do sometimes find emphysema, but not generally; we do not look for sound and percussion as in emphysema.

4178. Is there not rather an excess of resonance in the chest?—It is not marked. In emphysema we should have more resonance, a clear sound of percussion.

4179. Is there not often tubercular deposit?—Not only that, but we find the stethoscopic symptoms to be in the lower part of the chest.

4180. The fact that miners' consumption is situate mostly in the lower part of the chest, whereas common consumption is almost always at the top of the chest, makes a clear distinction between the two diseases, does it not?—It is not only that, but all the respiration and all the sounds are different.

4181. The formation of cavities in the upper part of the chest, I believe, is rare?—Yes; I should call it phthisis if we had cavities, but as to the emphysemous state in miners' consumption, I can distinctly state that in the last stages you may have the whole of the chest involved, so that at the last you may find some degree of emphysema, but it is certainly not so in the earlier symptoms.

4182. If the disease was produced by climbing, would not emphysema be a likely consequence?—Yes, you might get a forced extension of the air cells, that is by fast climbing.

4183. You are probably aware that the proportion of cases in which there is spitting of blood in true phthisis is very large, about two out of three?—That may be so in some part of its course.

4184. Is there anything like that proportion, that is two-thirds of the cases of miners' consumption in which there is spitting of blood?—No.

4185. Is there one-tenth of them?—It is a very rare thing; we sometimes see small streaks, but nothing more; we do not get hæmoptysis.

4186. Is hæmoptysis a rare occurrence?—Yes; very rare.

4187. Is not that another strong distinguishing mark between miners' consumption and tubercular consumption?—Yes; but the cases are not at all parallel.

4188. Does miners' consumption generally begin with spitting as well as cough?—No; not in the beginning, there is very little, if any, expectoration.

4189. That is not common bronchitis?—The first symptom that we see is a tightness in breathing, before there is cough to any extent; the person is not laid up in the beginning with bronchitis.

4190. Would you not rather call it bronchial irritation, or bronchial inflammation?—It is a low kind of inflammation that is set up which is not accompanied with the general symptoms.

4191. Is there at first much pain with it?—No; they do not complain of pain.

4192. No pain behind the sternum?—No; they complain of a tightness as if there was a band round them.

4193. But no pain?—No; they may sometimes have a little pain.

4194. Does miners' consumption very frequently begin with cold?—It begins in a slow way, with difficulty of breathing and tightness at the chest without abundant expectoration, but it becomes purulent in the end.

4195. After the disease has apparently become severe, if the miner changes his employment, does he generally recover?—I do not think they ever lose it after the disease has set in. I think they are always subject to it more or less, and always liable to have colds set up.

4196. The miner seldom recovers when the disease is once established?—No.

4197. If he changes his work may he not live many years afterwards?—Yes, and so they do as miners.

4198. When a person is suffering from tubercular consumption does he ever live many years afterwards?—Not frequently.

4199. Do you not know as a fact that considerably more than half the persons who suffer from tubercular consumption die in the first year after the attack, whereas miners' consumption often lasts for many years?—Yes.

4200. Does not that also show the strongly marked difference which exists between the two diseases?—Yes, of course.

4201. Have many of your patients complained of breathing in cold damp, as they call it?—I have heard some of the men who have worked in the granite mines in Beam, for instance, say that they have been breathing cold air.

4202. Mr. Lanyon divides the cold damps under two heads; he says, "Under the first we may place "all those in which carbonic acid is found to exist in "excess, forming a variety technically called cold damp "by the miner, found generally in shallow levels in "which granite or soft killas abounds. The effects "on the system are those in a certain degree which "are well known to be occasioned by carbonic acid, "first a sensation of coldness, quickly succeeded by a "giddiness and pain of the head, sickness, prostration "of strength, particularly of the knees, tremors, and a "most unconquerable disposition to sleep; to over-"come which and the coldness, the men are obliged "to work most actively and perseveringly." In your judgment is that a fair description?—I never heard our men complain so much as that, if they did I should suppose that they had been in bad air; into an old shaft that had not been worked; they are such symptoms as they describe when they go into a place of that kind, but I never knew our men working ordinarily complain of those symptoms; a man could not work with such air, and I can understand impure air producing all those symptoms, but not where any of our men work in this district.

4203. Such symptoms are very rarely produced, they are not common?—No; certainly not.

4204. Mr. Lanyon again says, "The general cha-"racter of the compounds to be classed under the "second head differs very considerably from these. "So far from being cold, these produce a disagree-"able feeling of heat, are found in deeper situations "and in harder ground than the preceding, and owe "their statistics in great measure to the more fre-"quent employment of gunpowder; it is here gene-"rally that we are nauseated by the sulphuretted "hydrogen evolved by the empyreumatic fumes "already noticed, and by the animal effluvia which "must be exhaled in great quantities from bodies "undergoing the most violent exercise in a tempe-"rature equal to that of a vapour bath. This atmo-"sphere is loaded also with powder smoke, which "renders it so dense as sometimes to be absolutely "irrespirable." Is that, in your opinion, a correct description of a hot end?—We have none in any mine that I have been engaged in.

4205. Mr. Lanyon goes on to say that out of 312 miners, 100 have cough, dyspnœa, palpitation, or all. It that anything like the proportion now?—I should say there was not so great a proportion, not nearly so.

4206. He also states that out of that same number (312) 87 suffer from dyspepsia, or some other diseases of the digestive apparatus. Is that in your opinion true?—It depends to what extent it goes. The miners very often complain of slight symptoms of indigestion. I should not say that there was so large a proportion.

4207. He further states that very nearly a tenth of them suffer from chronical rheumatism?—That certainly would not apply to this district.

4208. And 35 have had spitting of blood from the lungs at different periods of their lives?—There is no such proportion here. That is my opinion; but I am really answering without having kept tables. I certainly should say it was not so.

4209. (*Chairman*). You have stated that there are several who have upon them incipient miners' disease

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to whom you would recommend hygienic treatment?—Yes.

4210. How many have you under your charge at present?—I should think perhaps 400.

4211. Can you detect incipient miners' disease without making a minute examination?—The fact is, that I can detect it very easily in the breathing without examining them, when they have the first symptoms of this bronchial disease there is a hesitation in their breathing during the time they are talking.

4212. You have stated that in the mines with which you are connected there are some ends where the air is poor, and that means are taken to supply ventilation. Can you say what means are taken to supply ventilation?—It is generally with pipes or a fan, and sometimes with doors. I think at other times they use a falling stream of water.

4213. Is there an air engine attached to the steam engine?—I am not aware of that.

4214. Then it is merely where water is not used, to improve the circulation of the air below?—Yes, by using a fan.

4215. The means are below and not above?—Yes, it is not air brought from the surface.

4216. You have stated that although the men do not in large numbers wait upon the ladders in the shaft for fear of being spaled, yet still when they do wait, they would be likely to take cold?—Yes, especially if they had been climbing; if they come up by the man-engine they are not so likely to catch cold.

4217. Are you of opinion that the infants of miners are more weakly at birth than others?—Yes, I think that there is a great mortality among the children of miners; more so than among the children of the agricultural population.

4218. Do you think that there is a greater difficulty in rearing them?—Yes.

4219. (*Mr. Holland.*) Does that occur before or after the weaning?—After the weaning.

4220. What do you think that arises from?—I think partly from their food and from there being very little care taken of them.

4221. A surgeon of great experience informed me that he thought it arose from the bad cooking of the mothers?—I think that they do not keep their houses very neatly, as I have already stated, and I think I can generally tell a domestic servant from a mine girl who has become a wife.

4222. Have you noticed a difference in the comparative health of the children born of miners' wives who have been bal girls, and those who have been domestic servants?—You can tell the difference in the children. The latter are better clothed; there is more cleanliness visible in a house, and more care is taken of their children. I do not mean to say that there are no bal girls who do not make good wives, but I am taking it as a general rule.

4223. Are there many miners who have gardens in which they work?—Yes; and there are many of them who will go out and work between their times. I have a man who comes sometimes and he gets 7*s.* or 8*s.* a week from me for coming and working in my garden, he has done that lately.

4224. Is that a common practice?—It is not common to go out to work, but they cultivate gardens for themselves.

4225. Are those men who work in gardens more healthy than those miners who do not?—No; I should not say so, in fact this man is an example of an early stage of miners' consumption, you can see it by the catching in his breathing.

The witness withdrew.

Mr. John Berryman examined.

Mr. J. Berryman.

4226. (*Chairman.*) You are a medical man residing in St. Austell?—Yes. I have practised here about 12 years. I have not been surgeon to any mines of importance, but I have been parish surgeon during the greater part of that time, and from that circumstance I have derived what little knowledge of the miners' disease I possess.

4227. You refer to cases which have been brought under your notice in the parish?—Yes; and generally speaking they are in an advanced stage of the disease; occasionally I meet with them in an earlier stage, but not often.

4228. You say in an advanced stage of the disease, what is the disease?—I entirely agree with what Mr. Pearce has stated, that there is quite a distinction between tubercular phthisis and the miners' disease, and that they are two distinct disorders. I believe that the foundation of the miners' disease is at first bronchitis, and that repeated attacks of that bronchitis leads to a disorganized state of the different tissues of the lungs, the bronchial tubes, and the air vesicles themselves. It is from repeated attacks of bronchitis, not one only, but repeated attacks of bronchitis, and a continuance of cough.

4229. If the miners left the work in which they are engaged with bronchitis, would they equally, if they caught bronchitis in any other occupation, bring on the same state of disease?—Not unless it was repeated, and then it would have that effect.

4230. Are you of opinion that working in the mines is likely to cause a repetition of that disease?—Very likely. I think that it is the nature of the occupation which causes repeated attacks, and I think, also, that climbing is an additional cause.

4231. Have you examined any of these patients especially?—Yes, I have examined their chests; we have but few opportunities of examining, and particularly of making post-mortem examinations.

4232. Have you had any opportunities at all of making post-mortem examinations?—No, I cannot say that I have had any of which I could give a distinct and proper history.

4233. Do you find that amongst any other class of the population anything like the same kind of disease prevails?—We find the same kind of disease occasionally among the people who have been exposed to similar causes.

4234. In your parish are the cases which mostly come under your notice those of miners?—Yes, it is a mining district hereabout, and those who come under my care are frequently miners who suffer from this disease.

4235. Do you ever meet with them in an early stage?—Yes, occasionally.

4236. Have you known any cases in which they have recovered?—Yes, but that is not in an advanced stage of the disease. I think that if they were removed to some other calling the disease could be prevented from proceeding to an extreme.

4237. (*Mr. Kendall.*) Generally speaking you agree with the evidence given by Mr. Pearce?—Yes, with this exception, that I think emphysema is a very common accompaniment of the disorder.

4238. (*Mr. Holland.*) Do you mean early in the case?—I think that the bronchial tubes get dilated from frequent cough, and that the lungs become emphysemous. I think so from seeing them frequently in an advanced stage, and from the various symptoms which are shown. I believe, with Mr. Pearce, that the thickened state, from the inflammatory substances which are thrown out of the tubes gradually increasing, is the primary cause of it.

4239. (*Mr. Austin Bruce.*) Have you instituted any inquiry into the comparative length of life among miners and the other part of the population?—I have no statistics to go from; it is merely from memory, but we know that we very rarely see an old man a miner; they become disabled and unfit for work before they get to between 50 and 60. Some of them work on, but they are generally men of very

sound constitutions, who have been, perhaps, not subjected to such powerful exciting causes.

4240. The number of hours during which they work per day is very moderate, is it not?—They work for eight hours in the 24, sometimes by day and sometimes by night.

4241. Then their work must have something to do with the causes affecting their health, arising either from its severity or the conditions under which it is carried on?—I think it is from the nature of their occupation.

4242. What should you specially point out as that part of their occupation which produces the most injury?—I should say, first, it is from working in bad air, and from their coming up in an exhausted state from their work; coming out of a hot atmosphere and being subjected, under those unfavourable circumstances, to external cold, which is very likely to produce bronchitis and lung disease.

4243. I suppose that a large portion of them suffer from a combination of those causes?—Yes. I think that the irritating effect of the powder smoke is another cause by irritating the mucous membrane of the chest.

4244. (*Mr. Holland.*) Are you of opinion that the disease generally is at the base of the lungs, and not at the top of them?—I do not think that the lung tissue is affected. I think it is principally confined to the tubes; first, the tubes and cells. I think that a mistake frequently exists upon that point. Sometimes there is inflammation of the lung tissue, and there are cavities, although there are no tubercles existing that may be the cause of tubercular phthisis, but you get stethoscopic symptoms; a cavity without tubercles being present.

4245. A dilated tube may be so much enlarged as to give forth the resonance of a cavity?—Yes, but that is rare.

4246. Do you think it is an ulcer of the substance of the lung?—Yes.

4247. Is hæmoptysis a rare occurrence?—I think that pure hæmoptysis or spitting of blood is rare, but frequently they have hæmorrhage. If I had a case where there was distinct hæmoptysis, I should come to the conclusion that they had tubercular phthisis.

4248. Is distinct hæmoptysis a rare occurrence?—Yes.

4249. Much more rare than in the ordinary run of consumptive cases?—Yes, decidedly.

4250. (*Mr. Kendall.*) Have you ever been underground?—Never.

The witness withdrew

Mr. William Pace examined.

4251. (*Chairman.*) You have charge of the district adjoining that of Dr. Tayler's?—Yes, I have.

4252. Will you state to the Commissioners the number of miners in your district?—I should say about 2,000.

4253. And those are more or less under your charge?—Yes, together with Dr. Tayler.

4254. How many are under your own particular charge?—I should say 1,500.

4255. Have you at this moment many patients?—Not many.

4256. Can you state about how many are under your charge?—Very few indeed; I do not think I have now half a dozen.

4257. What is the disease under which those miners are suffering?—One man has been home with miners' disease, and for the last 12 or 13 years he has been receiving miners' pay from the club; sometimes the poor fellow is better, and sometimes he is worse. Then there is another man who is suffering from miners' disease, but not so badly; he occasionally works.

4258. Do you think that there are many men amongst those you have mentioned who, if examined would be found to have upon them incipient symptoms of miners' consumption?—No.

4259. You probably heard Mr. Pearce state that he could tell when a man had upon him the miners' disease in an incipient form, although not without minute examination?—I could very soon detect it if they came to me.

4260. Do they come to you in that state?—Sometimes; not in an incipient state. They have become so much improved in health in the last few years that they are quite a different race of men to what they were when I first came to the district 25 years ago, and that has taken place since we have had the mines better ventilated, and have had the man-engine at the mines.

4261. How long has the man-engine been employed?—About eight or nine years.

4262. At which mine is that?—At Fowey Consols.

4263. Is there a man-engine at the other mines?—Yes, there is at Par Consols.

4264. How long has it been there?—Only a short period.

4265. Do you know how long it has been there?—Within the last year and a half.

4266. Have you observed any difference in the health of the men as between Fowey Consols and Par Consols, or before and after the man-engine was put up at Par Consols?—Not any.

4267. At Par Consols the men had to climb to the surface by the ladder?—Yes.

4268. Until within about a year ago?—Yes.

4269. What height had they to climb up at Par Consols?—I think about 200 fathoms, and I think that the adit is about 30 or 35.

4270. The men at Par Consols having to climb by ladders to the surface were not in a more unhealthy state than those at Fowey Consols?—No.

4271. Have any new means been employed for the purpose of ventilation in the mines since you came to the district?—Yes, a great many.

4272. What is it that, in your opinion, has occasioned the improvement in the health of the miners, is it ventilation?—Yes, better ventilation and the man engine; the miners altogether are better in health, and there is more morality amongst them, they are better conducted than they were.

4273. Are they less addicted to intemperance?—Yes; that has been left off very much indeed.

4274. What induced the miners to leave that off?—I cannot say that; they are not decidedly teetotallers but they do not drink so much as they did.

4275. Are there many teetotallers among them?—A few.

4276. The man-engine could only have had an effect in one mine in improving the health of the miners?—Yes, but they are more careful in climbing; they do not climb so hard as they used to do many years ago.

4277. How is it that if the man-engine has had the effect of improving their health that any of the men have climbed for those two years during which the man-engine has been in operation, and that in Par Consols an improvement has also taken place?—It is from that cause that they do not climb so hard; I have advised them not to do so, and they have attended to it.

4278. You think that if they did not climb so rapidly, it would not be injurious to their health?—Not if they took their time in coming up.

4279. Would there be any difference in the effect of the climbing whether they had been working in poor air or in good air?—Yes, in poor air it would produce a great deal of exhaustion with them.

4280. With regard to the miners' disease, what do you consider that proceeds from?—I think that it comes on from cold, but they are more careful than

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they were. Formerly they would come up from the hot levels, and wash their breasts in cold water, and sluice themselves over with it, and put their feet and legs in cold water, and wash their arms in it; but now they do not do that, they now use warm water.

4281. Is the warm water provided for them?—Yes, they may get it.

4282. But is it provided for them?—They can get it when they like from the engine.

4283. The men can fetch it in from the engine?—Yes.

4284. Would it not be better to have a regular washing place provided for the men?—It might be; but perhaps some of them would not have recourse to it.

4285. Do you consider the miners' disease a form of bronchitis?—Yes. I believe that it commences with bronchitis.

4286. Did you hear the evidence given by the last witness?—Yes.

4287. Do you concur with him?—Yes. I believe that it may terminate in true consumption where there is an hereditary disposition to it.

4288. But if there is not an hereditary disposition, then what should you say?—I do not think it would so terminate with care.

4289. Would the symptoms be similar?—Yes, they would.

4290. So that you could distinguish between the two?—Yes, decidedly.

4291. (*Mr. Austin Bruce.*) You have given a most gratifying account of the state of the health of those who are under your charge. Do you believe that the miners are as healthy and as long-lived as the population who are not employed in mining?—I think so about this district. I saw a man yesterday, who was 72 years of age, a miner, and who went underground at the age of 11, a hearty, hale-looking man.

4292. He must have worked for a great number of years during the time when the mine was less well ventilated, and when there was no man-engine?—Yes.

4293. So that his constitution must have been a remarkably sound one?—Yes.

4294. Taking the average, have you at all compared from the materials which must exist in the neighbourhood, the length of the miners' life as compared with that of the agricultural population, and those engaged on the surface of the ground?—I think that they are about equal now. We have many miners in our neighbourhood now who are working, and taking their duty, and performing it as well as young men; they are between 50 and 60.

4295. Do you speak now from having observed more numerous instances than formerly of long-lived miners, or do you speak from any analysis you have made of the burial register?—I speak from my own observations of men residing in the neighbourhood

4296. Where are the greater portion of the miners, who are under your charge when they die, buried?—In St. Blasey.

4297. In the parish churchyard?—Yes.

4298. Are others buried elsewhere?—Yes; sometimes they are taken to Tywardreath.

4299. But the greater part are buried in St. Blasey?—Yes.

4300. Would it be too much trouble for you, occupying as you do so important a position among the medical men in the district, to analyse the burial register in order to ascertain whether your impression as to the longevity of the miners is correct?—It would be no trouble at all to do that.

4301. If you would be so kind as to do so the Commissioners would all feel much obliged to you?—I will do it. A great boon to the miners employed in our mines in Par Consols, West Fowey, and Fowey Consols, is that the surgeons have unlimited power to order them wine, porter, or ale or anything that they may think necessary for them; the adventurers allow that.

4302. In fact it may be assumed that the miners at West Fowey, Fowey Consols, and Par Consols, are working at least under as favourable conditions as any miners in Cornwall?—Yes.

4303. (*Mr. Holland.*) Do you agree with the other witnesses as to the difference between miners' consumption and common consumption?—To a certain degree I do.

4304. Do you agree as to its being more in the lower part than in the higher part of the lungs?—Yes, in its commencement it is so.

4305. Is hæmoptysis comparatively rare in miners' consumption?—It is very rare now, or within the few years, since we have had the man-engine at Fowey Consols. Before that we had many cases of hæmoptysis.

4306. (*Chairman.*) Did you observe that the same change took place at Par Consols where there was no man-engine until last year?—There were very few cases indeed, it was the depth of the mine, at Fowey Consols it was so deep and hot.

4307. Then the miners at Par Consols never suffered so much as those at Fowey Consols?—No.

4308. (*Mr. Holland.*) Are you acquainted with any of the miners in the rest of the country?—No; they occasionally come to me for advice from distant parts, but very few.

4309. Have you any means of knowing whether the miners at Fowey Consols are much more healthy than those of the rest of the country?—No.

The witness withdrew.

Mr. Richard H. Williams examined.

Mr. R. H. Williams.

4310. (*Chairman.*) Will you state to the Commissioners the name of the mine of which you have charge as captain?—The Charlestown united tin mines, and the St. Austell Consols mines; those are the largest mines.

4311. Have you charge of any others?—There are two smaller mines; we are only working above the adit now with some few men.

4312. Have you worked underground yourself?—Only for a very short time, a month or two. I have not worked much underground as a miner.

4313. How did you obtain your experience with regard to mines so as to be appointed manager?—I had been at the mines studying for a number of years before I became manager.

4314. How many years have you had charge of the two principal mines which you have named?—Of one mine about 12 years, and the other since its commencement, of the Charlestown mines about three years.

4315. How many men are there employed in the large mines with which you are connected?—We have 243 men underground in the Charlestown mines.

4316. And in the other large mine how many?—In the other mine we have 126 men employed underground.

4317. What is the depth of the Charlestown mine?—The bottom of the mine is now 140 fathoms deep under the adit, making about 160 fathoms.

4318. And what is the depth of the other?—That is comparatively shallow; it is only 80 fathoms from the surface.

4319. In the first mine is there more than one shaft, or how many are there?—We have six shafts in the Charlestown mine, and we have two communicating with the bottom of the mine, or the next bottom level at the St. Austell Consols mine.

4320. Are you now driving any levels where the air is what is termed poor?—We are driving on to the 50-fathom level, and also the level at the 124 fathoms, at the bottom of the mine. Those are what

we term the closest ends, and most requiring ventilation.

4321. Is there poor air there?—It requires a moving atmosphere in all those places.

4322. What means do you adopt to supply air?—I have adopted for some years in the mines a water jet with very great success, that is driving in water by means of high pressure, and the water is discharged through a small rose, similar to the end of a watering-pot, and that is thrown in through a larger wooden pipe, which forms a kind of natural vacuum, and so the supply is kept up to the end by continuous tubes.

4323. Made of wood?—Yes, all made of wood; or we could use cast iron, or galvanized iron; we find that the wood absorbs the oxygen to a certain extent, and consequently deprives the air of it.

4324. As you go on, do you extend your tubes?—Yes.

4325. Is it by ladders that the men ascend from below?—Yes.

4326. Have you ever thought of any means by which they could be conveyed to the surface without climbing up the ladders?—Yes, I have; I was created an associate of the Royal Institution of Cornwall for a paper that I wrote, and a model that I exhibited for lifting miners out of the mines. It was by drawing them up in a skip with a safety catch to it.

4327. Has that mode been adopted?—Yes, it has been. I threw the plan entirely open to the mining population, and it was taken up by some persons, and some little improvements have been made in it, and it has been adopted in one or two mines, for example, in the South Francis mine the men come up in a skip, and I have inspected it.

4328. Is that mine worked according to your own notion?—Yes.

4329. Has this plan been applied to your own mine yet?—No.

4330. Have you recommended that it should be used there?—I think that in putting up a machine in our own mines I should put up one of the ordinary man-engines like that which is used at Fowey Consols, for I think that it is more permanent, and more to be trusted to; I have been over them both. I have been to the bottom of Fowey Consols, and I learnt most of my mining there.

4331. Which is the most expensive of the two plans?—The man-engine would be considerably more expensive to the mine.

4332. Have you ever calculated what the expense of a man-engine would be if applied to your mine?—Yes; I should think it would be perhaps about from 1,000*l.* to 1,200*l.*

4333. Have you recommended that it should be adopted?—It has been suggested; I have not recommended it. We are only just opening the mine, we have not drained it very long. Had we constructed the whole of the works most likely we should have adopted some means before this.

4334. Has any accident happened from the use of the skip at South Francis mine?—I think that one man has been killed. I condemn the practice of using the skip as it is now done. I think that if the skips are to be used for drawing up the miners there should be duplicate ropes, not the same that they are drawing up with, because those catches might slip at any time.

4335. Are you acquainted with the man-engine sufficiently to say whether any accidents have happened?—No accident has happened at Par Consols or at Fowey Consols, I think, to either of them; but on its first introduction it was rather dangerous; they had two rods working side by side, so that a man stepped from one moving rod to the other; but at Fowey Consols you step off on to a platform which is fixed, and your attention is called only to one object instead of to two. I have come up by that with very great ease.

4336. Do you think that the man-engine can be applied to all mines?—I think that to all deep mines it should be applied, but in shallow mines it would be a question of very great expense. The operations of mineral mining are peculiar; it sometimes occurs at the first onset of a mine that all the establishment, the plant, &c., is erected on one spot, and after some time the most productive ground is found to be perhaps three-quarters of a mile away, and the works would have to be reconstructed. I think therefore that a mine should be established before a man-engine is resorted to.

4337. What would be the cost, by your plan, of a skip?—The cost of the attachment—merely catching the skip is very little—of course the same guide and skip rope that is in use in the mine would be applicable for drawing up the men.

4338. But that is supposing that you adopted the same means of draught as that by which the ore is brought up?—Yes; I do not condemn the plan exactly, I only think that where these skips are used for drawing up the men, duplicate ropes should be kept purposely for that; the same machinery would be safer if there were good duplicate ropes for drawing up the men.

4339. You would propose that they should come up the same shaft?—Yes.

4340. But of course the machinery for bringing up the ore would be stopped at the time the skip for the men was coming up?—Yes.

4341. Therefore the expense of it would be only the extra ropes?—Yes.

4342. Might not it be, at all events in the first instance, too expensive perhaps to adopt the man engine?—I think for shallow mines I should wholly condemn, but not for deep mines.

4343. How could you put a man-engine into a shaft that was not straight?—There would be a certain amount of difficulty, but I think that could be overcome by the handle being at an angle, and taking a shorter lift, the platform being at the same angle, so that the rod would take the line of the shaft; but the holding part must be made to fall like an inverted cone, and the platform across the shaft must be put in as before.

4344. So that the man-engine could be adopted although there were angles in the shaft?—Yes.

4345. (*Mr. Kendall.*) You do not speak as a working miner?—No.

4346. You have been, as I understand, connected with mining from your boyhood?—Yes.

4347. And you were first at Fowey Consols?—Yes.

4348. What is your special occupation now?—I am only a mine agent.

4349. Have you the command of the whole?—Yes.

4350. Have you given your attention a good deal to machinery for the purpose of ventilation?—Yes, I have, and to mining operations as well.

4351. Do you go underground frequently now?—I go underground three days a week, sometimes four, and I have gone underground six days a week.

4352. Do you set the ground yourself now?—Yes.

4353. You say that you have given your attention to the subject of ventilation?—Yes, I have.

4354. Has the ventilation of mines been improved since the time you can recollect?—I think that the plan I am now adopting, and have adopted for some years, has been approved by Captain Charles Thomas; he inspected the mine, and he said that he believed a level could be driven any distance with that, that is by a water jet.

4355. Is that different from the old water jet?—Perhaps it is not. I do not claim exactly the merit of inventing the thing, but I claim the introduction of it in the Cornwall mines.

4356. To what distance does the water jet enable you to carry air in?—The furthest distance has been 100 fathoms.

4357. Where is that?—At St. Austell Consols.

4358. Is the air very pure in the end?—Yes, that which comes in the pipe.

4359. You mean the air that is sent in ?—Yes.

4360. Does it enable you to burn a candle without any perceptible difference ?—Undoubtedly it does in the end.

4361. What do the men think of that ?—The men say that they never saw such a machine before.

4362. Are they pleased with it ?—Yes. I set a pair of men the other day to raise a shaft from the 85-fathom level to the 70 fathoms.

4363. Fifteen fathoms ?—Yes ; it is 15 fathoms perpendicular, but this rise has gone up in the under lie, so that the measure of the rise was nearly 20 fathoms.

4364. What is the distance from the rise to the draught ?—The last place where there was good air was at 80 fathoms, and I put in this machine, and the air in the top of that rise was as pure as it is in this room, except the heat from the candles.

4365. What was the expense per fathom of doing that ?—The iron pipes cost us about 2*s.* 6*d.* a fathom, and the zinc pipes about 5*s.* a fathom; they are easily put together, they are all of iron like gas tubing, and they screw universally ; there is no trouble in fitting them, and two men in three days would put the thing in.

4366. What was the cost of keeping the action up ?—A powerful machine put in with an inch pipe and about a two inch rose with 16 holes, would cost us about half a stroke per minute to a 12-inch lift, or equal to about 400 cwt. of coals a day. The water is taken from a high level and conveyed down into the mine through a small pipe, the height gives the pressure, the outlet is much less in proportion, owing to the small hole, and that creates a jet. That jet is blown in through a large wooden pipe, and after being passed in some three fathoms the jet throws the water about three fathoms through this pipe, and consequently all the air is knocked out, so that it forms a sort of natural vacuum, and the air rushes in at the back, the draught is so great that it will put your candle out.

4367. You have stated that zinc pipes would cost you about 5*s.* a fathom ?—Yes.

4368. After your arrangements are complete what is the working cost ?—That depends upon circumstances.

4369. Do you employ a boy to watch it ?—No ; nothing but the men who go down to relieve look to it.

4370. Is it self-acting ?—Yes.

4371. What extra cost per month do you think accrues from the use of this machine in taking up the water that you throw through the jet ?—It requires a little explanation. I have a very powerful one now working at the 124 fathoms in the Charlestown mines, supplying seven men in the corps ; there are two men in the end, two in the cross cut, and three men cutting out the lode, and this is giving those men a full supply of air now. It cost us nothing as it is taken from a high level, and the water would fall from that level, and be conveyed down through wooden pipes to the 124-fathom level, for in case that machine was not working, the same water would have to be brought down to supply that lift. It occurs in the mines that we graduate our lifts in size as we go down a little smaller so as that each lift shall only be sufficiently large to take away the water, but it occurs at the under levels in the water time that the top water comes in and overflows the top lifts, and we have to work the engine much faster, consequently our bottom lifts go in fork ; that is, they have not a sufficient supply, and that injures the work, it forces the air, and causes a great concussion of the valves, we obviate that by having a wooden pipe from the top to the bottom ; it goes down, and it conveys a sufficient quantity of water.

4372. So that this machine costs you nothing when it is once in operation ?—Nothing at all, but in some mines it would, in some mines where they are driven up on account of pumping, every lift is sometimes full of a quantity of water, and to take away that would be an additional cost. When the engine is brought to its full maximum load the speed of it would entail a considerable amount of cost, and perhaps cost 20*l.* or 30*l.* a month, and that might endanger the machinery by forcing the engine faster than it would go.

4373. Under ordinary circumstances you are of opinion that when once you have incurred the expense of erecting this machinery, the sum of money required to keep it in working order would be merely nominal ?—Yes.

4374. (*Mr. Davey.*) In ventilating a level, which is the best principle to act upon, to extract the foul air, or to force in pure air ?—To drive in pure air, I think.

4375. Have you seen your plan tried in any other mine than your own ?—No.

4376. (*Mr. Kendall.*) Did the miners under you suffer much from foul air before you adopted this machine ?—We could not have done the work without it ; we must have had either that machine or some other, and I have found this most effectual.

4377. Did you use any other artificial means before you adopted this principle ?—Yes, I have used the fan machine ; I have had six boys driving the fan, two boys in each corps, each eight hours, and I find that those little boys flag at their work, the fan stops, they drive too slowly, and they do not throw in the air.

4378. Did those fans throw in fresh air ?—Yes ; I applied a little water wheel underground with very great success, and I think that has been done in Polgooth as well. I am now putting it into the 124 fathoms at Charlestown to drive the fan there, it is a water wheel, a 10-feet wheel.

4379. (*Mr. Holland.*) Are you now working the 80 fathoms with no other mode of ventilation but the jet ?—Yes.

4380. (*Mr. Austin Bruce.*) How long has this plan been in operation ?—I have worked it for about seven or eight years.

4381. After the account you have given of it, I presume that there is no close end to which it would not be applicable ?—I could not say that, because sometimes we have got a driving shaft, and where we have not got a skip rope or some means of steadying the kibble, if we bring our iron pipes down that shaft this thing would knock them out. A level driven from the driving shaft would not be so easily ventilated by that means if the ordinary fan could be used.

4382. Are you now working close ends under two systems ?—Yes.

4383. Are the men in your opinion in the one case able to work more vigorously than they are in the other ?—I think that they work more hours.

4384. Do they work longer than the ordinary eight hours ?—No ; but in the one case there is so good a supply of air, the current is so great that the smoke of the powder, after a hole has been blasted, is instantly blown away, while in the other case the draught is so little that the smoke is merely floating.

4385. In letting work do you believe that you are able to let it more economically to your employers in well-ventilated mines ?—Yes.

4386. Have you had practical proof of that in your own mine ?—Yes, I set a pair of men on Friday last at St. Austell Consols to cut through a lode. I gave them 30*s.* a fathom more than I should have given them if they had had a full supply of fresh air.

4387. How much would you have given them then ?—About 45*s.* a fathom, and I gave them 3*l.* 12*s.*

4388. If that is at all a fair instance to give the difference must be out of all proportion to the expense of erecting and maintaining such a machine ?—Yes, no doubt it is.

4389. Is it as applicable to the rises as it is to the close ends ?—Yes.

4390. It can be applied vertically ?—Yes.

4391. Have you done so ?—Yes.

4392. And always with the same economical

effects as well as the same healthful effects?—Yes. I put in a rise through to the Charlestown mines 20 fathoms, and I do not think that any other machine would have done it; we should have gone to the level and sunk part of the way, but we had the machine there, and so have risen part of the way.

4393. Has this machine been examined by other engineers in the district?—It has been examined by Captain Charles Thomas and Captain Mitchell.

4394. Has Captain Charles Thomas approved of it?—Yes.

4395. Has he adopted it?—Yes.

4396. (*Mr. Davey.*) Which Captain Richards do you allude to?—Of the Devon Great Consols. I sent him a drawing of it, and I showed him the plan; I also got part of the apparatus made by Mr. West, and sent it to him.

4397. (*Chairman.*) How long ago was that?—It was some three years ago.

4398. (*Mr. Austin Bruce.*) I presume that the larger the portion of the eight hours which a man can devote to his work the better for himself and for his employer?—Yes.

4399. The man-engine, I suppose, leads to that desirable result?—It certainly does for deep mines.

4400. Can you give any instances of the difference it has made to the miner from your own experience, that is to say, what amount of time, in shafts of an equal depth, would be saved to the miner by the use of the man-engine?—I have come up from the bottom, at Fowey Consols, with the man-engine in 20 minutes, the depth being 240 fathoms, and the adit being 40 fathoms, making together 280 fathoms; and if I had had to climb up by the ladders I should have wanted an hour and a half to do it.

4401. The saving of time is over and above the advantage gained to the men's health and strength?—Yes.

4402. In blasting are any injurious effects produced upon the health of the men by the explosion of gunpowder?—The combustion of the powder produces carbonic acid, which of course produces a sort of coma, or lethargy, or stupor, as that must be inhaled by the miner.

4403. Is there anything that you think is injurious to the health of the miner from the smoke of the candles?—I think that the most injurious effect of the candle is that it takes up the oxygen and leaves the carbon, of which there is an excess. I believe that Professor Phillips has spoken of introducing an apparatus for generating oxygen, but I think he is quite mistaken as to mining; what we want is a moving atmosphere.

The witness withdrew.

Adjourned till To-morrow at 10 o'clock.

Tuesday, 22d April 1862.

PRESENT:

The Right Hon. Lord Kinnaird, K.T.	H. Austin Bruce, Esq., M.P.
The Hon. A. Fulke Egerton, M.P.	H. P. Holland, Esq.
Nicholas Kendall, Esq., M.P.	Richard Davey, Esq., M.P.

The Right Hon. Lord KINNAIRD, K.T., in the Chair.

Mr. Francis Barratt examined.

4404. (*Chairman.*) In what mine are you engaged?—In South Crinnis.

4405. Do you manage that mine?—Yes.

4406. I believe you are one of the principal proprietors of that mine?—Yes.

4407. Had you ever the management of any other mine?—Yes; East Crinnis, Pembroke, and the Charlestown mines.

4408. Did you ever work in a mine?—Not in this county, but I have in Devonshire.

4409. In what description of mine?—A copper mine.

4410. What is the mine that you are now managing?—A copper mine.

4411. What number of men are employed in South Crinnis?—Not many; there are 72 underground.

4412. How many boys are employed?—Of boys and girls there are 63.

4413. Are they all employed on the surface?—Yes.

4414. Are there no boys employed underground?—I think not.

4415. Have you any fan engine worked by a boy?—We have occasionally, but very seldom; we have 22 men employed at the surface to work at the engines and other things.

4416. What is the youngest age at which a boy works underground?—I should think about 16.

4417. I suppose it is no advantage to them to work underground below under that age?—I think it is no advantage for them to work very early.

4418. What is the greatest depth that has been reached in your mine?—At present we are shallow, only 35 fathoms below the adit.

4419. Do the men ascend by ladders?—Yes.

4420. Have you ever seen any other means of ascent or descent adopted?—Yes.

4421. Where?—In the north of England.

4422. What are the means adopted there?—The men go down in a bucket.

4423. Would that plan, in your opinion, be applicable to the mines here?—No, I do not think it would.

4424. Why not?—I think that the men would not prefer it; they would rather climb the ladders.

4425. Would it be practicable to adopt it, as far as your experience goes?—I do not see any use in it in our neighbourhood.

4426. Would it not be an advantage in a deep mine to have some means by which the climbing up the ladders might be avoided?—Yes.

4427. Do you think that the means which you have seen used in the north would be applicable here?—I should prefer a man engine.

4428. But do you think that what you have seen in the north, might be applied here?—It could be applied certainly, but I think a man engine would be preferable.

4429. Why?—In this neighbourhood the stuff is drawn up by buckets, and unless there was a separate shaft, a distinct shaft, there would be danger from one bucket going up and the other coming down.

4430. There are two means by which the stuff is drawn up, the kibble and the skip?—Yes; the skip is not generally used in this neighbourhood.

4431. Do you see any advantage in the use of the skip?—Yes.

4432. What is the advantage of it?—There are fewer accidents, and less breakages, and it is drawn cheaper.

4433. Do you think there is any less chance of the stones falling out?—Yes.

4434. Therefore you think that there would be an advantage in using the skip?—Yes.

4435. In places where the skip is used, could not

some means be devised by which, the skip being attached to the same rope, the men could ascend and descend at a different time from the material ?—Yes ; I suppose it could be done.

4436. What is the objection to its being so used ?—The steam whim would be occupied in sending the men up and down, and there are so many various levels that they must stop at. By the man engine they could step out.

4437. But the men only go down at certain hours of the day, do they not ?—It is at six o'clock in the morning, two o'clock inthe after noon, and ten o'clock at night.

4438. It would only be necessary to stop the conveyance of the stuff upwards at certain times ?—Yes ; but it is not always that the whim is working.

4439. In a very deep mine, if there were means to enable the men to mount from the level at which the ore is put into the skip or kibble, would it not be a great relief to the men, considering the great height that they have now to ascend by ladders ?—Yes ; of course, in deep mines, but not in shallow ones.

4440. You have spoken of the man engine, are you aware that the men objected to that at first ?—I am not aware that they did.

4441. Do you know what the expense of erecting a man engine is ?—No, I do not ; we have never erected one, it would depend upon the depth.

4442. Is it applicable to any large shaft as at present sunk ?—The perpendicular shafts are the best, but I do not know enough of the subject, I have never had anything to do with it, I have only seen them.

4443. In the mine you have spoken of, I suppose there are no hot levels ?—No.

4444. Are there any ends in which the air is poor ?—No.

4445. Do you ever drive ends at any great distance from a shaft ?—Yes.

4446. At what distance from the shaft have you ever driven an end ?—200 fathoms.

4447. What means of ventilation did you adopt when you were driving away from the shaft ?—A brattice.

4448. From the shaft ?—Yes.

4449. Is that carried along the level ?—Yes.

4450. Is that made of wood ?—It is a soller, as we term it.

4451. Is it necessary when you have a soller to raise the height of the level ?—Yes.

4452. With a soller to what height do you drive the levels ?—Eight feet, six, or nine feet.

4453. Leaving for the sollers about two feet ?—Fully that.

4454. And that is carried on to the full extent to which the men are working ?—Yes ; within about two fathoms.

4455. Do not those sollers wear out very quickly ?—There is a rail laid on them.

4456. You do not use any barrows on them ?—Very rarely.

4457. With a rail upon them those sollers will last ?—Yes.

4458. Is the air passing through them at all affected by passing through the wood ?—We do not observe that.

4459. Does the wood soon get rotted through ?—No.

4460. What kind of wood do you use ?—Deal.

4461. I suppose that where you are working now is not a wet mine ?—No ; it is dry.

4462. Do you consider that the ventilation by that means is complete to the extremity of the end ?—Yes ; the current is either under the soller or over, because we have doors in the levels and at the shafts so as to change as the draught changes.

4463. Do you mean that the draught is affected by the weather ?—Yes, by the wind.

4464. How many shafts have you ?—Six.

4465. If the ventilation is much affected by the wind you then shut the door down in order to force the air down the soller ?—Yes ; either to drive the current over the soller or under it.

4466. Is your object to introduce fresh air by the soller ?—Yes. That is constantly going in over the soller or under the soller.

4467. In that change of the current of air is it changed from under to over, or from over to under ?—It is according to the wind.

4468. That is from the communication that the soller has with the shaft ?—Yes.

4469. Do you provide any accommodation for the men on their coming up from the mines ?—We have galleries about the smiths' shop.

4470. Do the men get a change of clothes ?—Yes.

4471. Are their clothes well dried ?—Yes ; they are dried in consequence of the fires that are there.

4472. Is the smiths' shop far from the footway ?—It is about 40 yards from it.

4473. Is there much dust created when the men are changing their clothes ?—No.

4474. Is ventilation provided ?—Yes.

4475. How soon is the smoke cleared away from the end to which these sollers are conducted ?—That will depend upon the strength of current ; sometimes perhaps it may take three or four minutes, and at other times it may take three times that length of time.

4476. What should you say would be the longest time before it could be cleared away ?—I think that an end would be clear of smoke in about 15 or 20 minutes.

4477. Is the current also affected by the temperature ?—Yes.

4478. On a close heavy day I suppose there is not much circulation ?—No.

4479. Have you ever, in other mines, seen any other means adopted for ventilating close ends ?—Yes ; by a waterfall forcing in air.

4480. Is that in your opinion a good method ?—Yes ; no doubt of it.

4481. But that depends, does it not, upon your having the means of getting water ?—Yes.

4482. Will you describe to the Commissioners how that is done ?—It is by a perpendicular pipe, and the water falling through it, the air is admitted in with the water, or we take it perhaps 15 or 18 feet below the surface into the pipe ; in fact it is a vacuum created by the fall of the water.

4483. How is it discharged at the end ?—Into a cistern.

4484. How is the air conducted that is brought down by the water ?—It is drawn through a pipe into the level.

4485. Is the air discharged into a large wooden pipe or soller, or does it merely force its way into the end ?—This is the bottom of the pipe (*describing the same*), the pipe goes out in that direction (*describing the same*), and the water bubbles up over the cistern; the air cannot escape.

4486. Is the air sent along by an air pipe ?—Yes.

4487. To the end of the level ?—Yes.

4488. Then is the smoke from the powder and the candles soon dissipated ?—Yes ; it is soon driven off.

4489. So that the men suffer no inconvenience ?—I should say now that they suffer no inconvenience ; of course there is a little inconvenience felt for five or ten minutes.

4490. Do they resume their work until the smoke has dispersed ?—No ; they stop a little while.

4491. I suppose there are occasions when they rush in at once, or too soon ?—They are not required to do so.

4492. But they do it, do they not ?—Yes ; I am afraid they do.

4493. That is the fault of the men themselves ?—Yes.

4494. Then it is very important that the current of air should be sufficiently strong to drive out the smoke rapidly in order that the men may do more work ?—Yes.

4495. Have any accidents occurred in the last two or three years?—We have been working for 18 years, and we have only had two accidents, no deaths.

4496. From what cause did the accidents occur?—A piece of ground turned out and broke a man's thigh, and in the other case a man blasted a hole upon himself.

4497. In blasting is the powder put into the hole naked, or is it put in in a case?—Generally in a paper case.

4498. Are those cases supplied by you?—Yes.

4499. Are your instructions that it should always be so used?—No; we leave it to the men.

4500. Whether they will use a case or not?—Yes.

4501. Do you not think that a case is safer?—I see no advantage in it in perfectly dry ground.

4502. Then it is merely where the hole bored is in wet ground that you would think it more advisable?—Yes; in damp or wet ground.

4503. In a dry hole you see no advantage?—There is none that I can see.

4504. As far as danger is concerned, is there any danger when a hole is wet in putting in the powder?—No; it is to secure the powder.

4505. Do the men prefer tribute work or tut work?—We have very little tribute work; it is more tut work.

4506. Do you work your mine by means of tut work?—Yes, principally; we have only three or four pitches.

4507. Are the miners upon the whole healthy?—Yes.

4508. Do you know any of them who are now suffering from what is termed miner's disease?—They have colds; there is only one man who is suffering, but he is able to work.

4509. On the surface or underground?—Underground.

4510. Is he able to ascend the ladders?—Yes.

4511. Has he been long suffering to your knowledge?—He has been with us for about five years; he is about 48 years of age, and I suppose that he must have caught cold, or something of that sort in some other mine.

4512. In what way does he suffer?—He has a little tightness at the chest.

4513. And a cough?—Yes.

4514. And difficulty of breathing?—Yes.

4515. And yet he is able, your mine not being a deep one, to ascend the ladders?—Yes; he never complained.

4516. In the other mines which you have stated you have been connected with, were there any ends where there was poor air?—Yes; I think in the two first we must have had ends where there was poor air, but that is more than 30 years since.

4517. Were any other means than those which you have mentioned adopted in those instances?—We forced in air.

4518. By what means did you force in the air?—By working in a box in water.

4519. Can you describe it to the Commissioners?—One box worked in the other; the other box was filled with water with a valve on the top, and every time the box lifted, the valve would lift and shut again, and press in the air; but it is a very inferior way of doing it. A fan is best, worked by hand, or a little water-wheel.

4520. In that case it is merely making the air that is below circulate when it is done by hand?—Yes.

4521. (*Mr. Davey.*) In what mine did you drive a level for 200 fathoms?—At South Crinnis.

4522. Was it the adit level that you drove in?—No, the 35 fathom level below the sea level.

4523. You had, I suppose, communications from the other levels by winzes?—Yes.

4524. Then you did not at a distance of 200 fathoms from the shaft drive the air all the way in there?—Yes, we did; it was a cross cut south.

4525. And you carried out the whole of the 200 fathoms by the use of the soller?—Yes.

4526. Did you find that at all times sufficient to drive the air in?—Yes, quite sufficient, unless it was a very foggy day, and then the mine was generally affected.

4527. I think you stated that you had worked it in East Crinnis?—Yes.

4528. And you stated, I think, that there were other means by which the miners could ascend besides the ladder or the man engine; was that by an inclined plane?—No; I do not think that the miners went up; I think it was too hazardous. I think it was not used, generally speaking.

4529. What objection do you see to the men being drawn up in a skip?—The men do not like to risk themselves under a chain. We do not use chains.

4530. You think that coming up in a kibble would be dangerous?—Yes, there would be the danger of meeting.

4531. How long have you been working in the mines in Cornwall?—For 40 years.

4532. What improvement do you consider has taken place in the condition and health of the miners during that time?—I think that the miners, generally speaking, are supplied with much better air than they were formerly.

4533. Do you think their condition is altogether better?—Yes; I think that they are longer lived, and that they enjoy better health.

4534. Do you recollect in your younger days seeing the miners in their large frieze great coats in the towns sunning themselves when in a state of consumption, and coughing constantly?—I have seen them certainly.

4535. Do you ever see the same thing now?—No.

4536. (*Mr. Fulke Egerton.*) Have you had a great deal of experience in deep mines?—No.

4537. Have you had any experience in them?—I have had experience in mines about 150 fathoms deep.

4538. Are you of opinion that the man engine is an economical mode of working a mine?—Yes.

4539. Is it more economical than the ladders?—Yes, in a very deep mine, where there are a great number of men.

4540. At what depth do you think it advisable to put down a man engine, or can you speak with certainty upon that point?—When we go down below 100 fathoms.

4541. I suppose the principal saving is the saving of time?—Yes, and the men's health.

4542. You have stated that the men object to trusting their lives to a chain. Have you ever seen a pair of ropes in use in the collieries in the north?—Yes.

4543. Do you think the men would have the same objection to them?—Of course you mean that the skip should work in guides?

4544. Yes.—I think the prejudice might be overcome.

4545. In that case should you say that the use of a wire rope similar to those which are in use in the north, to enable the men to ascend, would be as satisfactory to them as the man engine?—I should prefer a man engine.

4546. On the average, what weight is now brought up in the skip?—15 cwt.

4547. Does that include the weight of the skip?—No, without the skip; that would be about a ton or 21 cwt.

4548. (*Mr. Holland.*) You say that you would prefer the man engine to the skip; is that because you think it safer?—Yes.

4549. Is that the only reason?—We do not use wire ropes in this neighbourhood.

4550. If your objection to them was removed then your objection to the skips would be removed?—I think I should prefer the man engine.

4551. For what reason?—I fancy that it is safer.

4552. But should you prefer it for that reason only?—Yes.

4553. If it were proved to you that the other was

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equally safe, would you then have any objection to it?—Yes.

4554. How long does it take to ascend 100 fathoms at a fair pace by the ladders?—About 20 minutes; that is tolerably easy work.

4555. Those twenty minutes are equal to an hour's labour, are they not?—Yes; about that, I suppose it is.

4556. Then in fact you make a man do nine hours work in eight hours; or, in other words, you impose an additional hour's work upon him by the use of the ladders?—Exactly so.

4557. Would it not therefore be much cheaper to have a skip to raise them up rather than make the men climb up, and by that means undergo an additional hour's labour, or, in other words, would not the value of the hour's work of all the men be very greatly in excess of the cost of working the skip?—I think that the men at present would not take to the skip.

4558. I am asking you to give your opinion; do you not think that it would save the men fatigue?—Yes, certainly.

4559. Is it not the fact that when the man engine was first introduced the men had a very strong objection to it?—I think it was not so in our neighbourhood, but I have heard of such a thing in the west.

4560. Have you not heard the men say, when the man engine was first talked about, they would not go upon it?—No; I have heard the men say at Fowey Consols, that they were very well pleased with it, and that it saved them a great deal of fatigue.

4561. You stated just now that you thought it probable the prejudice against the skip would be removed after a trial?—Yes.

4562. Then you consider it a prejudice?—Yes; I have no doubt of it, in many instances perhaps it may be so.

4563. The men entertain a prejudice without any knowledge?—I am sure that they would not risk their bodies were there was a chain working.

4564. You stated a short time back, that you preferred a fan to a duck engine?—Yes.

4565. Why?—Because it throws the air stronger.

4566. Why does it throw the air stronger?—I mean our duck engines, I do not know what others there are.

4567. A duck engine will throw the air as strongly as a small fan?—We find in practice that the fan is the best; a duck engine as large as this room may throw a great quantity of air.

4568. Is that the only reason why you prefer a fan to a duck engine, because it throws the air stronger?—I think that the fan engine is more easy to work.

4569. For the same quantity of air?—Yes.

4570. Have you calculated that?—Yes, I think we have.

4571. Have you measured it?—We have thrown aside all the duck engines, and have introduced fans, because we find that the fans are the best.

4572. You have not measured what amount of power each works at?—We find that a very small fan will throw in a greater current of air than the other engine of a moderate size.

4573. Have you measured them or compared them?—No.

4574. Those who have measured them have come to the opposite conclusion?—I do not know that.

4575. Is there a regular up-cast and down-cast current in the mine; does the air regularly go down one shaft and regularly come up the other?—No, not regularly.

4576. Is the air in the shaft good?—Yes.

4577. How can that be?—I do not know how it is, but so it is.

4578. Without a regular current up one shaft and down the other, you say that the air in the shaft is good?—I have found this, that the highest shaft is the down-cast.

4579. Regularly?—I have found at times the down-cast shaft 15 or 20 fathoms higher than any other shaft; the mine has a down-cast for about six months outright.

4580. And the longer shaft is a dow-ncast shaft generally, you say?—Yes.

4581. Is it not the contrary?—I will give you a proof of it. The adit there throughout the mine, or at least at that point, was 35 fathoms deep, and I have seen icicles at the adit level in the highest shaft, the shaft being nearly 20 fathoms higher than any other shaft in the mine.

4582. That is to say, it came up to a higher surface?—Yes.

4583. And it was regularly down-cast?—Yes.

4584. To what depth in the mine?—The mine was 100 fathoms deep; 100 fathoms below that level.

4585. About what was the temperature of the bottom level?—I should think about 50° or 60°.

4586. Is that the usual experience, or is it not a remarkable exception?—We find at South Crinnis that the highest shaft is frequently the down-cast shaft.

4587. How is it at the deep mines?—I cannot speak of any more than the Charlestown mines.

4588. When you ventilate an end you drive air into the shaft along the air-pipe, do you not?—We put in sollers now.

4589. When you ventilate artifically with the fan?—Then we put in pipes at the back of the level.

4590. And drive it from the shaft into the end of the level?—Yes.

4591. (*Mr. Austin Bruce.*) Have you ventilated other mines, besides the one which you manage at present, by means of the sollers you have described?—No; by a waterfall.

4592. Were the close ends as well ventilated by means of the waterfall as by means of the sollers?—No.

4593. The men, therefore, in the close ends work under more favourable conditions now than they did formerly in the mines?—Yes.

4594. Do you think that you get more work out of them in consequence?—Of course we do.

4595. Do you make any difference in the price of the labour in consequence?—I dare say that the price is a little less.

4596. And that is to the advantage of the adventurer?—Yes.

4597. While the good air is to the advantage of both?—Yes.

4598. Does this system of ventilating by means of sollers apply to rises as well as to close ends?—Yes.

4599. Do you so apply it?—Yes.

4600. Then the men working in low rises are just as well off as if they were working in any other part of the mine?—Yes; they are tolerably well off.

4601. Why are they not perfectly well off?—In the rises the stuff may fall down and may choke the passage, and therefore the air is obstructed for a short time.

4602. But only for a short time?—Yes; they go down and clear it out again.

4603. Have you not had instances of men working for months in bad air?—No.

4604. Nor for weeks?—No, nor even for days.

4605. Is there any real difficulty in so directing the current of air that there shall be, as there is in coal mines, a regular down-cast and a regular up-cast?—With us, we cannot make sure of the down-cast or up-cast; sometimes the down-cast may be the up-cast, and *vice versâ*.

4606. I know that the fact is so; but what I wish you to explain to the Commissioners is, why it is not possible to do in copper and tin mines what is done in coal mines?—I have seen a large mine that the men could not go down more than two or three fathoms below the surface of a morning in still foggy weather, and yet in the course of six hours that air would be driven away, and the men could resume their work; this, of course, was in a valley.

4607. If you had an up-cast shaft, with an air-pumping engine at its mouth, you would have secured a current of air which would enable the men to go down at any time, would it not?—I think it would be an advantage to have an engine to exhaust the air.

4608. But in that case it would be necessary so to conduct the ventilation that it should not return indiscriminately to every shaft, would it not?—Yes; I think that would be an advantage.

4609. Do you see any reason why that could not be done?—A column of pipes could be put down, and the air could be exhausted by an engine above; but I would rather force the air into the mine.

4610. If you forced the air into the mine you would not keep a distinct up-cast and down-cast in the manner I have suggested would you?—You could force the air into the down-cast and it would come up the up-cast.

4611. If you forced the air down the down-cast might not a portion of the return air return up the very same shaft?—It is possible.

4612. Is not that a thing to be avoided?—Why so, as long as you supply the bottom of the mine with good air?

4613. Is not the object to secure a sufficient quantity of good air to all the workings?—Yes.

4614. And to make the bad air, that is, the air already breathed, pass to the outer air without returning through the workings through which it has already passed?—You could drive the air to the extremity of the mine by an engine forcing in air only, and continue your pipes. I would have branches to the bottom to let out the air.

4615. If you had a regular down-cast shaft, and a regular up-cast shaft you would not require any pipes in the down-cast?—No, if you can make sure of your up-cast and down-cast.

4616. That can be done by proper management can it not?—I do not know; but I see accidents occur, or I hear of them in collieries, where there is no up-cast or down-cast, or no circulation.

4617. But those accidents occur from the accumulation of gases and from an insufficient supply of air do they not?—I should endeavour to drive out the accumulation of the gas, and drive it out to the surface, that is what I mean.

4618. Do you use water power for ventilation?—No.

4619. Have you ever seen it used?—Yes.

4620. Have you seen the system which is adopted by Mr. Williams?—I do not know what it is.

4621. You have had I believe but very few accidents in your mine from the use of powder?—Very few.

4622. But accidents are nevertheless very frequent in the neighbouring mines, are they not?—I think not.

4623. You have stated that, in your opinion, the health of the miners is better than it was, and that they are longer lived?—Yes.

4624. Do you state that from any careful examination of the register of deaths, or from your general observation?—I think that 30 years ago the health of the miners gave way sooner than it does now.

4625. Is that opinion based upon your own general observation or upon such registers as you have examined?—It is based upon my own general observation for 20 or 20 years back.

4626. Do you believe that at present the health of the miners is as good, and their lives as long as those of the non-mining population?—I think that a miner's life is of shorter duration than that of men engaged in other employments.

4627. Shorter than that of agricultural labourers?—Yes.

4628. Why should it be so?—It is from breathing powder smoke which is injurious, there is no doubt of it.

4629. But where the ventilation is as good as yours and the powder smoke soon dispersed, there is no necessity for them to breathe the powder smoke?—With us I think that the miners are just as healthy and live as long as other working people.

4630. But you do not think that they are so in general?—No; not in the deeper mines where they are not so well ventilated.

4631. Is there any reason why the very deep mines should not be as well ventilated as yours are?—I think that there is more difficulty in deep mines than in shallow ones.

4632. But why so?—The current is not so strong at the bottom.

4633. Ought not the current to be rather stronger in deep mines, where there is a greater difference between the temperature of the top and the bottom of the mine than in shallow mines?—We do not find it so in practice, the current is not so strong in deep mines as in shallow ones; I do not know why it is so, but so it is.

4634. In a question affecting the health and the lives of men, wherever difficulties in the natural ventilation occur, ought not artificial means to be resorted to to assist the natural ventilation?—Yes.

4635. And do you know of any case where, by the joint use of artificial and natural ventilation, sufficient air cannot be introduced?—No, I do not.

4636. Do you think that the question of cost would interfere with a sufficient supply of air?—Yes; it may be so.

4637. You have had the advantage of examining coal mines?—No; I have never been underground; but I have seen them at work,

4638. Do not you think that it would be an advantage to the Cornish captains if they were sometimes to see what is going on in the other mining districts of England?—In what way?

4639. In the way of ventilation.—I have never seen any advantage to be derived from that.

4640. Do you think that the Cornish miners have nothing to learn from any other people?—Yes; a great deal.

4641. Then considering the immense difficulties that exist in the ventilation of coal mines above those which exist in the ventilation of copper mines, is it not natural that the ingenuity of man should have introduced some better means of ventilation in coal mines than in copper mines?—I should say, as a whole, that the copper and the tin mines are better ventilated than the coal mines.

4642. What makes you say so?—I know that in some instances there is only one shaft in coal mines, and you cannot get a very good ventilation where there is only one shaft, and where the workings extend for a considerable distance.

4643. Why not?—I do not know why not; but so it is in practice.

4644. Do you suppose, where there is only one shaft, that that shaft is not so completely divided into two, as to separate the down-cast from the up-cast?—I think there would not be a continous current there.

4645. You do not think that anything is to be learnt from the collieries of Durham or Newcastle in the way of ventilation?—I am not exactly sure about that; but I think that copper mines, from what I have heard and read, and tin mines, are as well ventilated as coal mines if not better; that is my view of the case.

4646. Do any of your captains travel out of Cornwall?—Yes; some of them do.

4647. For the purpose of making inquiries?—No.

4648. (*Mr. Kendall.*) What is your opinion about the down-cast and up-cast; as I understand you there is no regular down-cast and up-cast in your own mines?—I have found it to be so in practice.

4649. Did you ever find the want of a draught in a mine where there were two shafts?—Yes; I have.

4650. Was the air dead?—Yes.

4651. For any length of time?—I have known it to be so for a day.

4652. For how many days in a year have you

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known that state of things to exist in your mine ?—I have never known it in winter, but in summer, in very hot weather—dull, heavy weather.

4653. Your supply of air, when you use artificial means, is of course taken from the main draught, that is from shaft to shaft and from level to level ?—Yes.

4654. Are there times when you have no air there to pump in ?—Yes ; and the men cannot go down.

4655. On those occasions the men do not go down ?—They cannot, they have no light ; the candle would be quenched in a moment.

4656. Has that occurred several times within your knowledge ?—Yes, at East Crinnis, and at Pembroke in the valley.

4657. Have you ever heard of that being so in any other mines in the neighbourhood ?—No, I think not.

4658. Speaking generally, where you have a connection by a shaft, have you not generally a good through draught ?—Yes.

4659. Very good ?—Yes.

4660. Does not the candle show you sometimes that it is very strong ?—Yes ; you are scarcely able to keep the candle burning on account of the draught being so strong.

4661. In those exceptional cases the men do not go underground ?—They could not go down.

4662. Do you, or do you not, when you find there is bad ventilation at once resort to artificial means ?—No ; a few hours would remove it, a change of wind would do it.

4663. But I mean generally speaking in the ends ?—Yes, they always adopt means immediately to send in air, either by fans or by bratticing.

4664. Have you ever known instances where, when the men have complained, and the complaint has been well founded, they have remained for three days, or four days, or a week before they have ceased to work ?—No.

4665. You at once attend to it ?—Yes ; the men would be ill otherwise. I never ask the men to work in poor air, I tell them to stop.

4666. I suppose the men do stop before they give you notice ?—Yes ; the tributers would be in a back level, perhaps in poor air.

4667. Comparing the tributor with the tut-work man, which do you think is the longest lifed ?—I should think there is not much difference, I should say they are just the same.

4668. Have you found that the deprivation of light for eight hours has something to do with the health of the men ?—I do not know in what way.

4669. Generally speaking a miner is a paler looking man than an agricultural labourer ?—Yes, he is certainly.

4670. Much paler ?—Yes.

4671. Do not the tributers at times overwork themselves ?—Yes, they do.

4672. For instance, suppose a man takes a pitch at 10*s.* in the pound, does it not frequently happen before the pitch is out that he finds he could work it very well at 2*s.* in the pound ?—Yes.

4673. If his time is short, unless he can have any other help, does he not frequently work 16 hours instead of 8 ?—Yes.

4674. They work like slaves do they not during 16 hours ?—Yes.

4675. Did you ever know a case in which a man who had got a start did not work like a slave, or at all events work very hard ?—I think not.

4676. And in most cases much harder than he ought to work ?—Yes.

4677. And much to the detriment of his frame ?—Yes.

4678. Does not that, in your opinion, tell much against the average life of a miner as compared with an agricultural labourer ?—Yes, no doubt of it.

4679. Now take the converse of that. Suppose that a man has got a fair price and the pitch fails, according to your experience, does he then work harder to make up for it ?—No.

4680. He gets disheartened, does he not ?—Yes.

4681. And it is quite the reverse of the other case ?—Yes.

4682. He often does not work at all ?—It is the hope of reward that sweetens labour.

4683. Is not this the fact that if a pitch turns out better than a miner expects, and he earns more wages, that he labours much more than he ought to do ; and if it turns out worse than he expects he gets disheartened, and he works less than if it proves to be a good pitch ?—Yes, just so.

4684. A good deal has been said about the skip and the man engine ; you have been asked whether the skip is not a more rapid mode of descent, and you said yes ; did you take this into your calculation, that by the skip some five or six men alone can go down, whereas, if you have a man-engine reaching down 240 fathoms you may have 120 men on that same engine at the same time ?—Yes.

4685. Taking that into your consideration, is not a man-engine, as far as economy of time goes, as good as a skip ?—Yes.

4686. You were the first person, I think, who introduced the skip into this neighbourhood ?—Yes.

4687. Was your shaft a straight one ?—Yes.

4688. Suppose you were to go into a mine where the shafts were not straight, and you wanted to apply either the skip or the man-engine, which would be the easiest to introduce, if the shaft were irregular ?—I should say that the man-engine would be the easiest to introduce.

4689. As far as your experience goes, the skip must either have a direct inclined plane to work over or the shaft must be perpendicular ?—Yes.

4690. But with a man-engine you can vary it ?—Yes ; and it is done.

4691. With regard to the food of the miners, you are in the habit of visiting them, I believe, a good deal ?—I see them.

4692. Do they take their principal meals underground, or in the evening when they reach home ?—They bring a small quantity of food with them ; a little pastry ; and they sit down and eat that about 10 or 11 o'clock.

4693. But they take the chief meal, do they not, at home ?—Yes.

4694. Of what does that meal consist, and is it a wholesome one ?—I do not know ; but I should think it would be.

4695. Can you state whether the miners eat much animal food or not ?—Most of them I think get a tolerable quantity of animal food.

4696. You have been speaking of the fan engine and the duck engine. I suppose from what you said, that you have discontinued the use of the old duck engine, which was possibly an inferior one of its kind ?—Yes ; not large enough perhaps.

4697. And you have resorted to the fan ?—Yes.

4698. I suppose you judge of the value of the fan by the burning of the candles in the ends ?—Yes; by the quantity of air that is thrown into an end.

4699. You feel that, and are sensible of it ?—Yes.

4700. What is the comparative amount of labour required for the fan and the duck engine. Could you employ boys to both ?—Yes, to both ; the duck or the fan in the various levels. The duck engine has a cistern, one working in the other.

4701. Is there much difference in the cost of the two ?—The fan would cost about 2*l.* 10*s.*, and the duck, I should think, would cost just the same.

4702. Then what would the labour of working cost ?—There is not much difference.

4703. As far as you have seen, is the effect of the fan much greater than the effect of the other ?—Yes.

4704. What is your opinion as to the comparative utility of exhausting the air, or of forcing it into the shafts so as to have a regular up-cast and down-cast; do you think, taking the mines generally in Cornwall, from what you have heard, that there are five

mines in Cornwall that are at all in the condition that you have stated other mines were, that is to say, with no draught at all, no up-cast nor down-cast, and the air so dead that you could not burn candles ?—I know another mine; Tywardreath mine was in the same situation—that is just below Par Consols.

4705. That is upon a flat ?—Yes ; in a valley.

4706. Where mines are in valleys, it is not at all unlikely that the same thing would occur ?—No.

4707. During several days in a hot summer ?—Yes ; perhaps for two or three days.

4708. In the year ?—Yes.

4709. With the exception of those two or three days in mines situated in valleys, you say that, generally speaking, there is a strong draught throughout a mine ?—Yes ; the circulation would be free.

4710. Quite free, that is, not only for general use, but for giving a supply when you resort to artificial means ?—Yes.

4711. Save and except in the mines which have been mentioned, would it be worth the cost, or would it be any particular service to employ the exhausting engines which have been referred to would it pay ?—I prefer the forcing engines.

4712. Would it pay to employ them ?—I think it would pay for deep mines.

4713. Your view is that in a very deep mine it would better to employ a forcing engine ?—Yes ; it would lessen the temperature in the first place and increase the volume of the air.

4714. And it would also, I suppose, save time with regard to clearing away the powder smoke ?—Yes ; no doubt of it. I would not let that air remain at the very bottom of the shaft ; but have apertures in the pipe, so as to send it through and through and everywhere.

4715. It is a mere matter of opinion as to whether you should exhaust or force in ; your opinion is that it would be not only useful to the men, but also economical for the adventurers, if they were either by exhausting or by force pumps to supply a current of air, not only in the main shaft, but throughout all the levels ?—We tried the exhausting principle at East Crinnis for some years ; we were advised to do so by the principal manager, and we found that we could not drive our levels very far, and we then changed, and introduced the forcing principle, and we found that we could drive a considerable way further.

4716. As I understand you all you require is this : that by some means enough air shall find its way into every end, and you would then let nature take its own course and let the air find its way out ?—I do not care where it goes.

4717. (*Chairman.*) You would send the air down with one pipe, and with branches from that to the different ends ?—I would.

4718. Would that be a very expensive process ?—I think not.

4719. What pipes would you use ?—That would depend upon the extent of the mine, a foot diameter would carry a large volume of air ; it is no new idea of mine ; I have turned it over in my mind for years and years and the result is that I would throw air to the bottom of a mine ; I would not exhaust it. I would throw fresh air from the surface.

4720. (*Mr. Holland.*) And the different levels, connecting one shaft with another, would divide the current ?—Yes ; we put doors in to carry the air through, otherwise the current would be weakened.

4721. You say that the main levels are, as a rule well ventilated ?—Yes.

4722. How long does the powder smoke hang about in the main level ?—From 10 to 15 or 20 minutes, depending upon the strength of the current.

4723. In the main level ?—Yes ; it depends upon how far the main level may be beyond the winze.

4724. If the powder smoke hangs about for 15 minutes do you consider that that is a sign of good ventilation ?—Yes, I should think that tolerable ventilation ; sometimes it hangs about for five minutes only, and sometimes for not more than a minute.

4725. The same shaft seems sometimes to be an up-cast, and sometimes a down-cast ?—Yes.

4726. Are the variations rapid on a gusty day ?—Yes ; I have known them to change momentarily.

4727. Perhaps several times in an hour on a gusty day ?—Yes ; I think I have known that.

4728. When a change takes place and when an up-cast shaft becomes a down-cast shaft, does not the air that has just left a mine enter it again ?—I suppose it does.

4729. Is it not exceedingly important in order to keep a mine pure that the same shaft should be an up-cast shaft always ?—Yes ; but that is rarely the case.

4730. Is it not commonly the case that the draughts are fighting in the up-cast shaft ?—Not commonly.

4731. Are you sure of that ?—Yes, I think I am sure of it ; it may occur.

4732. In those mines which you consider are well ventilated do the candles always burn well ?—Yes.

4733. Are they never obliged to slope them ?—No ; not in good air mines.

4734. If it has been stated that the men are often obliged to slope their candles to keep them alight, is that a correct statement ?—No ; there are some mines in which they are obliged to do it where the air is so weak and so foul too.

4735. But that is not the case in your mines ?—No ; there is as good air in our mines as there is in this room, just as good for the men to work in.

4736. And yet in those places where the air is so good the powder smoke will hang about for 15 minutes ?—Not there, but in some of the ends.

4737. I am speaking of the levels ?—Yes ; and so am I ; but the end of a level may be 20 or 30 or 40 fathoms beyond the last winze, and it will take a little time for the smoke to come out and to go up.

4738. It would not take so long if there was a strong draught ?—No ; if there was a pumping machine to pump in air it would be out in a very short time.

4739. You have stated that the man-engine is better adapted than the skip for a shaft when it is partly vertical and partly on an incline ?—Yes ; I think so.

4740. If it should be found that a skip will work well in a shaft that is partly vertical and partly inclined, your objection to the skip would be removed, would it not ?—I think the men would prefer it, as far as I have seen them.

4741. But what would you prefer ?—I should prefer the man engine.

4742. Would not the last objection that you have mentioned to the skip be removed, if it were found that the skip would work well in a shaft that was partly vertical and partly inclined ?—The skip must travel on the underlie as well as upon the perpendicular, and I think it is more liable to get out of repair than a man engine.

4743. But suppose it worked for two years, and did not get out of repair ?—Then my objection would certainly be removed; but I have not seen that.

4744. (*Chairman.*) Although there may be a strong draught in your mines with many shafts, are there no ends in which the air is poor ?—Yes. I suppose in some deep mines that the heat is so unpleasant either from the weather or from the ground, perhaps from both, as that really the air is difficult to breathe.

4745. And yet notwithstanding in parts of the mine the current is so strong as to blow out a candle?—No, not the current there.

4746. But in other parts of the same mine ?—Yes.

4747. Have complaints often been made to you of the poor air ?—No.

4748. Do you know that the men do complain sometimes of poor air ?—Yes ; I have known them complain some 20 or 30 years ago.

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4749. Do they not now complain within your knowledge?—No; they say that the air is rather dead, and we take steps to improve it.

4750. But in driving an end in a new mine to reach a shaft, it is necessary is it not to work in that end where the air is poor?—Yes; but we either put in sollers at once, or a fan machine, or a water-fall.

4751. But if neither of those things is done what is the consequence?—Then the air would be bad.

4752. Are there air machines in every mine?—I cannot say that.

4753. Would not a tut-work man persevere in working in poor air, where he felt that his means of supporting his family depended upon his exertions?—I suppose he would.

4754. So that both the tribute man and the tut-work man may be induced to work beyond their strength, or else under unfavourable circumstances, because it is necessary to provide the means of supporting their families?—Yes, I dare say it would be so.

4755. You say that the health of the miners has improved during the last 30 years; has it improved during the last 20 years?—Yes.

4756. Has it improved in the last ten years?—Yes.

4757. Do you know at all the ages of any of the men who are working in your mine at the present time?—Yes; we have a few as old as 64 and 65.

4758. And have those men no apparent ailment?—They are, generally speaking, healthy men.

4759. How long have any of those men worked in your mine?—Perhaps the oldest for about four or five years; he might have got complaints in other mines before he came to ours.

4760. Has no man worked in your mines more than four or five years?—Yes, some have worked there for 10 years. I think a man of the name of John Stephens is 64 or 65 years of age.

4761. Could you, if necessary, give the names of a number of men who have worked in your mines for 10 years?—Yes; I think I could from the books.

4762. (*Mr. Kendall.*) You have been asked about the tut-work men working in poor air to maintain their families. Would the agents allow a man to work in poor air for any length of time if they were aware of it?—No, I should think not; it is not economy to let men work in poor air; the adventurers lose money by it, for the men cannot do so much work.

4763. But still there are cases, are there not, where the men do work on under such circumstances?—Yes; but that will depend upon the price.

4764. Do you think that a man would be afraid to complain of bad air for fear he might be thought to be a troublesome fellow, so that he would work on and suffer thereby?—So far as I am concerned I invite the men to do it.

4765. I have no doubt of that, but the object of this Commission is to get at the bottom of everything that takes place in mines; do you think that there are mine agents who might perhaps be rather careless upon these points?—It is possible.

4766. (*Mr. Holland.*) Do you think that that is common?—I do not know, but I should hope not; the men themselves can tell you best.

4767. (*Chairman.*) Do you think that the men would not be afraid to speak out if they were examined by the Commissioners?—I should hope not.

4768. Do you think that the men would come here willingly to be examined?—I should think so.

The witness withdrew.

Mr. Francis Puckie, examined.

Mr. F. Puckie.

4769. (*Mr. Kendall.*) You are chief agent under the Reverend Mr. Treffry and his co adventurers?—Yes.

4770. In what mines?—In Fowey Consols, Par Consols, West Fowey Consols, Prideaux, and East Crinnis.

4771. How many working miners have you under your charge?—In all the mines, I should say very nearly 2,000.

4772. How many of those work underground?—I should say more than 1,000 work underground.

4773. You experience has been very great?—Yes; all my days.

4774. When did you begin?—At nine years of age.

4775. At what wages did you begin?—At 5*s.* a month, hardly 2½*d.* a day.

4776. Then you have gone through all the gradations, and worked both at tribute, and at tut-work?—Yes.

4777. And as grassman?—Yes; I began from the owest grade of mining, that is the trunking boy.

4778. You are acquainted with all the operations?—Yes; I have gone through all of them.

4779. What age are you now?—51.

4780. Have you brought with you a plan of the Fowey Consols mine?—Yes.

4781. How long did you work at the Fowey Consols mine?—I went to work in the Fowey Consols in the year 1826. I was born in the year 1811.

4782. You worked there as a miner until what year?—Until the year 1836.

4783. And during all that time you worked there as a miner?—Yes.

4784. How deep was the Fowey Consols mine when you left, at the deepest level?—I am not prepared to say exactly.

4785. But about how deep was it?—I know that the richest part of the mine was about 120 fathoms deep, and I believe she was then at 140 or 150; I may remark that when I left Fowey Consols in 1836 I went down under Mr. Treffry, the little mine at St. Stephens; I was there till the year 1842 under him, and then I came from there to Par Consols.

4786. And have you been there ever since?—Yes.

4787. How deep is Fowey Consols now?—800 fathoms below the adit, which is 40 fathoms.

4788. Then that at present is the deepest?—Yes; that is the deepest part of the mine.

4789. Do you think, if there was not a man engine there the men could work in those deep levels?—No; I do not believe that we should have any one to work there, but for the man engine.

4790. Unless you had a man engine, no man would work there?—No.

4791. Do you consider the man engine to be useful to the men as far as their labour is concerned?—Yes.

4792. Have you observed that a great improvement has taken place in the men's health in consequence?—Yes; it has been one of the greatest reliefs that ever the miners had.

4793. You go down to the very bottom of the mine at Fowey Consols do you not?—Yes.

4794. You inspect every level there?—Yes; I inspect every level that is working; we are working at the 270, that is the deepest level that we are working at the present time.

4795. You mean under the adit?—Yes; we work at that now.

4796. That is 310 fathoms deep?—Yes.

4797. What number of men are working at the 270 fathoms?—There would be one pair of men there—six men.

4798. Would they work there 8 hours a day?—Yes.

4799. Is the 270 laid down upon the plan you have produced?—I believe so; but it is not our regular working plan; it is a mere copy of it.

4800. How far is the end of the 270 fathom level from any shaft?—Very near 200 fathoms.

4801. The air in the end at the 270 level is supplied from a shaft which is 200 fathoms distant ?—Yes.

4802. How is it supplied ?—By winzes, sinking from one level to the other.

4803. You have got levels at the 260 and the 270, driving on in the same direction ?—Yes.

4804. And at every 20 fathoms or so is there a winze ?—Yes, or 30 fathoms ; we sink a winze to ventilate the ends, and likewise to open the ground for the tributors.

4805. How far is the end of the 270 fathom level from your last winze ?—About 20 fathoms.

4806. How far is the end of the 260 fathom level behind the 270 ?—About 20 fathoms more.

4807. Behind ?—Yes ; and as soon as we can get through this cross course (*pointing to the plan*) we shall drain the lode of the 260, and then we shall commence sinking a winze to ventilate 270 again.

4808. Before you begin to sink your winzes I suppose the ventilation begins to fail a little ?—Yes ; of course the place gets close, and sometimes we are obliged to get a machine to blow air in.

4809. After you find the air begin to fail, if you are near holing, I suppose you proceed without any machine ?—Yes.

4810. Have you now got to the point where you have your ventilation ?—Yes ; that is the very thing we want.

4811. Is that what you call not a good end ?—No.

4812. It is not a bad end nor a good one ?—No ; it is warm, the air is very warm.

4813. How will the candles burn ?—They burn pretty well.

4814. But you want better air ?—Yes ; and as soon as we ventilate it will destroy the heat.

4815. At the depth of 270 fathoms, the moment you ventilate does the place become cold ?—Very moderately so indeed.

4816. Is there much difference between that and the air above ?—Very little ; it is almost as cold at the bottom.

4817. As soon as the natural ventilation begins to operate, there is very little difference between the temperature at the top and 300 fathoms below the surface ?—Very little.

4818. Do you judge of that merely by your own sensations, or have you tried it by any means ?—No ; I have never tried it since I have been at the mines.

4819. Has it ever been tried ?—No ; I cannot speak to that. I believe it was tried in the late chief agent's day.

4820. Have you used any artificial means to throw in air at the end of the 270 fathom level ?—No.

4821. Shall you delay doing that much longer ?—No ; we shall be obliged to do it by and bye ; we shall put a machine there.

4822. How do you judge when it is time to have recourse to artificial means ?—When we come to get the air bad the candles refuse to burn ; and at other times when we go in it is so hot, and the powder smoke lies there; that we use artificial means to bring in air to destroy the heat and destroy the powder smoke.

4823. At present you can work on ; but you see that it is time to be looking forward ?—Yes.

4824. Do the candles begin to burn dim ?—No ; they burn very freely.

4825. Can you give the Commissioners any idea as to how many miles of draught you have underground ?—I am sure I cannot say.

4826. Have you ever heard it stated ?—No ; I do not think I ever did hear it.

4827. Have you ever heard that there is as much as 40 miles of railway underground ?—Yes ; I think I did hear that there was as much as 40 miles of railway in Fowey Consols at one time ; we have not that underground now.

4828. The mine not being in such full operation at the present time as it was some time ago ?—No.

4829. Supposing that it was in full operation, taking into account all the levels, most of which you know, in how many ends in the whole of the mine do you fancy there would be what you call bad air, or not very good air ?—There are many places in which there is bad air.

4830. Supposing you were to put men to work in all the different ends, there would be many in which there would be bad air ?—Yes ; but it is more from the poverty of the vein than from the poverty of the air.

4831. If those veins should continue, should you adopt artificial means ?—Yes ; and no doubt there was artificial means to supply air there before the ends were stopped.

4832. How many ends have you got in Fowey Consols now where you ought to resort to artificial means of ventilation, or where you are about to use artificial means ?—We have three or four.

4833. In which the candles now do not burn freely ?—Yes ; where we use artificial means.

4834. How many ends are there now in Fowey Consols where the candles do not burn freely ?—I do not know but of two.

4835. Which are those ?—One is the 180 south, and then the new shaft ; there we are now going to to give orders as we did last year to get pipes to put in.

4836. How far is that from any ventilation ?—I should say 100 fathoms, or very nearly so.

4837. Is there no artificial ventilation there now ?—No.

4838. Do the candles burn dead there ?—No ; they burn very freely. The chief object in introducing ventilation there by artificial means is because we will not put another pair of men to work there ; we consider the air is hardly sufficient to supply two pairs of men

4839. Of how many men does a pair consist ?—Of six men ; we want to put 10 or 12.

4840. Is the heat very great there ?—No ; it is moderate.

4841. If you were to continue there the same number of men as there are now, do you think there would be air enough ?—We could go for a great many fathoms further.

4842. Would not that be a long distance to go ?—Yes ; but there is a great deal of difference, the level is very large.

4843. How high is it ?—I should suppose it is seven feet high.

4844. What is the usual height of a level ?—Six feet high is what we call our usual levels, and four feet wide.

4845. Do you know how many ends you are working in Fowey Consols ?—Not many ends at the present time ; we have not more, I suppose, than about 10.

4846. Working ?—Yes.

4847. For how many of those do you use artificial means to throw in air ?—I think we have not but two now.

4848. Do you think that any more are required ?—The only thing is where we are going to put artificial means on to the 180, and we shall very likely put it on to the 270 ; all the other ends are very well ventilated.

4849. Is that because you actually want air now, or because you think you shortly shall want it ?—Not immediately ; but we shall want air there.

4850. (*Chairman.*) Where do you say those two ends are ?—At the 180 south and the 270 east.

4851. (*Mr. Kendall.*) You can speak more confidently about the different ends at Par Consols than at Fowey Consols ?—Yes ; I have seen every inch of the ground that has been opened.

4852. How many ends have you at work in Par Consols ?—I suppose more than 20.

4853. How many ends in Par Consols are you working by means of artificial ventilation ?—I believe there are five that we work by artificial means ; but then those artificial means will be thrown away again

by and bye as soon as we can hole the winzes, and likewise there are some in driving cross cuts.

4854. (*Chairman.*) You mean by artificial means the boy and the fan ?—Yes.

4855. No other artificial means ?—We throw it in by the force of water.

4856. In any of those ends ?—Yes ; not in the Fowey Consols, in the Par Consols.

4857. (*Mr. Kendall.*) How many engines are you driving in Par Consols ?—I should say more than 10; but I am not prepared to say exactly.

4858. Without artificial means ?—Yes.

4859. You have about 15 ends without artificial means of ventilation ?—Yes, I think so.

4860. What is the deepest level at which you are working an end without artificial means ?—200 fathoms, at Par Consols.

4861. You are not working with artificial means there ?—No.

4862. How far off is that from any shaft ?—I suppose that the farthest end may be 100 fathoms from any shaft.

4863. How far down does the man engine go ?—The man engine shaft is sunk down below the 200.

4864. If the Commissioners visit the mine to-morrow will they be able to see that end ?—We go by the man engine below 165.

4865. Take the next deepest level upwards, the 180 ; how far is that from any shaft ?—I suppose that is 40 fathoms from any winze ; but there we have artificial means by a waterfall.

4866. Then come above that again ?—The 165 is the next.

4867. I mean where you have an end that is being driven without artificial means of ventilation being used ?—Yes ; that is at 165.

4868. How far in is it ?—I suppose 30 fathoms.

4869. From any winze ?—Yes.

4870. How is ventilation effected there ?—There we are sinking a winze to ventilate.

4871. What sort of air is there there ?—It is rather close.

4872. (*Mr. Austin Bruce.*) Is that the closest of all your ends ?—I believe it is almost as close as any we have got.

4873. (*Mr. Kendall.*) What other end is there that is nearly in the same condition ?—We have a cross cut at 120 ; and there we have a fan machine.

4874. How many ends have you like that ?—I believe that that is about the worst we have got, the 165.

4875. Are there any others nearly as bad ?—We may have one or two close places.

4876. Which are they ?—The 100 is rather a close place ; but there we have a machine put in.

4877. I mean where you do not use a machine ?—I do not know of any one that is close beside that.

4878. When the miners find these places close, do you put in a machine ?—Yes ; as soon as we find that the men cannot labour as they ought to do, we use other means to bring air to them.

4879. Do the men ever complain of bad ventilation in your mines without your at once endeavouring to remedy it ?—No, never ; sometimes of course they will complain before they have any need to complain.

4880. Is that when they have made a bad bargain ?—Yes ; or if they want to come up sooner they will plead an excuse, saying that the smoke is bad, or anything of that kind.

4881. (*Chairman.*) What kind of ore does the Fowey Consols mine produce ?—Copper ore.

4882. Is there much mundic in it ?—Yes, sometimes.

4883. Much ?—Not a large quantity.

4884. Is there as much as a fourth ?—No, I should think not, not so much as that ; but I cannot say.

4885. Is these much mundic in Par Consols ?—Not so much as in Fowey Consols. Some lodes do produce more mundic than others ; and some places produce more mundic than others ; there are bunches of ore with scarcely any mundic in them, and some with a very great deal.

4886. How many men are working underground in Fowey Consols ?—I think very nearly 400.

4887. How many in Par Consols ?—There are 250.

4888. How many boys are employed underground in Fowey Consols ?—I cannot say.

4889. How many boys are there in Par Consols working underground ?—I do not know that. I should say that we have 200 boys and girls working at the surface.

4890. Do you know the age of the youngest who is working underground ?—No ; I do not know ; but I should say about 12 years of age.

4891. Do they go down to work with their relations ?—Yes ; perhaps father and son.

4892. Do you think there are none working underground below the age of 12 ?—I cannot say that there is not; but I should calculate 12 years to be about the youngest.

4893. Are there none, to your knowledge, under the age of 12 working underground ?—No.

4894. What is the highest temperature in which the men are working in Fowey Consols ?—I do not know ; we have never tried it.

4895. Nor in Par Consols ?—No ; that is not so high as Fowey Consols ; in some places they are very warm ; perhaps some may be between 70° and 80° in Fowey Consols.

4896. Do you know how long the man can work in that hot level in Fowey Consols? —No ; they calculate that they work there eight hours ; but in those hot places they do not work, perhaps, more than about six.

4897. Are there other captains who act under you in the mines ?—Yes.

4898. Probably they could answer questions better than you can with regard to Fowey Consols ?—Yes, very much better, as they are constantly in the mine.

4899. You stated just now that in driving a level, if you are near to an end, where you put in a winze, you endeavour to proceed, and do not stop the work although the air is bad ?—No ; not if we possibly can keep them working ; and particularly if it is a place of importance ; but we use every means to supply air to enable the men to work.

4900. I suppose that in those instances the men are obliged sometimes to work where the candles burn dimly ?—Yes.

4901. For how long would the men probably work there; a month ?—They may sometimes work there a month.

4902. Or for two months ?—I do not know that exactly ; but there is a great deal of difference at times, and it will depend a good deal upon the atmosphere at the surface ; some days we may have in certain ends as good air as the men need work in, then upon a change of wind at the surface perhaps you may go down the next day, and you cannot carry a candle into the end.

4903. When that is so, do the men come up again ?—Yes.

4904. They must then stop work until the wind changes ?— We generally employ them somewhere else.

4905. But if you have no other work for them they must stop ?—Yes, certainly.

4906. And they do not, I believe, get paid all the same ?—No.

4907. How long have you known a man out of work under such circumstances ?—Perhaps not two days.

4908. And he does not get paid as if he were at work ?—No ; they are always on tut work or on tribute work.

4909. You have stated that as soon as you can ventilate a place the heat is diminished ?—Yes ; as soon as we can get in ventilation that destroys the heat, we get then a current of air.

4910. That is to say when you put a winze in ?—Yes ; then we go on again as fresh as ever.

4911. But until that is done, must not the men work in a close place?—Yes.

4912. Do you judge of how long the men can work by the candles, or in what way?—The men can tell that by their working, and sometimes at the end of a corps the air may get thicker than at other times, and then they may blast a hole just before they leave perhaps, then they will go up.

4913. I suppose the men will endeavour to work on as long as they can?—Yes; the more they work they more they get.

4914. Although the air is bad, yet they will endeavour to work on?—Yes; some will work very much longer than others.

4915. I suppose that a young miner who has not suffered at all in his health will work longer than a man who has suffered?—I do not think there is much difference; some of the older ones will persevere even more than the younger men.

4916. In poor air?—Yes; but I suppose that our mines are as well ventilated as any mines in the county; still we have on certain occasions bad ends.

4917. In these ends where the powder smoke hangs about are the men able to work on soon after they have blasted?—Sometimes they are obliged to stop half an hour after they have blasted a hole, sometimes a little longer, and sometimes perhaps not quite so much; in some places, perhaps, they may not stop scarcely at all.

4918. I suppose that is where there is a current of air?—Yes.

4919. Where there is not a current of air, or ventilation, they have to stop half an hour?—Yes.

4920. In Fowey Consols do you find granite or killas?—Killas.

4921. How many holes can a man blast in eight hours?—That all depends upon the hardness of the ground.

4922. Suppose it is killas?—Then some will blast three, some four, and some not more than two; it will depend entirely upon the nature of the ground.

4923. Are they able to bore two sets of holes in eight hours?—Yes; and sometimes they will bore four.

4924. In how many ends in Fowey Consols is there a fan engine?—Only one; we have got in one end in particular a piston machine that works with an engine.

4925. At one end?—Yes.

4926. Which shaft is that near?—Near the engine shaft, that is where the pumping engine is, and that engine works the piston machine.

4927. Does it supply a greater quantity of air?—No; I would as soon have a good fan as a piston machine, only it is a longer distance to this end, as I suppose 40 fathoms, behind any ventilation, and yet this end has air 50 fathoms beyond where the ventilation is on account of the means of applying the engine.

4928. You have stated that some men have complained of the smoke lying dead; is the captain the judge of whether the end is in a bad state or not?—We all know that when we go into the place.

4929. But when the men complain that an end is bad, is it for the captain to judge of that?—Yes.

4930. When the fan engine is required, does it depend upon whether the captain says it shall be put in or not?—Yes; if he thinks it is necessary to do it.

4931. I suppose you would put it in if the wind changes?—Yes; in places where we have fans working; there are occasions, for instance, we have one place in Par Consols, where, in certain winds, we cannot carry a light, and the reason of that is that the damp settles at the time the men are absent, and they are obliged to force it out again by artificial means.

4932. You force out that damp air by artificial means?—Yes.

4933. There are damp ends?—Yes, there are occasionally.

4934. How do you judge of a damp end?—If you go to a place where the damp is, the candle will go out just as soon as if you put it into a tub of water. I have seen it in our mines where they have not been more than three feet, at the back of a level, and a strong current will go through, and if you put up a candle, it will go out immediately.

4935. Besides poor air, you have to contend with damp?—Yes.

4936. In that damp, have the men ever fainted and fallen down senseless within your knowledge?—Yes, I have known that.

4937. A miner can work for a time in poor air?—Yes; but in the other he could not live in it.

4938. (*Mr. Austin Bruce.*) Is not that called cold damp?—Yes.

4939. (*Chairman.*) In an old mine that has been abandoned, and then worked again, does this occur more frequently?—I do not know, perhaps it may. I will not say that it does.

4940. Does the damp gather at the top or at the bottom of a level?—It is generally found above, more so than below; it is possible to have it in both places.

4941. Have you heard any explanation as to what it arises from?—I do not know what it does arise from. I cannot account for it.

4942. Does it occur in Fowey Consols or in Par Consols?—I have seen it in both.

4943. At what level, or what is the lowest level at which you have known it?—We have it generally more so in the shallow levels in Par Consols than in the deeper ones; we have seen it at the 30 fathom level, and we have had it at the 80 fathom level. I I have seen it in Par Consols, so that you could not carry a candle, not near the end within two feet, and that was just particularly once on coming upon a bunch of ore, and the men came up from underground one afternoon very near the ventilation, and said that the air was so bad they could not keep the candle alight. I said it was impossible as they were so near the ventilation, and they said that they never saw such a thing in the end before. I went down the next day, and I found that the men were correct; you could stand back three feet from the end, and you could see it as well as I can see anything in this room, but you could not carry a candle, not for two or three days there.

4944. The candle would go out?—Yes; after a while it subsided, it went off, and the men worked on as usual.

4945. Were any means taken to get rid of it?—No, it was not required. It went off again, and the men could work on as well as ever. The only way to account for it is by supposing compressed air to be coming out of the lode that has been made a little more porous than others, and it might come out through those pores to escape.

4946. Do you use air sollers at all?—No, we use them very little in our mines.

4947. How many changing houses have you at Fowey Consols?—I suppose that we have got three regular changing houses; but I think the men change in more than 20 houses.

4948. You say that you have three regular changing houses; will you describe to the Commissioners what those are; in the first place, is there a fire kept in them?—We have got in some of them a warm iron tube that goes from a place that we keep always heated to dry their clothes, and to warm the room; every man can change there if he likes, but there are some who would rather change off from those places.

4949. How high are those changing places?—As high as this room.

4950. Are the walls of the changing houses at Fowey Consols as high as those in this room?—Perhaps not quite so high.

4951. Are they six feet high?—Yes.

4952. Are they eight feet high?—More than 10

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feet high I should think, some of them; some of them are not quite so high, some are not more than six.

4953. Is there glass in the roof, or how are they lighted?—They are generally lighted by the doors and windows; in some places we have glass lights, and in some places only wooden shutters.

4954. Where there are wooden shutters there would be no light, except by opening the shutters?—Not in some of them, and the doors.

4955. In such a place as that would not the men have to change in a draught?—No.

4956. Do the men never complain?—No. I have very seldom heard any complaint against them. I believe that the men are generally very well satisfied with the changing places, and with the drying of their clothes, and everything of that kind.

4957. Do you not think that it would be an advantage to have a changing house near the footway?—Ours are not very far from it; it is impossible that you can get them near the footway every where without great inconvenience. In mines where they have not the advantage of a man engine of course they have to come up a great distance from the different parts of the mine; in Fowey Consols the men in the mine do not go up and down by the man engine, it is not so far down for them to go underground, they would rather take the ladders in shallow levels; perhaps they would change in the places that were first erected for them, instead of going to the regular changing houses. In Par Consols, in the western part of the mine, we have no man engine, we have different footways and different shafts.

4958. Do the men change in the nearest changing house to the footway?—Yes.

4959. I suppose they do not like to go on a cold wet day a long distance?—No.

4960. Those men who come up by the ladders, come up, do they not, much hotter than those who come up by the man engine?—Yes, very much so.

4961. Do they never catch cold from changing their clothes in a changing house without windows?—I do not think that they do, they are there only a few minutes, and they are gone.

4962. They have to change their clothes?—Yes, they must do that.

4963. Do they wash themselves when they come up?—Yes, almost every one of them.

4964. Where is that done?—Generally in all our changing houses we have the means of bringing the condensing water, which is warm for them, so that they all have the advantage of that.

4965. Do they have the advantage of that in all of them?—No, not in the little ones, but in the principal changing houses they get it.

4966. Is there not a great deal of dust flying about when they change their clothes?—There is sometimes more dust than there need be, because they will get playing one with another, and get throwing about their clothes.

4967. Still their clothes are full of dust, are they not?—Yes.

4968. How many men would change their clothes in one house?—Perhaps we might have 200.

4969. All of them changing in one house?—Yes; but not at one time.

4970. How many should you say would be changing their clothes at one time?—Sometimes as many as 50.

4971. Fifty men changing their dusty clothes would create a good deal of dust, would they not?—Yes, they would sometimes; generally before they go to change, if the clothes are dusty from working in a dirty place, they will go out and clean their clothes before they change them.

4972. But if it were raining they could not do that?—They generally do that; they give them a good shaking, and some of them will take a stick and beat their clothes with it.

4973. Are the women who work above ground all under cover?—Not all, but a great part of them.

4974. Are there some places where they are working without any cover or shelter?—Yes, they could not have it.

4975. But are there places which might be covered in, and which are not covered in?—Yes. In most of our places we have sheds for them, when we can conveniently put them up; and sometimes they are working here at one minute and away at another place at another minute.

4976. Where they sit down are they under cover?—Yes, chiefly; but not all of them.

4977. Is it not desirable that they should work under cover?—It is very necessary in winter time.

4978. And in bad weather?—Yes.

4979. Is there any place for them to go to, to take their dinner and tea?—They have got their places to go to at dinner time or in very wet weather; we have got places on purpose for them.

4980. Separate from the men?—Yes.

4981. Are all the men's clothes dried in those drying houses, or are any dried on the boiler?—Men are kept there night and day to dry their clothes.

4982. Do they dry their clothes as they come in?—Yes, they are all hung up. A miner will say to the man looking after them, "I shall be glad if you will dry my clothes," and he does so.

4983. Is it his duty to do so, unless he is asked?—Yes; but of course he does not know which is wet and which is dry unless he is told of it.

4984. Do you use many doors in the mine in order to regulate the current?—Yes, there are several in different places.

4985. Under whose charge are those?—Of course under the agents, they give the direction, and then of course it comes to the men. We have men on purpose to look after that work.

4986. Is any inconvenience felt from the candles and the powder smoke?—There may be a little in the close places; in the closer places they may feel the effects of them.

4987. Do you contract for the candles, or how are they supplied?—We contract for them.

4988. Do you ever get any bad ones sent in?—Yes, occasionally; but then I do not think we can complain much of our candles.

4989. What would you call a bad candle?—The first complaint is that the grease is so soft, but we have very seldom any complaint as to the candle smoke or anything of that kind. If it is very warm in same places, the grease about the candle gets soft, and they cannot use the clay about them so well.

4990. Do the men judge of the time they should come up by the candles?—Yes, that is the only thing they have to go by, some may carry a watch, but that is a very rare occurrence.

4991. I suppose watches would be spoiled underground?—They do not like to carry them under ground.

4992. In those shafts where they still use the ladders, may the tut-work men come up at any time, or are they fined if they come up shortly before the time?—There is a regular time allowed for them to come up.

4993. Are they fined if they come up before the time?—Sometimes they come up too soon.

4994. Do they wait below until it is time to come up?—Some do, and perhaps some do not, we are disposed to think that some wait on the ladders.

4995. If they stand on the ladders waiting, will they catch cold?—They will certainly.

4996. After they have fired a shot how long do they remain absent?—Some may stop away half an hour, some less, and some longer.

4997. I suppose with the man engine at work at regular times, it is far better for them to come up by that means?—Yes; it works at certain hours.

4998. How long does it work?—It works always on the change of the corps at six in the morning, at two in the afternoon, and at 10 o'clock at night.

4999. For how long at a time does it work?—Generally for an hour and a half or two hours at a time.

5000. At each time?—Yes; it depends entirely upon the number of men to come up; after they are all up, we may as well stop as work.

5001. Do you employ any signal?—Yes.

5002. How do the tut-work men manage to come up?—The tributors come up at a different time, the tut-work men go down at six in the morning and the tributors go down at eight o'clock in the morning, the tut-work men leave again at two o'clock, and we work again for the tributors at 5 o'clock.

5003. Have any accidents occurred with the man engine?—Nothing serious.

5004. What was the nature of the accident that occurred?—We had an accident at Par Consols just after we went to work, through a man's carelessness.

5005. In what way?—I believe he missed his footing.

5006. In stepping on to the engine or on to the plat?—On to the plat.

5007. What then happened to him?—Nothing more than that he came in contact with the soller and injured his chest a little, but it did not detain him only a little time from his work

5008. Were the men at first prejudiced against the man engine?—No.

5009. Did they take to it at once?—Yes; after they had been once on it.

5010. Before that, was there any prejudice entertained by the men against it?—Some of them felt a little timid, perhaps, the first time they went upon the man engine.

5011. Was there any great objection made to it?—No; I do not know that there was.

5012. What other accidents have happened in your mine?—The greatest number of accidents that we have had have arisen from powder explosions.

5013. Do the men put the powder into the holes in cases?—Some do and some do not.

5014. Is it left to the judgment of the men alone?—Yes.

5015. Do you supply cases for the purpose?—Yes; if the men choose to use them.

5016. Are they charged for?—Yes.

5017. What is charged for them?—I think it is something like 1½*d.* each.

5018. Do you think that prevents them from using them?—I have no doubt it does in some measure; then others again do not like them, they would rather shoot with the raw powder; they consider that the cases take up too much room, and they would rather have the powder contained in the hole without anything.

5019. According to the size of the hole they think that they can get more powder in?—Yes; or that they can regulate the charges as they calculate upon the burthen of the ore.

5020. So that in order to get the same explosive force from the powder, they must make the hole somewhat larger?—Yes; the bag may be a little too large and sometimes a little too small for a hole, and many of our men instead of using the prepared cases will make bags themselves for the powder; they would even rather have them that way than have those prepared cases, as they do not come so expensive as the others.

5021. How do the accidents generally happen?—They happen in the tamping, that is after the powder is put into the hole it is filled up with the small stuff, killas generally; we never calculate to put spar for tamping, for it is very fiery and very sharp, and apt to cut the fuze; we generally tamp with killas.

5022. Suppose the men are working, are they supplied with anything to put in?—No, they go back and choose their own material for tamping.

5023. If they take the wrong material it is attended with more danger?—Yes.

5024. How does an accident happen from tamping;—It is generally from the first portion which they put in on the powder that is generally the worst time for an explosion; some of them are not careful enough, and at other times these explosions occur through the men's neglect after they have got the powder in a hole; a very careful man almost always puts in dry sludge, which is as fine as flour, they will put it in upon the powder, and will ram it in with a pud, then they will take the end of this pud and put it in the water-pipe, and hole out all the powder from the hole, and in doing that there is scarcely any danger; but often again they are careless, and they will even put the powder in the hole and ram it down with an iron bar, and then, perhaps after they have put in the powder, and they come to put in their first portion, they are not careful in cleaning out the hole, they will ram away and perhaps make fire in the hole which will ignite the powder; that is the only way in which we can account for those explosions.

5025. Do your men use steel borers?—Yes.

5026. Do they use them to ram down with?—We never use them for ramming; we use a steel borer to bore a hole.

5027. Did you not say that the men used a borer and rammed with it?—No; that is the tamping bar.

5028. Is that made of wood?—No, the tamping bar is of iron, but we have always a swabstick to clean out the hole with.

5029. Do you think that accidents occur from not cleaning out the hole?—Yes.

5030. And not putting in the proper material?—Yes; perhaps too fiery a material for the tamping.

5031. In ramming it down a spark may be made?—Yes; it is just the same as rubbing a piece of iron over spar stone, you will see fire follow from it.

5032. In ramming it down, why should not the stuff be put together?—It would not tamp tight enough, it has to be rammed as tight as the rock itself.

5033. Is there any material that they could use for tamping that would not strike fire?—I do not know, we always tamp with iron.

5034. Have you ever heard of a composition of metal that would not strike fire?—We have never had it, nor used it.

5035. Do the men use a wooden mallet?—No; iron or steel mallets.

5036. What is about the weight that a man has to carry with all his boring tools?—It varies a good deal.

5037. But what is about the heaviest?—It depends entirely upon the nature of the ground; sometimes a man may have 3 cwt., and perhaps some men have not more than 20lbs.

5038. So that if a man has to climb a ladder he has to carry that weight?—No; they never carry their tools along with them unless it is in a very shallaw place where they have no convenience near a shaft.

5039. I suppose that in shallow mines they carry their tools with them?—They do so very little now; not half so much as they did many years ago.

5040. But do they carry them sometimes?—They may carry a pick in their hand, and they might bring two or three borers on their back, but it is a very rare occurrence to see men bring up their tools.

5041. Do the men ever fall away from the ladders?—Occasionally, but seldom.

5042. From your experience of the man engine do you think that it is a very desirable thing for the man?—Yes; very desirable.

5043. And for the agents likewise?—Yes.

5044. Can you tell the Commissioners what was the cost of the man engine at Fowey Consols?—No.

5045. Do you know what it was at the Par Consols?—No; I never entered into that, to say what the expense was.

5046. Which should you say that the men prefer, tut work or tribute work?—Some choose tribute and others choose tut work. A man who has always been accustomed to tut work has a difficulty in working upon tribute, and a man who has always been accustomed to tribute has a difficulty in working upon tut work; it depends a good deal upon how they were brought up.

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5047. The men are paid once a month, are they not?—Yes.

5048. Are they two months in arrear of pay?—Some are. They give subsist generally for one month, and pay for the next.

5049. That is so in some cases, but not in all, I suppose?—In all.

5050. Not unless they apply to you?—We have a regular rule.

5051. For all?—Yes. Every tut-work man is paid subsist from our mines after working one month.

5052. How much?—One pound a man. The next month he is paid half his balance, and he will have subsist again for the next month, so that it makes no difference to a man upon tut work after the first month; the only thing is that he gets a pound a month sooner.

5053. Is that the general practice?—Yes, at our mines.

5054. That is all you can speak to?—Yes. At different mines there are different rules.

5055. We have been told that there are very few men in your mines on the sick list?—Very few.

5056. Do you know how many are away?—I do not think that in the Par Consols mine we have more than four or five sick men but what are able to do a little.

5057. Are any of those men, who are not quite well, working below?—We put those men who have got old, and disabled from working in the mines, to attend the dries, and so on; to dry the men's clothes and to do a little necessary easy work.

5058. Do the men who are somewhat affected in their breathing go down by the man engine and work?—Yes; some do who are able to work.

5059. Whereas, if they had to climb the ladders, could they do so?—They would not be able to go down them at all.

5060. They are now induced to go down because of the convenience of getting up?—They can work now down to the 240 fathoms as well as they can work on the surface, as far as that goes.

5061. So that, though a man is affected in his breathing, he can work below?—Yes, quite so.

5062. Do you think that many do work below who are affected in that way?—No doubt many, little or much; those who are slightly affected.

5063. So that they continue to work below ground although they are affected in their breathing?—Yes.

5064. You stated that the men were much healthier since the man engine had been there?—In our mine the men are in a very healthy condition, and have been so for years.

5065. Do not you see any particular difference in their state of health since the man engine has been established?—I think that it has improved.

5066. Is there a difference between the two mines, the Fowey Consols and the Par Consols?—Par Consols is not so deep, and it is not so hot, as the Fowey Consols, although I believe that the Fowey Consols' men live as long as the Par Consols' men do. I do not think that there is much difference in that respect.

5067. What is the general age to which your men work?—From 40 to 45.

5068. They do not work much after that?—I believe that that is about the average.

5069. (*Mr. Austin Bruce.*) The average of what?—As long as they live; they live to about an average of 40 or 45 years of age.

5070. (*Chairman.*) And you think that they work with you as long as they live?—Some may be home, perhaps, for a little while; it depends entirely on the disease.

5071. Do they go to seek other work after being at the mines?—Men are constantly changing from one mine to another; and in the different mines we have many old miners who have been perhaps working in the mines for more than 40 years.

5072. Do you think that the men would come from other mines to your mines, on account of your having a man engine?—Perhaps they would.

5073. But you do not know?—No; they are generally changing about.

5074. But at about 40 or 45 they generally die off; you have not many men older?—We have a great many above that age; we have men working now who are 60 years of age.

5075. And have they never been affected?—Not generally; some have been slightly affected, but not to disable them from working.

5076. (*Mr. Davey.*) Will you explain the position of those places where the damp air was which you spoke of where it extinguished the candle?—There are holes—places where the air is light—and while the air machines are idle perhaps it is damp (the machine is idle over night), and when the men come down the next morning perhaps there is a damp, and they are obliged to use the machine to break the damp and to throw air in.

5077. Does that occur also where the lode is not rich?—Yes; just the same as where it is rich.

5078. You have stated that some men were at one place where that occurred approaching a bunch of ore?—Yes, but that is not a general thing; there is no general rule.

5079. You have not so many men comparatively working there now as you used to have at Fowey Consols?—No, not by a great many.

5080. Did you find the ventilation equally good when you had so many men there?—There was very little difference.

5081. (*Mr. Austin Bruce.*) You stated, I think, that the lowest depth at which men are now working in the Fowey Consols is 270 fathoms?—Yes.

5082. I suppose that the natural heat there would be very considerable were it not for the ventilation?—Yes.

5083. The deeper you go the hotter it is?—I do not know that it is so. I do not think that we find it hotter at the 270 fathoms than we did at the 200 fathoms. Even when the mine was only 180 fathoms deep it was hotter there than it is now, because it is better ventilated.

5084. Generally speaking is it hotter at 200 fathoms below the surface than at 100 fathoms?—No; I do not believe that it is.

5085. You stated that at the deepest part of the Fowey mine it was as cool as on the surface?—So it is in some parts of the mine.

5086. And you said that that was in consequence of the quantity of air introduced?—Yes.

5087. The air introduced is of the same tempera ture as the air at the surface, of course?—Yes.

5088. The air must be affected I suppose by the heat of the place through which it passes?—Yes, after it passes a certain distance.

5089. How is it brought down from the surface to the bottom?—It comes down perhaps one shaft, and goes up another.

5090. Through the shaft?—Yes.

5091. Not through a pipe?—No, through the shaft itself.

5092. In its progress downwards it must be affected by the temperatures through which it passes?—No; I think that the shaft is as cool at the bottom as it is at the top.

5093. If there is more heat at the bottom than there is at the top, does not the air take in some of that heat?—Perhaps it may take in a portion.

5094. Can it do otherwise than take in a portion?—I should think not.

5095. Then it follows that do what you please the air must be hotter at the bottom than at the top?—I cannot give the exact particulars of that. I know that we have a very good ventilation at the bottom of our mine; it is very cool.

5096. I do not deny that; but I ask you by what means you can prevent the air which descends from taking in some of the heat which exists at the bottom of the shaft?—The only thing is, that after passing through certain levels, and so on, it may take in some

of the heat; there is no doubt about that; but the air apparently is as cool at the bottom as it is at the top.

5097. The longer it is there the hotter it gets, of course?—Of course; but it is constantly passing.

5098. Would a man standing still at 270 fathoms in your well-ventilated mine perspire or not?—No; he would not perspire standing still where there is good ventilation.

5099. Do the men who work there perspire?—A man perspires almost working anywhere.

5100. Do the men working at that depth perspire more than the men who work 100 fathoms below the surface?—They may in certain places, because of course there are certain changes, and so on. They may perspire more at one place than at another; and as another thing, perhaps, the ground is very much harder to work upon at one place than at another, so that that may cause an increase of perspiration.

5101. But my question is directed entirely to the ordinary heat of the air apart from the nature of the ground?—I do not think that they perspire much more at the 160 or 170 fathoms than they will at the 100, beyond certain places.

5102. How far is the furthest close end, at the 270 fathoms from the shaft?—It is about 200 fathoms from the shaft, and about 30 fathoms from the nearest winze.

5103. In that close end is there any artificial ventilation?—No.

5104. How many men are working there?—Six.

5105. Have you visited them lately?—Yes, I saw them last week, last Friday.

5106. Did they complain of poor air?—No.

5107. Did you find the air good?—The air was very fresh when I was there, but it was hot.

5108. Did you use no sort of artificial ventilation at all, but did you leave the air to find its own way in and out?—We have done so there.

5109. Although the men did not complain, do you think that those men would not be much more exhausted at the end of the day than men who were working in a better ventilated part of the shaft?—Certainly.

5110. Do you think that they could do that often without permanent injury to their health?—I do not know. Certainly it is more injurious to health than working where the air is fresh and where it is not hot, and where the men do not perspire so much.

5111. Had these six men driven the whole way forward from the last winze?—No.

5112. How long had those men been in that close end?—They had been there three or four months.

5113. Do you observe any difference in their appearances since they have been there?—No.

5114. Why did the pair before those men leave that end?—They were relieved, they were taken from that end and put to another.

5115. Why?—Because they were the men who looked after the working of the shaft, what we call sumpt men, and they had so much work to do in keeping the pit work in order. We were not driving that end as fast as we could wish, and we put them in another place, and put another pair of men to do nothing else but work that end.

5116. How soon will this end communicate with the winze which is being driven from the 260 fathoms?—As soon as we can cut through the cross course and drain the lode we shall commence sinking the winze at once.

5117. How soon will that be?—It may be in one month, we cannot tell.

5118. Do you believe that the men can go on working in this end for another month without having their health effected?—Yes, and perhaps for six months or longer than that.

5119. How do those men return to the surface?—By the man engine.

5120. The whole way?—From the 240 fathoms, that is the bottom of the man engine, they climb 30 fathoms.

5121. You say that the men never complain to you?—But seldom, you may find them complain occasionally.

5122. Do you think that there are any grievances which they know by experience would not be remedied whether they complained or not?—Some will complain; we can always tell when men ought to complain as well as the men themselves, and we always know when the places require ventilation, and as soon as ever we think that the men in a close place require ventilation we feel it our duty to put means to do so.

5123. You stated that there were some places in the mine where the powder smoke remained for half an hour before the place was fit for working in?—Yes.

5124. What sort of places are those?—Perhaps where they are 20 or 30 fathoms off from ventilation.

5125. Do you believe that places in which the smoke remains half an hour before it can be removed are supplied with sufficient air for men to work in as hard as those men are expected to do?—They are much better places than some where there are not the artificial means for throwing in air.

5126. Do you think that those places in which the smoke remains for half an hour can be as well ventilated as those in which it only remains for five minutes?—No.

5127. Then whatever difference there is must tell upon the health and strength of the miner?—Certainly.

5128. Do you not think that it would be a useful rule wherever the powder smoke remains more than a certain time, say more than ten minutes, to introduce a current of air?—I hardly think it necessary if the powder smoke remains only ten minutes because men generally speaking when they have blasted a hole go back and sit down perhaps half an hour to rest from their work; and not only that but sometimes they will have occasion to blast two holes together; then perhaps they will eat their dinner.

5129. But would not the fact that the smoke remained there so long, be a proof that the air was not sufficiently fresh, that it did not change fast enough?—Certainly. But I think that we should have something to do to work the mines if we endeavoured to put air into all those places. I think that there would be very great difficulty in doing it.

5130. But you would not deny that men can do more work where the air circulates freely, than where it is dull?—They can.

5131. And that it would be as much to the advantage of the employers as of the men to improve the air in that respect?—Not altogether; perhaps they would not do a great deal more work if they had better air; they would not work perhaps a greater number of hours, and perhaps they would stop from their work just the same.

5132. Even if they did not work a greater number of hours they might work more heartily while they were at it?—We have not many of those places which injure men by working.

5133. You have no places which would injure men in a week or a month?—Yes.

5134. But do you think that men work long in places where the powder smoke remains half an hour?—Yes.

5135. Without injuring their health in the long run?—I cannot say about that, I do not know but what it might injure them, but I do not think that it would injure them so much perhaps as a good many many would calculate upon.

5136. How many shafts have you at the Par mine?—I suppose more than ten.

5137. How many have you at the Fowey?—I suppose more than 20.

5138. I suppose that these do not communicate with each other?—Yes, many of them do.

5139. The Fowey and the Par?—No; they are two separate mines.

5140. Have you either at the Fowey or at the Par any shafts which are always used as down-cast, and any which are always used as up-cast?—No.

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5141. Upon what does it depend whether a shaft shall be an up-cast or a down-cast ?—They change, we often found that they change ; sometimes the air goes down one shaft, and it may come up the same shaft and down one and up the other ; they will change occasionally.

5142. Do you think that it would be a good thing so to direct the currents of air as to make some shafts always the up-cast and some always the down-cast ?—Perhaps it would be a very good thing or it might not be, we cannot tell. Sometimes perhaps we might ventilate one part of the mine best, and at other times we might ventilate another part of the mine best, so that which might work the best upon the whole we do not know.

5143. Have you the management of the ventilation ?—Yes. If we think that any thing in the way of ventilation is necessary we give orders to put in trap doors, and so on to throw in air to a certain place.

5144. Who is it that judges what should be done for the ventilation of the mine ?—The agents do so.

5145. Are you one of those agents ?—Yes.

5146. Is one more than another responsible ?—No.

5147. Each is responsible for his own mine ?—Yes ; we all consult each other ; one is responsible as much as the other.

5148. Have you ever examined the ventilation in the mines out of Cornwall ?—No, I have never visited a mine out of Cornwall, but I know that we have in the Par Consols, more particularly where our new engine is, the draught playing down exceeding strong; we see the draught playing down that shaft, and it plays up, we do not know why it is.

5149. (*Chairman.*) You have said that you expect in about a month to sink a winze which will ventilate the end where there is poor air ?—We hope to commence it in about a month.

5150. How long will it take before it is done ?—We cannot tell to two months, it will depend entirely upon the nature of the ground.

5151. You cannot tell how long it will be before it is completed ?—No.

5152. It may be three or four months ?—Yes.

5153. It may be six months ?—No, I do not think that.

5154. It may be four months ?—It may be four months.

5155. Until that is done that end cannot be properly ventilated ?—No, except by machines.

5156. (*Mr. Kendall.*) you can get no natural ventilation ?—No.

5157. But you can force air in before that ?—Yes.

5158. (*Mr. Holland.*) We have been told that miners at 40 or 50 look as if they were 50 or 60 ?—Some may, and some look very well ; some look healthy and strong, and some look perhaps very delicate.

5159. We are told that the class of miners look about ten years older than they are ; is that true or not ?—They look older than other people—than men who are always working upon the surface ; they look more delicate, but I believe that their health is generally speaking as good.

5160. From your experience do you believe that mining is a healthy occupation ?—I enjoy very good health, and I have been working at as bad a place as there is in any mine.

5161. Are miners as a class a healthy race ?—You cannot expect miners to live as long as other men.

5162. Why do not they ?—I suppose it is by working in poor air.

5163. Why do you think that they are not a healthy class ?—I suppose that it is perhaps by working in bad air, and so on, under ground ; the air is not so pure as it is on the surface of course, not in some places. I do not see why it should be otherwise than that.

5164. Is that true of the Fowey miners as of others ?—They are just the same as other miners in the county, taking the county through, I believe.

5165. Do you know other miners generally as well as Fowey miners ?—Yes, they change ; perhaps a Fowey miner may be here and there, and down west, perhaps, in two or three months.

5166. And the Fowey miners are not much better than the others ?—No ; they are just like them.

5167. You have spoken of the 270 fathoms ventilation ; is it the up-cast or the down-cast shaft that it ventilates from ?—That I think is a down-cast shaft.

5168. Just look at this little sketch which I have made ; will the air enter the upper or the lower of those levels first ?—It generally comes at the lower level.

5169. Why is that ?—I do not know ; perhaps sometimes it may come in one way and sometimes another ; it may go from this shaft perhaps to a shaft back there (*pointing to the sketch*).

5170. Taking this particular case, of these two particular levels of 260 and 270 fathoms, do they communicate from the same shaft, or from two different shafts ?—From the same shaft.

5171. Does the air enter the shaft at the lower of the two levels ?—Sometimes at one and sometimes at the other ; sometimes perhaps it may come up and sometimes it may go down; sometimes it may be going in this way and sometimes in that way.

5172. Does it vary constantly ?—Occasionally. I do not say very often, but you will find it so.

5173. Is there anything like a strong current through this part of the level close to the shaft ?—Yes, in some places.

5174. I am speaking of that place, and not of some places ?—It is not over strong there ; you can carry a candle very well.

5175. When you hold a candle still, is it blown away much ?—You will see it blowing ; but it is not blown out.

5176. To keep that flame alight, how fast must you walk ?—I am sure I can hardly answer that question. If you have no draught at all somewhere, of course, by walking, the candle will flare.

5177. I speak of this particular spot ?—There is a very good ventilation there, that is all I can tell you.

5178. I want to know what you mean by a very good ventilation ; at what rate do you walk in this particular level to keep the flame alight ; have you ever noticed that ?—We very seldom take that observation, we generally go fast and a little faster than that.

5179. You have five or six winzes in those two different levels, have you not ?—I do not know how many there are, but about five or six.

5180. Are those all open ?—No ; if we went this way (*pointing to the sketch*), we should perhaps do away with that winze.

5181. Do you close the winzes as you pass them ?—Yes ; perhaps all this ground may be taken away and we fill up that hole if possible with deads and that will throw a stronger current of air to the present end.

5182. Is that done ; are those winzes closed ?—Yes, generally speaking, if it is required they are ; sometimes, perhaps, we have air enough without doing that.

5183. How do you judge with regard to its being required ; if your candles will burn are you satisfied ?—Yes ; if we have air sufficient to work we are satisfied.

5184. How long does the powder smoke hang about at this 270 fathoms end ?—Perhaps the men are obliged to stop half an hour every time they blast their hole.

5185. Is it ever so much as an hour ?—Perhaps they may sometimes stop as much as an hour, because they may sometimes stop even longer than is required.

5186. Is it sometimes an hour before they can go into it again ?—They need not, I should say, stop so long as that ; they have to judge for themselves.

5187. How long is it common for them to stop out ?—I should say that it is necessary for them to stop half an hour.

5188. With regard to blasting, you told us that accidents happen in blasting from filling in the hole with killas, which sometimes strikes fire by tamping it in?—Perhaps it is for the want of putting killas in. They may put in perhaps a hard substance; they may put in spar, and not the proper material.

5189. Do they habitually put in some soft substance, such as paper or hay?—They generally put in something soft upon the powder; they take up some fine stuff from the bottom of the level, and put it upon the powder.

5190. Do they habitually put in soft stuff, such as paper, or hemp, or tow?—Not as a general rule; sometimes they put in dry clay.

5191. That is very good, if you have it; but suppose that you have not it?—Then they will take up some fine stuff from the bottom of the level, as fine as flour. A wooden rammer would not do in all cases.

5192. (*Mr. St. Aubyn.*) Would a copper one do?—Yes; it might do better, because it would not strike fire.

5193. (*Mr. Austin Bruce.*) If a wooden rammer would not do at all times an iron rammer would be necessary sometimes?—Yes, of course.

5194. Can an iron rammer be used without a certain amount of risk?—There is a difference in the nature of the ground; some ground requires harder tamping than others. A good deal depends upon the difference in the hardness of the ground.

5195. (*Mr. Holland.*) But is it not a proper thing to use that which is always safe?—Of course it is.

5196. Why not use a copper rod?—The only thing is, that it is more expensive; but I do not think that we ought to find fault with that in a copper mine.

5197. How much more expensive is it?—I suppose as four to one.

5198. How long will it last?—I suppose iron would last longer than copper.

5199. But how much difference is there?—I cannot tell.

5200. Would a copper rod last a man nearly his life?—No.

5201. Would it not last 20 years?—It would last a long time there is no doubt.

5202. Mr. Fox proposed a tamping wedge some 20 years ago; do you know that?—No.

5203. (*Mr. Kendall.*) With respect to the draught in the mines, how many fathoms is Henrietta shaft, in the Fowey Consols, from Bottry's shaft?—I should say 100 fathoms or more.

5204. Say 270 fathoms; Henrietta shaft is not holed down to 100 fathoms?—No.

5205. Supposing it was holed, would the draught be such there, without doors, as would put your candle out very frequently?—Yes, it would.

5206. Supposing that a man stood still at the 270 fathoms from the adit, which would be 300 fathoms from the surface, would not he catch cold very soon from the draught?—Yes; certainly.

5207. Much sooner than at the surface?—Yes, I believe so.

5208. Take our mines generally, is not there a very strong draught, a sensible draught, in all our large mines?—Yes, there is; sometimes you can hardly carry a light through a level; and if a person stops in that draught no doubt he will very soon take cold.

5209. With regard to tamping, your instructions always are to put something in very soft on the powder?—Yes.

5210. And, among other things, you recommend the fine stuff which comes out of the boring?—Yes.

5211. It is the finest dust?—Yes; as fine as flour.

5212. If you struck the iron as hard as you could against that dust a thousand times, you could not create a spark?—I do not think you could.

5213. You put in that first?—Yes, we always order so; but I believe that sometimes it is seriously neglected.

5214. And your belief is that when an explosion takes place it arises from the miners not following out the orders given them by the agents?—I should say so.

5215. (*Mr. Holland.*) About how far is the furthest end from the man engine below?—I cannot tell I am sure; there may be pernaps some ends 300 or 400 fathoms from the man engine.

5216. Or more than that?—Yes.

5217. Half a mile perhaps; 800 fathoms?—Yes; but I speak of the principal parts where they are working; there are places, perhaps nearly half a mile, where they are not working now.

5218. Do the men always prefer going underground that distance to the man engine, to going up the nearest footway?—They will go to the man engine if they can get at it; sometimes they may have hundreds of fathoms, and may have to go up 20 fathoms climbing before they can get to the man engine, or sometimes down that distance before they can get to the man engine.

5219. Still they will go to it if they can?—Yes.

5220. If the man engine is stopped by any accident, will not they rather wait a long time than come up by the ladder?—Yes; they will rather wait three or four hours than climb up.

5221. Before the engine got into use, did any of the men prophecy that it would never answer, and say that they would never go up by it?—Not that I recollect.

5222. Were you at the mine at that time?—No, not at the Fowey Consols.

5223. You have heard of such things being said at the mine, have you not?—I heard some say that they did not approve of it, and that it would not do, and they would be afraid to ride in it; but I believe that everybody is satisfied with it now.

5224. Is it not likely that prejudice against those sort of things will die as soon as that did?—Yes.

5255. Provided it be prejudice?—It is a prejudice, no doubt.

The witness withdrew.

CHARLES BARHAM, Esq., M.D., examined.

5226. (*Chairman.*) I believe that you reside at Truro?—Yes.

5227. You were employed in preparing a report for the Children's Employment Commission?—Yes.

5228. In preparing that report, had you an opportunity of becoming acquainted in a special manner with the families of miners and with miners themselves?—Yes; I became pretty largely acquainted with the whole class, more especially with those actually at work.

5229. Did you observe anything in the state of their health to attract your special attention?—Yes; there were many things which were very striking at first sight; but the general results were rather those derived from an examination of the registers of deaths; and the evidence which I collected more quietly than from direct observation. But under the eye of the medical man there are many things regarding miners which are very observable as different from the other classes of the community.

5230. You have the principal charge of the Infirmary at Truro?—I am the senior physician to the infirmary.

5231. Have you an opportunity in that capacity of observing any diseases of miners?—A considerable number of miners are admitted as patients. It is not at all exclusively a miners' hospital.

5232. Have you had any opportunity of comparing the diseases of miners with the diseases of other patients?—Certainly.

5233. (*Mr. Holland.*) You are also in free com-

munication with a large number of medical practitioners throughout the county who practise among miners?—Yes.

5234. (*Chairman.*) Is the subject of the miners' disease ever a topic of discussion between others in the medical profession and yourself?—Yes. The influence of mining occupation becomes a topic of discussion when miners are attended. When I have to meet medical men in consultation, who are in attendance on mine agents or on miners, the influence of their particular occupation becomes a considerable element in the discussion as to the nature of their case; but I should say that by far the largest proportion of the diseased conditions of miners does not come very much under the observation of the hospital physician; it is rather a deteriorated state of health, which does not immediately bring them to the hospital, which tends to shorten their lives very materially as compared with the rest of the community; perhaps they die off without ever becoming patients in the hospital; and they are not, perhaps, very much patients even out of the hospital.

5235. Is there a general agreement, in your opinion, amongst the medical men as to the nature of what is called the miners' disease?—Yes; I should say pretty generally. Some persons have particular views as to the causes in the earlier stages of the disease, and the particular character of what is, perhaps, called miners' consumption; whether it is more of the nature of what is called tubercular consumption, or whether it is the result of inflammatory changes in the lungs, and so on; but there is generally speaking no essential difference prevalent upon the subject.

5236. What would you describe as the miners' disease, in your opinion?—My own view, as far as the facts have come under my notice, is confirmatory of what I had occasion to state more than 20 years ago, in 1841, I think, when I reported before. I had then had a pretty large opportunity of seeing the mining population, both in the mining districts of Devonshire, in the neighbourhood of Tavistock, and in Cornwall; and my opinion remains the same, namely, that there are two large sections of the diseases of miners which are, I may say, essentially distinct; one the diseases of the young miner in early life up to, perhaps, about 25, which is partly ordinary consumption,—what we call scrofulous consumption; such as might occur in the general body of the community, and especially in those who are shut out from free access to the air, and who are exposed to mechanical causes of irritation of the lungs, and other agencies which tend to ripen the seeds of consumption rather speedily, and to interfere, perhaps, with the full development of the body. And there are also at that age a large amount of inflammatory affections of the lungs, such as arise from rapid changes of temperature,—what we call bronchitis and pneumonia, pleurisy, and so on, and occasionally spitting of blood. And secondly, what is more properly miners' consumption, which finishes the originally healthy and sound miner when he gets perhaps to be from 40 to 50 years of age, and upwards, which is a slow disease, the result of his occupation purely, I think, as being the effect of impure air and the inhalation of mechanical particles,—irritation of the lining of what we call the bronchial tubes,—the air tubes; and also the effect of climbing to a considerable extent, too great a strain upon the heart and upon the chest. Those two classes of disease require to be kept distinct by any person who would investigate the effect of mining occupation, both on scientific grounds, because they are capable of being obviated in very different degrees. You may say that a very large amount of mischief is done (at least that is my own opinion) by subjecting boys at very early ages to the influences which they must sustain when they go underground. That is a conviction which I hold very strongly, that in the growing age, the early age of life, it is much more prejudicial comparatively than it would be at a later age, to introduce them into places in which the air is very impure, in which their physical powers are overtaxed, in which their digestive organs are very much thrown out of sorts, and in which their natural course of development is seriously interfered with. That, of course, was an element with which we, in that early Commission with regard to the employment of children, had a good deal to do. The employment of very young boys underground was a thing which it was my duty to point out as one of the practices which might be very properly corrected in this county.

5237. You have referred to the inhalation of mechanical particles, will you explain what those particles are?—There is a great deal of carbonaceous matter in the first place from the burning of candles and from powder smoke.

5238. (*Mr. Holland.*) The imperfect burning of candles?—The imperfect burning of candles. Then there is a certain amount from the operations of the miner,—dust and so on;—but that is not so considerable. There is a large accumulation in the ends which are not within reach of efficient ventilation. You may say that a mine is like a chimney if you get into a corner, if you get into an end; the ventilation may be very good a little way off, but the end itself is rather beyond the point which is ventilated: this is constantly the case in mining operations. You have to carry on the operations beyond where efficient ventilation yet exists, and in those situations after blasting, and to some extent even from the mere burning of candles, there is an accumulation of carbonaceous and other particles, and there is also a great deterioration of the air from the consumption of oxygen, and the increase of carbonic acid.

5239. (*Chairman.*) Do those particles affect the bronchial tubes or what part?—They affect immediately the bronchial tubes, and in some measure the minute vesicles,—the air vesicles—the more minute structure through which the air acts upon the blood; and the impure air deteriorates the quality of the blood, and so far depresses the power of life. It is a constant occurrence in such places that the miner for a long time after he comes up spits black stuff. Any persons going down for some time, mere civilians, going down if they choose to stay long enough, say six or eight hours under ground, and get into these ends, will find that they spit this black carbonaceous matter. That is got rid of pretty readily in the first instance, and perhaps in the earlier years of the men's mining, but I believe that gradually the contact of these particles damages the delicate structure of the air tubes and vesicles, and that the secretion which throws that matter off is lost; and the older and healthy miner, in my opinion, gets damaged very much by that cause, by the repeated effort to spit up this carbonaceous matter, just as any one might do from inhaling dust for a long time. He gets rid of it naturally by expectoration for some time, but if he had to do it day after day, the texture of the lining of his air tubes would become injured, and the lungs themselves would be damaged in consequence. The miner has a species of disease which lessens his power of expansion of the lung, and in many instances he dies of a chronic consumption; but in other instances by a sort of want of breath, a contraction of the lung without any great amount of destruction.

5240. Is there any injury arising beyond the mechanical injury from the powder; is any noxious gas created by the powder which is injurious to health?—Not seriously. I should say that though such gases are commonly generated they are not seriously noxious in our mines.

5241. I mean by an explosion of powder?—There are sulphurous acid and different gases which are noxious; but I do not think that they really constitute a material element in the injury done to the miner; not anything seriously so.

5242. Supposing the candle to be made of any deleterious material, would the inhaling of that be likely to be injurious?—Yes, it has been found so in other mines, such as in some of the Scotch collieries it has been found in a very marked form; but I do not

think that anything considerable is to be attributed to it in our Cornish mines as far as it has come under my own observation. There is some difference in candles, but it is not a very material thing.

5243. Have the candles in this district ever been analysed at all?—I think not. I do not recollect any analysis. Of course bad candles are disagreeable, but I do not consider it at all an important matter in relation to our mines. The influence of climbing is one very essential element, I have no doubt.

5244. Supposing that a man working in good air had to climb 200 fathoms, would that be injurious to him?—It would be the most fatiguing part of his day's work.

5245. I mean as affecting the air tubes of the lungs or the heart?—In early life it would tend to produce some injury to the heart; I should say in a general way, that diseases of the heart are not frequent amongst our Cornish miners. Diseases of the heart have been supposed and stated, I believe, to be frequent, and one great cause perhaps of mortality. My own experience contradicts that; I believe, that what we should professionally call disease of the heart is not common; I have found the effects on the heart of great exertion very marked in young subjects; the heart is in a state in the first place of palpitation, the young miner likes to go up pretty quickly if he is climbing a ladder, and will run a sort of race with his comrades. Then of course they are like persons running a race up hill, there is a violent beating of the heat induced, then the heart gets, to a certain extent, stretched, it gets exhausted by the time they have finished the race, and if you were to examine one of the miners on his coming to the surface you would find that the heart was exhausted and acting very rapidly and feebly, and sometimes irregularly. If you were to see a party of miners who had just come up, especially the younger ones, you would find that to be the case in a marked degree. Then the subsequent result of that is, that as the part exercised gets an increased nutrition, in consequence the heart gets enlarged and beats strongly. But the miner does not complain of that: I have frequently examined young fellows, whose hearts when they have come to the hospital have been beating strongly, whose cases would perhaps be set down as diseased heart in a London hospital, and who would not themselves be sensible of anything going wrong; they are accustomed to the heart beating a little strongly; but that is a condition which a period of rest will do away with; it should not be called disease, it is the effect of causes which no doubt will tend to injure the heart ultimately, but it is not really a diseased heart. The older miner is not frequently subject to what is technically called disease of the heart, disease of the valves of the heart, it is a comparatively rare occurrence; but the effect of climbing is doubly injurious, it causes from the amount of perspiration, and of exhaustion, a very great susceptibility to the impression of temperature and to catching cold, and so on, and a large portion of the pulmonary diseases of miners, especially of those of the younger miners, are in fact inflammatory diseases, which may be caught in that way, inflammation of the lungs and of the air tubes, bronchitis as it is called. A very large amount of the disease of the younger miners is of that nature; the exhaustion from climbing affects doubly in that way, it causes a liability to other diseases, and it produces in itself a weakness of the heart, and an inability to resume labour with the same advantage, and some interference with the digestive powers as well.

5246. Is there a thickening of the membranes of the heart?—No, not of the internal parts of the heart, it is rather an enlargement of the heart with some degree of thickening of its walls.

5247. As you state that the climbing and the work below render a man peculiarly liable to cold, it is important that he should have on coming to the surface a proper place to change, so that, as far as possible, catching cold may be obviated?—Yes. A recommendation was introduced into the former report of driving a shallow level to the changing place from the shaft where the men come up, so that they might come into a warm changing house where their clothes could be dried; I think that since the time when that report was written considerably more attention has been paid to those matters; and at that time, the man engine had not been introdnced at all. It strikes me that it would be a very important thing to ascertain what the effect of the introduction of the man engine has been as regards the health. My own impression is strongly, that it has been very beneficial as regards the prevalence of pulmonary disease and general disease amongst the miners, and that opinion has been supported by the reports of some of our most able mine agents, the late Captain Jennings and Captain William Francis, who were both very able men, and Mr. G. Michell, of Redruth; they all reported to me some years ago, and I drew up a paper on the subject, representing the favourable influence which had resulted from the introduction of the man engine, in reference to miners' consumption, and to the general affections of the chest of the miner. That has been much more extensively introduced now.

5248. How do they judge of that improvement?—They judge partly from their observation of the men and partly from the results on themselves; Captain Jennings was the agent at Tresavean, one of the largest mines which we had at that time, and one of the deepest, it being 340 fathoms from the surface, and he was afterwards at Seton; I think he was agent of another large mine; he had been a patient of mine sometime before, and had had an affection of the lungs, induced by climbing as I considered at that time, and he was very well satisfied of it afterwards. After the introduction of the man engine he was able to resume his work without difficulty, and he stated to me, in a report, that he was satisfied that he should have added many years to his life had the man engine been introduced before; that a number of men who had been employed in that mine had been able to be put underground again who had been obliged to give it up, and so on.

5249. You have stated that a captain was able to go below ground because instead of climbing the ladder he had a man engine, although he was previously affected?—Yes.

5250. Would not that be the case with many other men who with the man engine would be able, though affected, to work below ground, which they would not have been able to do if they had not had a man engine; and therefore would not there be fewer men put off work although there would not be fewer men, in fact, affected by disease?—Unquestionably. A certain amount of disease would be consistent with their continuing at work, because the climbing being the most difficult part of their work, if a man's breath was short, he could not climb; perhaps a comparatively slight disability would prevent him from climbing from a great depth, whilst he could continue, if he could just be relieved from that one difficulty.

5251. Therefore in any inquiry as to the number of men who were obliged to leave the mines from disease that would diminish the number, because there would be so many who could continue to work?—Certainly.

5252. So that it does not follow that the climbing produces the disease, but the man engine may enable a diseased man to work longer in the mine?—It does not follow from the particular evidence that the climbing produces disease; but there is sufficient evidence of another kind, that the climbing naturally tends to produce disease both by exhausting the general power, and particularly by exhausting the heart and also causing, from the act of climbing, a great stretching of the lung, because the miner has to keep the chest as a fulcrum for motion; he must keep the chest pretty full when mounting, and that causes one affection of the chest to which the miner is to some extent subject, what we call dilatation of the bronchi, and emphysema, though, in my opinion,

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that is not a prevalent disease among the miners. There may be perhaps some portions of the lung which may be subject to the emphysema, which consists in the breaking up of the minute vesicles or air cells; that may occur in detached and small portions of the lungs, but it would be difficult to ascertain it exactly without post mortem examination, which is very little practised among our miners as compared with other artizans. The miners object to it. That minute emphysema can hardly be distinguished during life; but what would be recognised as emphysema elsewhere has not been a prevalent disease under my own observation. There is very little expansion in the upper part of the lung in the disease of the miners, and there is not that resonance which there is in an emphysematous lung.

5253. Would the climbing tend to produce that disease?—The climbing would tend to stretch the air tubes, and there may be other causes which perhaps would be a set off against that.

5254. (*Mr. Holland.*) Then do you consider the existence of emphysema of the lungs rather hypothetical?—I do.

5255. (*Chairman.*) Have you ever turned your attention especially to the examination of the emphysema?—We are constantly examining the chest. My own experience is that there is not, generally speaking, a very resonant chest in the miner who characteristically has the miners' disease; he has a rather contracted chest; the upper part of the chest does not expand, it is more like what occurs in chronic pleurisy.

5256. Do many boys work under ground?—I do not think that the proportion is much altered. I have not the evidence before me as to the number at this time in the mines from which I before had returns. Between the ages of 13 and 18 there were 1,364, and under 13 there were 550; but the latter were not all employed under ground, the greater part of them were at the surface.

5257. (*Mr. Austin Bruce.*) Were the 1,364 employed under ground?—No; but after 13 a very large proportion were employed under ground.

5258. (*Chairman.*) In calculating any change which may have taken place in the health of the miners during the last 10 or 20 years would you not take into account the number of miners who have emigrated?—Undoubtedly it is a necessary correction in estimating the average duration of work and the average of death. It is quite necessary to examine how many have gone abroad, and to some extent, I should say, it ought to be ascertained how many leave the mining occupation; it ought at least to be estimated in one or two districts, so as to be applied as a general correction.

5259. Have you any means of estimating the number of miners emigrating from Cornwall?—It would be a troublesome thing to do for the whole county, but it might be done in one or two districts without difficulty, for the miners are a set of men very well known to the agents in the different mining districts. There would be no difficulty excepting the employment of a few clerks and a little expenditure.

5260. You believe that it might be ascertained?—I believe so, without difficulty.

5261. Is it at all within your knowledge that young men who have found themselves affected by working in the mines here have emigrated?—Yes; I have had occasion to be consulted by miners who not feeling equal to the work at home have asked me whether they might go abroad. I have encouraged some of them to go, and have known that they have gone and got on well.

5262. Have you ever heard whether they have recovered their health?—I have heard of them as doing well and being able to continue their work.

5263. In any statistical inquiry as to the improvement of the health of the miners that should be taken into account?—Yes, certainly; it would be quite necessary, supposing, as I believe to have been the case for some years past, that a very considerable number of miners have emigrated in that way. Then it would be very essential in order to arrive at a just conclusion as to the duration of their working age and also the relative mortality as given in the Register of Deaths, to ascertain how many had left, and at what ages, as far as it could be done.

5264. (*Mr. Kendall.*) Have you ever descended much into our mines?—Not very much.

5265. You have been down?—Yes.

5266. More than once?—Yes, I have been down Botallack and Huel Vor in olden times.

5267. Then you have been down some of our deepest mines?—The Huel Vor to the 200 fathoms in the old working. I went down to make some observations on the temperature below ground a good many years ago.

5268. Did you go down with regard to the temperature, or with regard to the ventilation?—To the temperature solely at that time, at the time Captain Tyack managed it.

5269. I understand that your great experience among the miners is with those whom you see as physician to the hospital?—Yes; and I see a large number of miners who consult me from time to time. I see a great number of miners in the course of the year; miners at home and from our colonies, from Mexico and Cuba, and so on; a large number come from time to time. I have what may be called a diffused experience of the mining population; it is not concentrated in a particular mine, but I think I have a very good selection.

5270. As physician you are called in every now and then?—Yes, to the mine agents.

5271. And even to the lowest order of the miner class?—Yes, at times.

5272. Before a case comes to the hospital I suppose the party applying for admission is always examined by some local surgeon?—Yes.

5273. In order to know whether it is a case or not for the hospital?—Yes.

5274. In the case of miners, do the surgeons simply say, that it is a case for the hospital, or do they also enter into the minutiæ of the case?—We do not generally get a report from the surgeon, or even a statement that the party has seen a surgeon; but we know that he has, because they apply to the mine surgeon; but you know that persons who are supplied by contract are not always satisfied, and so they come on to the hospital. They have been previously attended, but we generally get no statement from the surgeons prior to their introduction to the hospital; they get recommended from the mine or from subscribers.

5275. I understand from you, that as far as the younger miners go, there are more cases of danger arising from their catching cold than from bad ventilation?—I do not think that I said there were more; I said that the younger miners suffered more, I think, from catching cold than the older ones would do. I did not draw any comparison between that and the effects of ventilation.

5276. I want to come to that point. In cases, generally speaking, both as regards the old miners and the young miners, who get what is called the miner's disease, and who also get consumption, do you think that it arises more from bad ventilation or from their catching cold from rapid climbing, and so on, or that it is combined?—When you say "bad ventilation," that is jumping to a conclusion. I should say that it is a combined influence. It appears to me that the old miner suffers from the combined action of a variety of causes which have lasted through life. Supposing him to have been, as he must have been, a healthy and strong man originally, it is very much the combined influence of an impure atmosphere, acting from time to time, an excessive strain and exertion on the heart, and an application of mechanically irritating particles to the lining of the air tubes, as I explained just now. The ventilation, however, well carried out, could not prevent there being a certain

amount of difference in the air from that above in a place where they are blasting.

5277. Taking a number of mining cases, both in the hospital and in your own private practice, have you any idea of the per-centage of those who have complained to you that in their own idea their illness has arisen from working in bad ends?—A very large number of the older miners speak of poor air as being the cause of their ailments. I think they feel it themselves more distinctly; they have been, perhaps, working for some months in poor air, and then they feel that they have broken down; they have tested their powers to the utmost.

5278. In your conversations with them, have you been led to suppose that they have been working in many cases in very badly ventilated ends?—Certainly.

5279. More in olden time than now?—I have hardly the means of making a comparison. It has certainly struck me that the amount of cases of that sort has lessened of late, that has been the impression on my mind, and it has been rather confirmed by statements, which I have had from mine agents and mine doctors, that the condition of things has improved; but that I believe applies more to the great mines in the central districts, and so on. The outlying mines, I am inclined to believe, are often very bad in that way.

5280. I understand that some years ago you applied your mind very greatly to statistics, and since that you are led to believe that the ventilation is better, and that the climbing is better, but you have not any statistics to prove it?—I have not any statistics to prove it. I think that they are very desirable.

5281. (*Mr. Holland.*) Mr. Pearce of this town expressed a very strong opinion that there was a clearly marked distinction between miners' consumption and ordinary tubercular consumption; do you agree in that opinion?—Yes, as regards the disease of the older miners. I expressed that opinion just now to a certain extent.

5282. He also said that he was not quite sure that the proportion of deaths from tubercular consumption was as great among miners as among other men, that it was certainly not more; perhaps you have not noticed that?—Unless there were much more extensive post mortem examination upon that point than there has been, I should say that it would be mere guess work. There are no materials for medical men to say that the disease is not tuberculous unless the structure is examined.

5283. He also told us that miners' consumption more commonly attacks the lower than the upper part of the lungs; what is your opinion in that respect?—There are a large number of cases of younger miners who are affected with a sort of chronic pneumonia, a condensation of the structure of the lower part of the lung, which brings them to their grave without there being evidence of tubercles certainly.

5284. Mr. Pearce told us that he had found the unnatural sounds more marked in the lower than in the upper part of the lungs, and that he believed the miners' disease to be more frequently at the lower than at the upper part of the lungs; does that correspond with your observation?—Yes, it corresponds to this extent, that I believe there is a large class called consumption, which is in fact pneumonia, inflammation of the lung.

5285. He was confining his observation to the class called consumption, which he believed not to be consumption?—I should agree with him so far; but the cases of proper consumption, I think, are located just as usual.

5286. He was speaking of the class which the miners themselves called consumption, because it was accompanied by a cough and a spitting and a wasting away, but which he believed to be quite distinct from tubercular consumption?—A miner has of course very imperfect evidence as to his own case, he calls it consumption if he finds himself failing; but I believe the class is quite distinct to the medical man. There is a large class of cases which probably would be entered on the register of deaths as consumption, but which to the medical men are not consumption, they are chronic inflammation of the lung. The proper consumption, which is a very prevalent disease among the younger miners, is the ordinary consumption.

5287. Mr. Pearce was speaking of the consumption among miners which occurs particularly after 40 in the older men, as distinct from the less frequent cases which occur below 30. I think you agree with him in that opinion. He also told us that in that class of miners' consumption, properly so called, spitting of blood from the lungs was rather rare?—Yes, in the miners' consumption.

5288. In pulmonary consumption it is very common?—Yes, and so it is with miners in early life in ordinary consumption.

5289. He also told us that if miners were decidedly affected, but not very far gone, by a change of their employment, they very frequently, although they did not recover, lived many years, and then died; is that correct?—Yes, they live on. There is a considerable number who live on in any community. They are not much inclined to change their employment, but still a certain number of them do change it.

5290. He said that those who did change their employment, and were not very far gone, would remain valetudinarian for many years, but not very ill?—Yes, it would make a difference of several years of life.

5291. Supposing that persons were as much affected by tubercular consumption, would there be any probability of a large proportion of them living for many years?—No.

5292. The majority of them would probably die?—Certainly.

5293. Do not those circumstances confirm what you before stated, that the cases are two distinct divisions?—Yes.

5294. You say that you thought that a man engine had been very beneficial. There are only six man engines in the county, I believe, and those are in the deepest mines, and therefore, where they are most wanted?—Yes. Have you ascertained that there are only six?

5295. I have not ascertained that there are only six, but I have only heard of six?—I thought that there were more than that. The whole of those mines where the man engines are, embrace a considerable population.

5296. They also embrace the population which most need the help?—Yes.

5297. You have stated that disease of the heart is not frequent; I suppose a simple thickening of the muscular walls of the heart is frequent?—Yes; I drew a distinction between a temporary and a permanent thickening.

5298. A simple thickening of the wall, unless it were the consequence of some other disease, would not be a serious matter?—No. I meant to explain that it was rather an effect of excessive exertion, just as a muscle of the arm would increase in size by use.

5299. Therefore when we meet with hypertrophy of the heart in ordinary practice, which looks serious, it is rather that it points to that of which it is the consequence?—Yes.

5300. We fear that it is the consequence of some obstruction which has been overcome?—Yes.

5301. Therefore it is rather the mark of a serious disease than in itself a disease?—Yes.

5302. We were told by some of the miners that the candle smoke, by which they meant the smoke of candles burning in very poor air, was more annoying to them than powder smoke?—The smell of it.

5303. Do you think it likely to be injurious?—It would be injurious if carried to any great extent.

I am not competent to say what candles are used at the present time in all our mines, but generally speaking, if a lot of bad candles are sent in, the same

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person is not employed again, or at all events some arrangement is made for their being better next time. It is not the practice here to use that sort of candle.

5304. You said that you thought mining much more injurious to growing than to mature age ; do you think that that is a fact which has been proved statistically ?—I think so ; statistically you may find, I think, that the mortality is great at an early age.

5305. That is, that miners who begin at an early age are less healthy than those who begin at a more mature age after growth ?—Yes, that is the result of my own inquiry.

The witness withdrew.

Captain John Webb examined.

Capt. J. Webb.

5306. (*Chairman.*) In what mine are you at present employed as captain ?—I am the manager of three or four mines, two in this neighbourhood and two or three in the west ; West Par, East Beam, and two or three little mines about Camborne.

5307. You were a miner yourself, and worked underground ?—Yes.

5308. How long ?—I commenced working when I was seven years of age in the dressing of ores, and I went underground when I was 15 years of age, and I was 56 last week.

5309. How many years have you been an agent ?—Nearly 30 years.

5310. But before that you worked underground ?—Yes ; before that I worked as a miner.

5311. At tribute or tut work ?—Principally tribute.

5312. Did you ever suffer in your health when you were working ?—No ; I generally worked in good air places.

5313. When you worked in good air did you ever feel any inconvenience from climbing the ladders ?—I was always cautious not to climb fast. I always knew that I should sustain an injury from that.

5314. In what depth of mine did you work ?—From 70 to 80 fathoms.

5315. Do you think that miners generally suffer in health from their occupation ?—Yes.

5316. Have you observed them suffer yourself ?—Yes ; they suffer from bad ventilation in many cases ; I do not say in every case, and they suffer from climbing too fast, that is their own fault.

5317. How far from a natural means of ventilation would it be safe in ordinary cases for a miner to work in an end ?—I do not think that they ought to work beyond 20 fathoms, although some places will convey air better at 40 than others will at 20. But there should be some artificial means when a level or gallery is driven on beyond 20 fathoms from a current or draught ; I think that there should be some standing rule of that sort.

5318. Must not that differ according to the depth of the mine ?—No ; I have seen the air as bad five fathoms deep as down 100.

5319. As bad at the end ?—Yes.

5320. How do you discover the air to be bad ?—We generally discover it to be bad from the slopedness of the candle burning.

5321. Do you also observe any difference after a blasting, as regards the smoke getting away ?—Yes ; the longer the smoke continues in a place the less current of draught there is to carry it off. It shows that the air is bad when the smoke does not pass off quickly.

5322. How would you obviate this defect ?—If I could not bring in air naturally, I should use some artificial means ; I should do it mechanically by putting either a fan or some other appliances which we use in mining; but a fan is the most effectual, and it is cheap.

5323. A fan worked by a boy ?—Yes ; or sometimes we work it with little water wheels if it is not more than two feet high, as well as by a boy.

5324. Will that introduce fresh air ?—Yes ; especially if we have metallic pipes through which we can deliver the air as good as we receive it, but if we have wooden pipes, wood is a consumer of air.

5325. In a dry mine, if the wood is dry, do you think that the air is injured by passing through wood ?—Yes ; I have observed wood in dry places throw forth a sort of moss or fungus, as it were, more than it does in wet places ; when dry rot takes timber it is more offensive than it is when it is wet.

5326. Is it the case in mines that there is dry rot ?—Yes ; and it throws forth very poisonous vapours.

5327. Therefore you think that the air should not be introduced by means of wood ?—No, unless it was well pitched over within ; I suppose that that would be a sort of remedy, but that is not done generally.

5328. But if it was pitched over so that it could not decay, do you see any objection to the use of wood ?—I think that that would be an improvement.

5329. It would be much less expensive than pipes?—It would be a little less expensive than metallic pipes.

5330. What kind of pipes would you recommend ?—Zinc or galvanised iron would do very well.

5331. Have you ever seen such a pipe as this employed, would this pipe answer for ventilation (*handing a black pipe to the witness*) ?—Yes ; I think that that would do very well for a pipe.

5332. Do you know anything about the size of pipe in proportion to the number of men at work ?—The pipe should be of tolerably good size ; if the aperture is a pretty good size there is less friction to the machine; eight inches would not be too much, but six would do very well.

5333. I suppose that it depends upon the rate at which the machine is driven ?—Yes ; it depends upon the velocity of the fan.

5334. Have you ever seen one attached to the steam engine at the surface ?—Yes ; I have applied them to the steam engine when we have worked the rotary engine, but our pumping engine will not do it, it goes one stroke and then stops and it would not revolve anything.

5335. You think that it could not be applied by an engineer to a pumping engine ?—No.

5336. (*Mr. Fulke Egerton.*) In a pumping engine there is a cessation between each stroke, is there not?—Yes. But there are little portable fans made by our founders here only about three pounds each, and they are very portable, and they have given air under ground very easily, and if we had metallic pipes and little portable fans in places where men are almost suffocated, and which is very injurious, I think they might have good air.

5337. Do you know any places where men are driving in poor air ?—Yes ; I frequently observe it in inspecting mines where men are 30, 40, or 50 fathoms off, and a little fan might give them a fresh supply of air.

5338. And yet that is not provided for them ?—It is not provided for them one time out of ten ; there are some agents more particular than others, but generally speaking it is neglected.

5339. Do you know of any instances in which, if the men had applied to those agents they would have allowed a fan ?—I do not know that they have made any direct denial of those things ; but men cannot say we will have a machine here. It is the agents' place to say that they will do it.

5340. Are there mines working in which there are none of these small machines ?—Yes, many mines in the county.

5341. So that if a man applied for them he could not get them at once ?—No. I do not know that I have heard tell of any flat denial to the men.

5342. But if there were none in the mine then they could not be applied ?—No, by no means.

5343. How long do you suppose a man could work in poor air ?—The general hours in the county are eight, but in some deep mines they work six.

5344. How long can a man work in poor air, how many hours consecutively ?—He ought not to work four hours.

5345. Do you suppose that they do work four hours sometimes ?—Yes, and eight very often.

5346. In poor air ?—Yes ; they ought not to be there more than four hours.

5347. But do they work eight hours continuously in poor air ?—Perhaps at their shift time they might remain idle for half an hour, or something like that, to cool, and very often when they come away from their mine they blast a hole, then they cannot go in there again perhaps for half an hour, and then they just lie in a place idle for half an hour for the smoke to clear away, whereas if they had a little fan they might blow in a little fresh air as well as being back in a current doing nothing.

5348. So that it is a loss both for the men themselves and for the adventurers ?—Yes ; I have been long urging that. I have never let men work under my guidance for many years in poor air, unless they were trying to hole or to communicate air to another place. I have said, if there is poor air I will have a fan or a water fall, or some appliances.

5349. But that is not the general practice ?—No ; or at least it is not general enough ; a great deal of the poor air might be avoided with a little attention being paid to it.

5350. Are there cases where you think that it could not be avoided ?—No place. If you have a fresh current of air you can always take it up from that place.

5351. And therefore it is neglect ?—It is neglected too often, I am sorry to say.

5352. Do you think that the men suffer in health from that ?—They must suffer in health when they are breathing such a bad atmosphere. You hear men complaining very often when they are climbing the ladders ; they know when they are working in poor air, they feel a weakness in their legs. I have not experienced it myself. I have generally worked in good air places upon tribute.

5353. Do the men go back again the next day to the same place when they find that the air is poor ?—Yes ; in most of our mines we keep three shifts of men, and they will relieve each other, and they may have half an hour before their relief time.

5354. Supposing a shift of men found the air bad, would they go on with the work for the whole month for which they had taken it?—Yes; very often, when men are in such a place they are reluctant to be out of employment, and they work and injure their health, and it goes on for years imperceptibly, perhaps, till it tells upon the constitution.

5355. They are obliged to work there for the sake of getting employment ?—Yes ; if they put themselves out of that place, perhaps they will be out of employment, which they cannot afford to be at all times ; when employment is not very plentiful they will work in these places for the sake of having work.

5356. And do you suppose that they know themselves that it is injurious to their health ?—Men get habituated to things, and they sometimes do it almost without consideration.

5357. But you consider that they suffer seriously ?—Yes ; all miners' lives are shortened by working in such foul air.

5358. The miners' lives you consider are shortened?—I have no doubt of it, that has come under my observation. I have observed it very particularly. I have seen the lives and health of the tributers much better than of the tut-work men, because the tut-work men are driving on to the extreme points to a winze or shaft, perhaps. Then when that is done the tributors come in and explore the ore above that level, and a current of air is kept up there ; consequently, the lives and health of the tributers, it has been ascertained, are much better than those of the tut-work men.

5359. Do you think that many of the men prefer tribute work on account of the air, besides the chance of getting more money ?—I do not know that ; some are more enterprising than others ; there is more chance of success upon tribute.

5360. How long should you say that men would go on driving in bad air to reach a winze or a shaft ?—It varies very much ; sometimes we have to drive 40 or 50, and I have known 60 or 70 fathoms to reach a winze or another shaft.

5361. Would it take five or six months ?—Yes ; it might take twelve months in some hard rock.

5362. So that men might be driving twelve months in poor air ?—Yes it is very possible, and not only possible but very frequently the case.

5363. You know that ?—I know that to be the case, and every miner knows it to be the case. Sometimes levels are driven on so far that they cannot go any further, unless they have some means to drive air. Then they are obliged to put in some fan or something of the kind ; but if that was only provided in the early time it would not cost more than at last, so that men have suffered a great deal, and have lost their labour through the want of such an appliance, and it sometimes has been obliged to be used afterwards.

5364. So that in those cases they only put in because men cannot work any longer ?—That is generally the case ; in some cases the captains are otherwise.

5365. It depends upon the captains ?—Yes.

5366. It varies according to the captains ?—Yes ; some captains have no thinking powers ; they do not regard the health of the men. But I have long argued that there is no reason for men to work in a close, dense atmosphere, and that a little artificial means might be used.

5367. And you think that by that means the health of the miners might be improved ?—I am sure of it.

5368. Do you not think that if the captains had a better education, it would be advisable so as to know something about ventilation, beyond the mere driving of an end ?—No ; I do not think that education would assist them there. Education is a very good thing, I am sorry that I lack it. I never had any since I was six years of age, and I should be glad if I had a little more, but I do not think that it would have made me a better mechanic than I am now.

5369. If the captains knew the evils attendant on bad ventilation, do you not think that they would be more ready to adopt means to improve it ?—No ; I do not think that education would give them anything more like a human feeling.

5370. (*Mr. Fulke Egerton.*) You think that they know that the air is dangerous ?—Yes ; they know it.

5371. (*Chairman.*) I suppose being strong men themselves, and not having suffered, they think that others will not suffer ?—Sometimes for the sake of the expense perhaps they will hesitate, and sometimes men will go on themselves and the candle will burn tolerably well ; but then the air is not so good as it might be, and it could be made better, and if men do not complain the captains do not give it the consideration which they should do.

5372. If men complain, do you think that the captains always provide means ?—I should expect that they would ; but in many cases there is poor air and the captains know it, and it is not remedied as it should be.

5373. And you know that of your own personal knowledge ?—I know that that is the case.

5374. You have examined different mines ?—I am called on frequently to inspect mines.

5375. And you have found that to be the case on inspection ?—I have found that to be the case. I have very often said to captains, "I should put in some fan or some pipes, or do something to convey air to the men." They say that the air is good ; that

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it is not so very bad. I say, "You must have it by and bye, and why not have it directly." Then it goes on still in that way, it is not done as it should be. These are facts, and the miners suffer from it, and I have been long arguing or contending with parties that it should be done.

5376. And yet you know many cases where they have not adopted it after you have spoken to them?—Yes.

5377. Are the powder smoke and the candle smoke injurious to the men?—Very injurious.

5378. Can they be removed also by proper ventilation?—You can improve the wick of candles very much. There is a sort of slovenly stuff like hemp often employed in the wick of candles which gives off a cloud of smoke with it.

5379. That is well acknowledged, is it, namely, that a quantity of hemp will produce more smoke?—Yes; I think that I have a bit here now. (*The witness produced a candle.*) There are two wicks of that candle cotton and two hemp.

5380. And the hemp makes it create a great smoke?—Yes; if you were to light that candle now you would see a large cloud of smoke from it. [*The candle was lighted, and was found to produce smoke.*]

5381. Is that occasioned by the amount of hemp in the candle?—That and the amount of heat under ground. Carry two of those candles into a small space six feet high, and you will see what a smoke they must occasion.

5382. Are there candles made which will not give off so much smoke as that?—Yes; Palmer's candles of London—patent candles—which we have been consuming for years. They are made with a wick which gives no smoke.

5383. And will that answer in a mine?—Yes; miners like them after a little while.

5384. You have used Palmer's candles in your mine?—I have used them for years for the sake of doing away with this smoke.

5385. Is that smoke occasioned by the wick or by the bad tallow?—I think that it is from the wick.

5386. You find that the men in your mine are satisfied with the candles?—Yes, they like the Palmer's candles better; but I should think that you might put the same wick with this kind of tallow as Palmer uses.

5387. Where did that candle come from?—These candles are made by the merchants in this neighbourhood. The candles generally are of this kind in our mines.

5388. What is the difference of price between Palmer's candles and those candles?—I think that Palmer's candles are 3*d.* per dozen pounds more than these. We buy them at per dozen pounds.

5389. What is the cost of a dozen pounds?—It varies a little according to the tallow. I think that these candles now are 6*s.* 9*d.*, and that Palmer's candles are 7*s.* per dozen.

5390. Do you charge anything extra to the men?—We charge the men generally a penny a pound more than the candles can be bought for from the merchants. In some mines they charge 8*d.* when they do not give but 6*d.*; in some mines they charge 7*d.* They generally charge about 1*d.* a pound more.

5391. They charge the men 1*d.* a pound more than what they pay for them?—Yes, generally throughout the county. This is a thing which has hardly come under anybody's notice; but I have been long making my observations upon it, and saying what a nuisance it is in a small place where there may be two or three men working with two or three candles, and this dense smoke is going away in a small place. I used to take two of those candles, and go into a small room, and light them up on the table for about half an hour, and it was almost suffocating.

5392. Do you think that the men who work under you are more satisfied with your mine, and that they prefer it?—They prefer Palmer's candles after they know their value.

5393. With respect to blasting, how do your men fill the hole; do they put the powder in cases or not?—The general system of blasting in the county is to put the naked powder into the rock; but some captains say that the men shall use a case of paper or some other kind. That is the only safe way.

5394. You recommend a case?—By all means.

5395. Does not the hole require to be bored larger when there is a case?—No.

5396. The case must take up so much of the hole; so much less powder can be put into the hole?—You can put it firmer, more solid, and closer into a case than into the hole, unless it is driven in by a bar or something of that kind, which some men will do wilfully, and blast themselves by it.

5397. Will the hole contain the same quantity of powder if it is in a case as if it is not in a case?—I have tried it, and it will contain more, because you can put it in firmer. I have a case in my pocket. I have been studying that matter for years, and I now make all my men use cases.

5398. What do you charge them for those cases?—The price varies. (*The witness produced a case.*) It is prepared waterproof cloth.

5399. What is the cost of a case to the men?—That size would be about 12*s.* per hundred; in fact it is my patent. I took out a patent some time ago for it, and a great many of them are used in the county. There is a wadding of cowhair as a protection for the case and a foundation for the tamping.

5400. That prevents the danger?—That prevents the danger; there never is any. You never find an accident if the men will use those cases. I make some cheaper ones than that for dry ground.

5401. Those are for wet ground?—Those are perfectly waterproof.

5402. Do you think that the reason against the men using them is the price?—Some have objected to the price; but I contend that it is cheaper, because less powder will do; it will keep thoroughly dry, and if the powder is put into a rock where it is damp, without a case, it will destroy more powder than the case will cost, and damp powder will make a considerable deal more smoke.

5403. So that you would recommend the cases to be used for the safety of the men?—Those, or some cases; I prefer those, but they are my patent.

5404. For the safety of the men, you think that powder should always be put into a case?—Yes. The hole should never be blasted unless there was a case for it. I have known scores of accidents in my day from the want of it.

5405. Have you ever seen any cold damp in a mine?—Yes. I have seen it so that if you put a candle into it it will go out in a moment, the same as if you put it into water.

5406. Is it generally below or above the level?—Generally above.

5407. (*Mr Holland.*) Generally in the higher part of the level?—Yes.

5408. (*Chairman.*) Do you know what it arises from?—I suppose that it is from the dense fumes; we call it the damp.

5409. Cold damp?—Yes.

5410. It is your opinion that the health of the miners would be considerably benefited if the mines were properly ventilated?—Yes.

5411. Is bad ventilation, in the mines which you have visited, more general than good ventilation?—No. I think that there are more men working in good average air than in bad. It is at the extreme points that it is bad.

5412. Then it is your opinion that there are many ill-ventilated ends?—Yes.

5413. (*Mr. Kendall.*) You have had the management of a good many mines in this neighbourhood, have you not?—Yes.

5414. What are they?—The first mine that I managed in this neighbourhood was the Great Polgooth, then the Great Hewis.

5415. How long did you manage the Great Polgooth mine?—Two years, after Mr. Bell's death.

5416. Did that mine cease after that?—It came into other hands.

5417. And then it came into the hands of another agent?—Yes.

5418. Then you went on to Hewis?—Yes.

5419. Did you manage that for some time?—Seven years.

5420. And did it then fall into other hands?—I was there as long as it was worked; till it was abandoned.

5421. Where did you go then?—I had the Great Crinnis mine at the same time.

5422. Did that also pass into other hands?—Yes.

5423. With regard to ventilation, where there is defective ventilation, does that occur more in small and new mines, or in large mines?—I do not know; it varies very much.

5424. Have you been called in lately to see any extensive mine, to report on it?—No, not for the last two or three months.

5425. Have you, within the last year, seen any old workings?—Yes, many times.

5426. Do you think that it is more frequent in old mines?—Yes.

5427. In old mines is there much decayed material—much decayed wood, or anything of that kind?—Yes; I have known several mines where the wood has been decayed, and the atmosphere there has been very bad indeed. I think that all the dry levels should be pitched or tarred underground. It would be worth while to do so for the preservation of the timber, and I do not think that then that matter would issue from it.

5428. In any of the mines which you have visited do they use air sollers?—Yes; that is frequently done.

5429. Does it answer?—Yes, when you can get a strong current and a trapdoor, as we call it, to throw it into that soller instead of above.

5430. You think that that is a good mode of ventilation when you can apply it?—Yes; but we cannot always apply it. We must have a strong current of air to apply it; because if you confine the air under a soller it will be contracted, and it will not travel so easily unless there is a strong pressure.

5431. Have you ever seen any other artificial means of ventilation besides the air fan, the water, and the soller?—Yes; we have sometimes put in a piston when we work it by the engine, but we cannot always bring it to bear when we are at a distant point from the engine.

5432. But if it is near the engine you can throw in a good flow of air by that means?—Yes; you can put in a piston.

5433. Have you inspected any mine hereabouts?—Yes, I have inspected a mine down here, 180 fathoms deep, several times in the last year.

5434. Did you see bad ventilation there?—No; the ventilation was good there.

5435. Have you inspected any deep mine lately—within the last 12 months?—No; not within the last 12 months.

5436. Where has the ventilation been bad which you have inspected?—In most mines that I have inspected, when the ventilation has not been generally bad throughout, there have been ends driving or winzes sinking where the air has been very bad in many points.

5437. Can you state a case, without mentioning the mine, where there has been bad ventilation?—It has come under my observation several times, and I do not know any particular place.

5438. Will you state some mine, at some depth, where there has been the driving of an end, within the last two or three years, which you have been called in to inspect?—There is a mine which I have inspected for the last 20 years. I have observed that there have been ends or distant points where men have been working in such air as I have been speaking of. I have observed it many times in that period, and in my own mines I know that it is the case if I do not apply some machine.

5439. Take the last four or five years. Will you state one or two of the worst cases where you have remonstrated, and have said that the men were working in very impure air?—In almost every mine, if the levels are about 20 or 30 fathoms from the shaft, I always observe that the air is not fit for the men to work in.

5440. Have you observed that more in small mines or in large mines?—It is possible to have the air as bad in a shallow mine, not more than five fathoms deep, as it is at 100, or 130, or 140 fathoms.

5441. Have you observed it most in those small mines or in the large and deep mines?—In both. I always observe, that when the end or gallery is 20, 30, or 10 fathoms off, the air is very close and very impure. Men must keep their candles down flat for them to burn, and I have seen men working when the grease has been running down from the wick.

5442. Do you think that agents and men are as careless now as they were 20 years ago in those mines?—Yes; I do not see much difference.

5443. With regard to your mines, do you principally use fans or water-falls?—The fans are the most direct and easy to be applied where we cannot have water-falls. We cannot have water-falls in one place out of ten.

5444. Where you have a water-fall, can you apply that water-fall to rises as well as to ends?—If you have, say a 10-fathoms fall, there is no better or cheaper means that you can apply than a water-fall.

5445. If you have a supply of water, you can direct that water-fall not only in your drifts, but in the backs and where the tribute workers are, and so on?—Yes; anywhere.

5446. Have you not an improved water-fall by Mr. Williams in your mine?—I have worked one in West Par for a long piece of ground. We were sinking 90 fathoms from the shaft, and we did it by a water-jet; but there is not one case in 10 where you can apply that. We must have a column of water in the shaft and pressure.

5447. It is not Mr. Williams's patent, but is an improvement upon the old plan, is it not?—No, I do not think that it is any improvement. It was suggested by some person up in the northern part of England, who came down here and suggested it.

5448. How long ago?—I should think 4 or 5 years ago.

5449. But a water-fall was used many years ago?—Yes; but this water-jet and a water-fall are two different things. A water-jet will do with a great deal less fall than a water-fall. With the water-jet you may take in a small stream of water, and it will give a pressure.

5450. Take your patent case for a moment; since the use of that case in your mine you have had no accident?—Not any.

5451. Having a case for powder and having something round it which is waterproof, is not new. In what does your patent consist?—It consists in a cloth covered with any waterproof solution and with cowhair wadding upon it.

5452. I suppose the improvement is the cowhair wadding?—Yes; and the cloth. It has never been used in that form; paper has been used and pitch for many years, but cloth covered with waterproof solution was never used before.

5453. That is the patent?—Yes.

5454. I suppose that if you could make the men use it, the impalpable powder which they get from the mine would be almost as safe as cow hair, would it not?—Sometimes, if the holes are wet, if you put in the borings, it becomes almost like slime, it would not do in wet ground to put in those soft borings like flour.

5455. And this you find answer very well?—That is a foundation for tamping and that is a complete cure.

5456. Do you find it generally used or not?—

I have found a great many of them in the west, and in some mines in this neighhourhood they have had them for years, and the more the men use them the better they come to like them. Some of my men say, "We should be afraid, or should be timid, to use powder after using these cases." It is because men become so habituated and hardened to the thing that they do not think it dangerous.

5457. What is the cost of using your patent in the different mines ?—I merely supply the materials.

5458. At a price named by yourself ?—Yes ; I supply different sizes, and different lengths at different prices.

5459. (*Mr. Dovey.*) You said that some of the men objected to Palmer's candles ; can you state the reason for that ?—They objected at the beginning, but afterwards they liked them ; there was a little smell with Palmer's candles which they did not fancy at the beginning.

5460. Supposing there should be any accident and the candle went out, could they restore the light again and blow it up ?—No, they can never blow up Palmer's candles.

5461. And that is the great objection to Palmer's candles, is it not ?—I do not see any disadvantage in it. They always take lights with them; there is another man with them.

5462. Do you know why, in the candles to which you object, hemp is put with cotton into the wick ?—No ; but they have been accustomed to do so.

5463. Do you know that it is because the men can blow the candle up in case it goes out, and not be left in the dark ?—No, I do not think that it is for that purpose.

5464. You said that there was a profit charged by the adventurers on the materials supplied by them ? —Yes ; I do not know that it is always the case, but generally they charge the men a little more than they give the merchants.

5465. Do you know that the object of that is that the men shall not go and sell them to other people ? —Yes, perhaps that was the first object.

5466. (*Mr. Austin Bruce.*) You say that you have gone down to inspect a good many mines of late years ?—Yes.

5467. In what capacity did you go to inspect them ? —Perhaps I should have a letter from a gentleman asking me to inspect such a mine for him being an adventurer in the mine. Then I should go and inspect it and report to that gentleman who employed me.

6468. Taking one year with another during the last 10 years, how many mines have you inspected ? —I could hardly tell, I have inspected a good many in a year sometimes.

6469. How many did you inspect last year ?—The last two years my health has not been so good for going down in deep mines, and I have refused to go into some places, but in the last four or five years I have inspected a great number of mines, I do not know that I can give an account of the number.

5470. Cannot you give some sort of idea ?—I have inspected two or three mines in a quarter sometimes, and sometimes I have been a quarter when I have not had an inspection, and sometimes again I have been too busy to do it. I do not know that I can give you any definite statement of the number of mines which I have inspected.

5471. Have you inspected 20 mines in the last five years ?—Yes, and more than that I should think.

5472. Are you usually paid for your services ?—Yes.

5473. Is it a common thing for experienced captains to be employed to inspect other mines ?—Very common.

5474. Then most captains can speak as to the ventilation of other mines besides their own ?—Yes, if they are called upon to inspect mines.

5475. I asked you that question whether they usually were called upon to inspect mines ?—I hardly understand you.

5476. I ask you whether it is a common thing for captains to be called upon to inspect mines ?—Very common.

5477. (*Mr. St. Aubyn.*) When they were called upon to inspect mines, would they report on the ventilation unless they were specially desired to do so ?—No.

5478. (*Mr. Kendall.*) Are those 20 mines to which you have referred, which you have inspected, established mines or mines going into the market ?—Sometimes they would be established mines, and at other times they would be mines in the market.

5479. Out of the twenty mines which you have inspected in the last five years, how many were established mines ?—You may say 20 mines in 10 years. I know that I have inspected a great many mines in the county in the last few years. I have been connected a great deal with mining gentlemen, and I should receive a letter saying—"Will you inspect such and such a mine for me, being a shareholder," and I should inspect it, and report on it.

5480. (*Mr. Austin Bruce.*) Do you consider that at 30 fathoms from a winze, the air can be sufficiently good for a man to work in, without any artificial ventilation ?—I think that it should be improved if above 20 fathoms. Men may work at 40 fathoms.

5481. Have you ever known an instance in which a close end was worked at 30 fathoms from the shaft or winze without some stagnation of air ?—Yes, I have known levels more than 30 fathoms from any current of air, and a candle would burn well ; but when the men blasted, the dense smoke would lie where it was until they made another blast, and the place has been quite full of smoke from one end of the corps to the other, when the candles would burn moderately. Even then, I think that the air is too bad for the men to breathe, if it can be improved.

5482. Do you think that any place in which the powder smoke remains half an hour, can be a proper place for a man to work in ?—No ; he ought not to do so.

5483. Is it common for close ends to be driven 30 fathoms from a supply of ventilation without any artificial ventilation ?—It is very often the case.

5484. Am I to understand it to be your opinion that in all those cases artificial ventilation ought to be supplied ?—Yes, it would improve it.

5485. And that a man's health must suffer sooner or later from continuing to work in the air of such a close end ?—Yes ; if an end is 20 fathoms off and a little fan machine were put in, and three boys were employed to drive that fan, I believe that the men in the end would do more extra work than would maintain those three boys, besides the value of their health.

5486. You have been a working miner ?—Yes.

5487. How many years were you a working miner ?—I commenced working underground when I was about 15 years of age, and I worked underground until I was somewhere about 28.

5488. You were 13 years a working miner ?—Yes.

5489. During that time did you ever work in close ends ?—Very little.

5490. You were a tributer ?—Yes.

5491. Did you ever work in rises on backs which were ill ventilated ?—Very little indeed. I might for a few days just to hole a piece of ground, that is all.

5492. How came you to be more fortunate than many others who, according to your description must have been working in bad air ?—Because I was working on tribute generally.

5493. Could you choose your own places of working ?—No. I did choose, because I always refused to work in bad air.

5494. (*Mr. Kendall.*) You say that within 10 years (at first you said within five), you have inspected 20 mines ?—Yes, I say 10 years to be safe.

5495. Out of the 20 mines, how many do you think were established mines and how many were mines going into the market ?—I do not know that I could

answer that question. I have inspected various mines; they were of each class I suppose.

5496. As much one as the other?—Perhaps so.

5497. Then you would say that you have inspected 10 established mines. Were most of them in this county?—Yes. I have inspected some in Ireland and some in France, but in this country generally.

5498. What established mines in this country have you inspected; take a few of the most established?—I might call to my remembrance in a little while several mines. I could not call the whole to remembrance.

5499. Take one or two of the best?—I have inspected some in Gwennap, and I have inspected some in St. Just, and I have inspected some in Camborne.

5500. What established mines in Gwennap have you inspected?—I have been in the Henry mines and I know that there was a close place there; I have never been in the great mines, the United mines. I was never down those or the Consols.

5501. How many men were working in Huel Henry?—I suppose at that time about 40 men, that is 14 or 15 years ago; but I have inspected in Camborne and in St. Just.

5502. What mines in Camborne have you inspected?—I have inspected the Roskea.

5503. Which Roskea?—South Roskea.

5504. How many years ago was that?—It was several years ago. I do not know how many; perhaps 10 or 12 years.

5505. Has not that mine stopped for nearly 20 years?—No.

5506. For how many years has it stopped?—I should not think more than 10 years; it may have stopped 14; I cannot tell.

5507. What other established mines have you inspected?—I can hardly call them to remembrance. I could give them to you upon paper.

5508. What established mines at St. Just have you inspected?—I have been down the Levant mine.

5509. You went to inspect and report upon it?—Yes.

5510. How many years ago?—Several years ago. I have inspected a great number of small mines; I have been in the great Beam mine.

5511. Was not that one of the worst mines that we have ever had in the county of Cornwall?—Yes, I suppose so.

5512. What established mines in the west have you inspected in the last 10 years?—I have been in the Trevenen mine.

5513. What parish is that in?—In Wendron.

5514. How many men were working there when you inspected it?—I should think there were somewhere about 50 or 60 men perhaps working then.

5515. What depth was it?—170 fathoms.

5516. How was the ventilation there?—The ventilation was tolerably good. I have observed that the air has been as bad in close places in shallow mines as in deep ones.

5517. What particular shallow mines do you refer to now which you have inspected?—I can give you a list of a score, I suppose, if I go home, and just go through my pocket book and see what mines I have inspected, but I could not call them to remembrance now.

5518. In fact your inspection has not been much the last 10 years?—Yes, it has. I could give you a great number of mines that I have inspected in 10 years.

5519. (*Mr. Davey.*) Did you make reports for prospectuses when you inspected the small mines; were they published at all?—I made out my reports for those who employed me.

5520. But were they published as a prospectus afterwards?—Yes; I have seen my reports to a prospectus many times.

5521–48. Was not it principally for that purpose that you were employed?—I do not know that it was principally, but I have been employed on some occasions.

The witness withdrew.

Adjourned to to-morrow at 12 o'clock, at Par Consols mine.

Wednesday, 23rd April 1862.

REFORM CLUB
PALL MALL

PRESENT:

The Right Hon. Lord KINNAIRD, K.T.
The Hon. A. FULKE EGERTON, M.P.
NICHOLAS KENDALL Esq., M.P.
P. H. HOLLAND Esq.
H. AUSTIN BRUCE Esq., M.P.

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

MR. WILLIAM PETHERICK examined.

5549. (*Mr. Kendall.*) What age are you?—58.

5550. How early in life did you begin mining?—In 1817.

5551. Since the year 1817 you have been connected with mines?—Yes, but principally from the year 1820. I was in the West of Cornwall employed underground as a boy, then I came here, and went underground here.

5552. You were employed as a boy, and worked your way up?—Yes.

5553. You came to this place in 1820 as agent?—I was at Landiscot Mine before.

5554. What depth was that mine at the time you went there?—Very shallow; about 20 fathoms.

5555. How deep was that mine when you left it?—She was in 1834, I think, 140 fathoms.

5556. During the years that you were there was the ventilation generally good or bad?—It was always very good, except in a little way from the ends where the winzes were not communicated.

5557. How far used you to drive before you communicated with the winzes?—Perhaps about 30 fathoms.

5558. Have you known bad air there?—I have known bad air there occasionally for days.

5559. Did you ever see any difficulty as to the burning of candles?—Sometimes, but not very often.

5560. Were you obliged to put the candles in an inclined position to make them burn?—Yes, occasionally, in the close ends.

5561. To the best of your recollection, how many close ends at one time were they obliged to work in that way?—Perhaps five or six.

5562. In those cases the men, I suppose, suffered?—Yes, some little; sometimes it was owing to the stuff not being taken away.

5563. There was so much stuff in the end that they were overcrowded by it?—Yes, it was so, sometimes; and very often that occasioned a close atmosphere.

5564. What was your experience as to the health of the miners while you were there?—They were generally very healthy.

5565. I believe there was no dry there then?—They just had one, before I started; I think so.

5566. What has been your experience as to the miners; were they as strong as the agricultural laborers?—They were shorter lived, and not so strong.

ST. AUSTELL.

Mr. W. Petherick.

23 April 1862.

5567. Did you attribute that to the nature of their occupation, or did it principally arise from the bad air?—The nature of the occupation, I think, has been a great detriment to the miners, and climbing.

5568. The man-engine had not been introduced there when you came away?—No. I recollect going up from 140 fathoms deep, and when I got within 50 fathoms of the surface I would as soon lie down and remain there as go up, I was so exhausted; that principally arose from the inclined state of the ladders; they were inclined in that way that the weight rested upon the chest and head.

5569. Although you have constantly ascended and descended a mine, still you never ascended without feeling considerable fatigue after mounting a certain number of fathoms?—Always great fatigue; it was so at 100 fathoms.

5570. And that would increase as the mine became deeper?—Yes.

5571. What other mines have you been in since that time?—I went from Tower Consols to a small lead mine in the north of Ireland, county of Armagh.

5572. Did anything strike you upon the subject of ventilation there?—No; it was very good there; the mine was shallow.

5573. There you had natural ventilation?—Yes, always.

5574. What mine after that did you go to?—I went into a colliery in the county of Tyrone, and we drove, I suppose, 100 fathoms without any shaft; there was no communication with a shaft.

5575. How did you manage there?—Just as you do here, by levels being driven, and another communication by winzes all the way along.

5576. In the different beds of coal?—Yes.

5577. You went from one bed to another, and ventilated in that way?—Yes; with air courses.

5578. Therefore the ventilation of coal mines must of necessity be very different from that of copper mines?—Yes. The advantage of copper mines is, that you communicate by the winzes to the surface; and in coal mines you have a receptacle for all the gases called goafs, which is not relieved but for a certain distance, and beyond which they cannot have it; but here 140 fathoms is the greatest distance from a shaft. The shafts are often 100 fathoms apart only; some 50.

5579. Can you speak of any other mines that you have been in?—A colliery in the state of Pennsylvania, and there we worked to a great depth, and went the length of a quarter of a mile without a shaft.

5580. How did you manage the ventilation there?—In the same way as here. Having got to the surface, we put up an air course.

5581. (*Mr. Austin Bruce.*) Had you a furnace there?—Yes; and when we went up we communicated in this way (*describing the same*), and then the air course came back to the level.

5582. Over the furnace?—Outside, until we got in sufficiently to drive up the mountain. It was a level.

5583. Have you been inspecting any copper mines in Cornwall during the last few years?—No; I have never been underground. I have been down through Cornwall making inquiries.

5584. Have you had any experience at all with regard to the ventilation of copper mines any where besides?—No, I have not; only here.

5585. Have you had any experience in America?—No; I have in the native copper mines on Lake Superior.

5586. The means of ventilation there used would not be applicable here, would they?—I do not know. The air is much lighter in the summer time. The air will rush in with great rapidity in the levels; 400 feet in a minute in the winter time; and in the summer time it will rush down, and come the contrary way.

5587. The upcast and the downcast are different?—Yes; in summer and winter.

5588. As I understand you, in some part of the year in one shaft it is an upcast, and in another part of the year it is a downcast?—Yes; the mean temperature inside is about 60° in the winter time, when the thermometer ranges from 40° above zero down to 35° below; then it rushes into the level, and goes up 200 feet high, and where the workings are perhaps 2,000 feet long. In summer time, when the temperature ranges from 75 to 95, then the atmosphere is so heavy below that the heat rushes down, and destroys the ventilation, as it cannot escape through the shaft.

5589. When at Fowey Consols did you observe any difference between the winter and the summer?—In summer time it was hotter, and there was a little closer ventilation, and it neceesarily will be so.

5590. Acknowledging, as you do, that the miners are not so strong as agricultural labourers, do you think that they suffer more from climbing or from bad ventilation?—From both combined; but I think principally from climbing.

5591. Take bad air as one element; then, as against bad air, put climbing, want of proper accommodation for men to change their clothes in drys, and their sleeping in crowded rooms; which do you think does the most damage to the miner?—I think that very often the want of accommodation on coming to the surface militates against the health of the miner very seriously.

5592. Do you think that the climbing, and the bad accommodation for changing their clothes when the men come up warm, and the bad ventilation which very frequently arises from over-crowded rooms, are not more injurious to the miner than the one element of bad ventilation in the mines? Yes, I think they certainly do amount to more than the bad ventilation in the mines. The Commissioners may perceive, upon this plan, which represents the mining generally throughout Cornwall, that the ventilation is perfect almost to the ends.

5593. (*Chairman.*) Have you studied medicine?—No.

5594. Have you ever examined the men on coming up from the mines?—No.

5595. Then upon what is your opinion founded?—It is from my own feelings.

5596. You have stated that in this mine there are five or six bad ends. How many men are working in each corps?—Six; sometimes four, and sometimes there are eight.

5597. Then there would be about 36 men working at one time in bad ends?—Yes; but that is very often temporary. I wish to draw your Lordships attention to one point. That part of the mine would be perfect (*pointing to a plan*) if there were a communication with the air; owing to the levels being driven here (*pointing to the plan*) the communication is perfect all the way up here (*pointing to the plan*); but then here, before this communication (*pointing to the same*) was made, possibly there would be bad air for two or three months before the communication was made, and then it would be so perfect that the air would rush through.

5598. Has the longest time you have ever known the men driving in an end before the winze was opened been three months?—Yes; in inferior air.

5599. Have they never driven more than three months in inferior air?—Not on veins. I am speaking generally. There might have been one case in a year. I was there for 17 years.

5600. During that time was there only one case within your knowledge?—They have never been more than three months working in bad air.

5601. During the whole of those 17 years?—Yes; at a time.

5602. (*Mr. Kendall.*) How happened it that they were for so long a time as three months?—Sometimes the stuff could not be brought away from long distances; a great distance from the whinze would be another cause.

5603. In driving an end, or in driving before a winze has been opened, the men have never driven for more than three months?—They may not drive

for three months in bad air; not for more than a month.

5604. But never for more than three months?—Not to my knowledge.

5605. *Mr. Austin Bruce.*) How soon do you think that the air becomes bad after the miners get into a close end?—It may be a month or two.

5606. After driving for a month or two?—Yes.

5607. How do you judge of the presence of bad air?—We can tell by the state of the candles.

5608. Have you anything else to judge by?—Our feelings.

5609. Does the unpleasant feeling begin some time before the candle shows any sign?—I think not.

5610. Do you think, therefore, that the men may work healthfully in a close end up to the time that the candle begins to fail in its light?—A man may so work for a short time.

5611. But would you say that he might work up to that time, or do you think that a man could work, even for one week continuously, as a miner works, in close air, without being, in the long run, the worse for it?—He would not feel a great deal of it in a week; he would in a month.

5612. At the end of a month he would feel probably rather weak, as compared with what he was at the beginning of the month?—Certainly.

5613. But without feeling either weak or ill, do you suppose that a man can frequently work in bad air without its affecting his constitution?—Certainly not; he must feel it.

5614. Is not that the probable cause of the shorter life which is generally attributed to the miner?—No. I think the climbing and the bad accommodations are another great cause.

5615. Do not you suppose that the effect of climbing is much more marked and severe upon the man who has been working in tainted air?—He would feel it rather more.

5616. Suppose that the powder smoke were to remain, after the shot has been fired, for half an hour in a close end, should you consider that a proper condition of the atmosphere for the men to work in?—No.

5617. Does it not frequently happen that the men do work in close ends in which the powder smoke remains for half an hour?—Not frequently.

5618. But does it not occasionally happen?—Yes, unavoidably.

5619. You mean unavoidably, I suppose, unless artificial means of ventilation are introduced?—You cannot drive a level beyond a winze but what you begin to feel the want of ventilation a little.

5620. In that case, the want of natural ventilation, I suppose, can always be supplied by artificial ventilation?—It is supplied in many cases, wherever it is wanted.

5621. Then will you explain your meaning in using the expression "unavoidably?"—You cannot always at first apply artificial means.

5622. You have spoken of what you suffered in climbing?—Yes.

5623. Are not those sufferings very often much aggravated by the fact that you are climbing in the upcast instead of the downcast?—No, I think not. I do not think there is much difference.

5624. The upcast air must be heavy and tainted?—Yes.

5625. Do you mean to say that to breathe the upcast air in 100 fathoms would be no worse than to breathe at 100 fathoms down the downcast, when you would meet the fresh air coming from the surface?—Certainly, it would be worse.

5626. On some occasions the climbing in the upcast must be very severe, apart from the mere labour of climbing?—Yes; but you must not suppose that all the shafts they climb up are upcast shafts.

5627. But the shaft is sometimes upcast, and sometimes downcast?—Yes.

5628. If you so managed your ventilation, as in coal mines, as to make the upcast always an upcast, and the downcast always a downcast, you might have more of the climbing take place in the downcast shaft on all occasions, might you not?—That depends upon the state of the atmosphere.

5629. No. if you managed your ventilation as it is in coal mines, so that the upcast should always be the upcast, and the downcast always the downcast, you could then confine the place where the ladders were put to the downcast?—Sometimes it would be so, and sometimes not. Sometimes we have seen the downcast go one way and sometimes the other.

5630. I am aware of that; but if you so contrived the ventilation as to send the return air uniformly up one shaft, so as to make that the upcast, and the ladders were put in the downcast, that would be a great advantage to the miners, would it not?—That is true.

5631. Is there any insurmountable difficulty in so directing the air that the downcast shall always be the downcast, and the upcast always the upcast?—I think that it cannot be directed with any thing like certainty.

5632. By means of natural ventilation?—No; it is not like coal mines; you are always changing your cast here.

5633. You do not think it worth while to imitate the coal mines?—I do not think it would be; I do not think it could be carried out.

5634. (*Mr. Kendall.*) I suppose it could not be carried out because there are so many shafts?—Yes; you are always altering.

5635. Would not the quantity of tainted air in the upcast shaft be very small as compared with the quantity of pure air in some of the shafts?—Very small indeed; you are always coming in contact with the levels coming out of the shaft.

5636. Therefore, I presume that the miners would not be so much affected by the tainted air in the upcast shaft?—No.

5637. (*Chirman.*). If there are only two shafts, or only one shaft, in a mine, would not the quantity of poor air and powder smoke be greater than where there are many shafts?—Certainly, vastly greater.

5638. So that if there were two shafts, and the impure air was coming up one, you would sensibly feel it?—Yes, that would be the case.

5639. Must not the length of time during which the men would be driving through poor air depend upon the material they had to drive through?—Yes; whether it is hard or soft ground.

5640. Where the ground is hard, would they drive for a much shorter distance?—You must always drive to your object.

5641. Therefore the length of time in which they might be driving an end must depend upon whether the ground was hard or soft?—Yes.

5642. (*Mr. Kendall.*) Can you explain to the Commissioners why, in working through different strata in different localities, the air is, sometimes, in an end, ten fathoms off from a winze, twice as bad as in other localities 30 fathoms distant?—They always vary.

5643. So that you never exactly know how far it is necessary to make your artificial means of ventilation extend, judging by the candle, according to your present practice?—No.

5644. (*Mr. Holland.*) Have you seen many coal mines?—Not many; I have seen very large ones in Pennsylvania.

5645. Have you seen any in Durham?—I have never been there.

5646. Or in Yorkshire?—No.

5647. Do you know that coal mines are better ventilated than copper mines?—I do not think that they are so well ventilated as copper mines.

5648. Not, generally speaking?—Generally speaking, I think that the copper mines are the better ventilated.

5649. Is it not the fact that there are great currents of air in coal mines, at something like ten miles an hour?—Yes.

5650. Is that so in copper mines?—Yes. There is a cross-cut in this mine, particularly if you blast a

St. Austell. Mr. W. Petherick. 23 April 1862.

hole at one part of it; you could not follow the smoke to the other, it would go faster than you could.

5651. But is that a common thing in your mines?—Yes, very often; it rushes at the rate of 400 or 500 feet a second.

5652. Throughout the levels, generally?—Yes. The foul air that I have alluded to is only in short distances before they communicate with winzes. There are 800 miners altogether, and 400 of them are tributors, and, generally speaking, they are working in perfect ventilation; you will see that. Any of the remaining 400, I suppose there are three-quarters of them in very good ventilation; they are sinking winzes and driving levels.

5543. (*Mr. Austin Bruce.*) Then seven-eighths of them would be in good ventilation?—Yes.

5654. (*Mr. Holland.*) Granting that there is a good draught in the mine, unless that draught goes right through the mine, down one shaft and up another, may it not be a changing about of the same air; not fresh air?—The bottom part of the mine will be necessarily warm; it will be very fair, but changing; as you come upwards, it will get cool.

5655. (*Mr. Kendall.*) Did you not drive a long adit at Kedmore?—Yes, 220 fathoms; and by means of a waterfall the air in the end was as good as the air in the shaft.

5656. Do you not think that the men might be sent up and down from the mines in skips?—I think so.

5657. Have you seen them in use?—I have; I have used them myself, at small depths; still I know it is practicable.

5658. But your experience is not very great in that matter?—No.

The witness withdrew.

Adjourned to Callington, To-morrow.

Thursday, 24th April, 1862.

PRESENT:

The Right Hon. Lord Kinnaird, K.T.	John St. Aubyn, Esq., M.P.
The Hon. A. Fulke Egerton, M.P.	Richard Davey, Esq., M.P.
Nicholas Kendall, Esq., M.P.	P. H. Holland, Esq.
H. Austin Bruce, Esq., M.P.	

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

The Commissioners took the following evidence at Redmoor Mine.

Captain Thomas Taylor examined.

Capt. T. Taylor. 24 April 1862.

5659. (*Chairman.*) What kind of ore do you produce here?—Tin generally; tin and copper mixed.

5660. About how many men have you employed underground?—About 40.

5661. You have only charge of this one mine?—Only one. We have another small mine below, but it is not of much importance as yet.

5662. What is the depth of the mine?—One hundred and twenty fathoms. We are only working at the 80 fathoms; the shaft is 125 fathoms.

5663. In what manner do the men ascend?—By ladder.

5664. How many ends are you driving now?—We are driving only two now.

5665. I suppose you have no hot end?—No.

5666. Are there any ends where the air is poor at all?—No; we have very good air here.

5667. How soon does the powder smoke clear away?—It depends partly on the state of the atmosphere. Just as the wind is now, it is scarcely any detriment at all to the men; the hole is no sooner blasted than the smoke goes off, almost at once.

5668. How many shafts have you?—Four.

5669. Is there one up-cast and one down-cast particularly?—Yes.

5670. Do they change at all?—Sometimes they change; it depends upon the way of the wind. If the wind is from the east, it blows down through this shaft (*pointing to a plan*), and if it is the other way, it goes the other way and comes up through the other shaft. But that current is only as far as the 40 fathoms; below that it is always in one way.

5671. Which shaft is the upcast from below that?—The engine shaft; the lower one. Then it comes up, and there is a cross-cut; then it changes as the wind changes.

5672. But below the 40 fathoms it is always the same?—Yes.

5673. When you are working below the 40 fathoms, does the powder smoke not hang at all?—Very little; it is scarcely anything; it is what you may term very good air. Of course it is not as clear as it is at the surface.

5674. In summer, when there is no wind, does the powder smoke hang for a quarter of an hour, so that the men are obliged to leave it?—No; we could go to work within a quarter of an hour at either end that we have got. We have three ends; one is a cross-cut. We have two ends driving on the lode.

5675. Have you any boys employed below?—Yes.

5675*a*. What are they employed in?—There are two employed in wheeling the stuff; they are from 16 to 20 years of age.

5676. Are there any younger than that?—No; not underground. I believe that one or two of the tributors have their boys with them; they are perhaps from 14 to 16 years old; the fathers take them down with them.

5677. Have you had any accidents from blasting within the last four or five years?—No; we never have had one; we have been very fortunate. We have had one arm broken, and that is the greatest thing that we have had in these 12 years.

5678. Have you any rules as to blasting which you make the men observe?—The rules are, that supposing they should what is termed miss the hole, and it should not explode, they are not allowed to go to it for their corps; and if they should bore a hole and it should not throw out its burden, but crack out, I compel them to put clay in it and fill up the crack, so that no powder shall lodge in it.

5679. When it does not go off, do they bore another hole afterwards?—No; they let it remain, perhaps, for six or seven hours, and they take what is termed a picker and pick it out. They keep the hole full of water.

5680. Is the picker iron?—Yes. When they get down to what is termed the first laying, the laying on the powder, it is then very easy to come up.

5681. Do your men reside at a distance from here?—In Callington chiefly; it is not more than half a mile. I think there are one, or I think two, who may perhaps be a mile and a half.

5682. Have you any men that you know of working who are at all affected in their breathing?—No; I do not know that we have any. There is one who is now home. I do not know what is the matter with him; he is affected in the heart or something; but I do not know that it is occasioned by working under ground.

5683. Was he working with you for a long time?—No; not more than about six months.

5684. Did he come to you with that affection?—He never complained of being injured in the mine at all.

5685. But he has left work now?—Yes.

5686. Where does he reside?—At Callington. I do not think that he considers that he has been injured under ground. I never heard him say so.

5687. Have you a dry?—We have a changing-place close to the blacksmith's shop. Ours is not a wet mine, it is very dry; there are hardly any wet clothes at all. Then we have a fire-place in this changing-house; they do not throw their clothes on a sort of tube, it is not required here; they change their clothes near the blacksmith's shop.

5688. (*Mr. Kendall.*) You say you are driving two ends?—We are driving three ends, but two are on the course of the lode.

5689. You are driving two ends and a cross-cut?—Yes.

5690. What is the deepest level at which you are working?—The 80 fathoms.

5691. How far is the 80 fathoms end from any winze?—About 4½ fathoms, I suppose.

5692. Not more than that?—No; I do not think it is at all more than that.

5693. How far shall you most likely drive before you communicate with another winze?—We can hardly say that; much depends upon the working of the end. We have a cross course now close to the end, and very likely we shall run on from there up to the 70 fathoms.

5694. Generally speaking, in driving that level, how frequently have you had winzes?—We have had six winzes.

5695. In what length?—I suppose that that is very nearly 70 fathoms off from the shaft. As the end goes on, the end is put down here (*describing the same*), and pieces are put in here, and the air passes right along, and that serves as another winze, and we get equally good air.

5696. How far do you generally drive before you find it necessary to sink a winze there?—It depends more upon the nature of the air that is out. If you are coming away from a shaft, you can drive a great deal farther than otherwise. It all depends upon the current of air.

5697. Do you ever go beyond 30 fathoms?—Yes; many ends have been driven beyond 30 fathoms. Some of the ends are driven 40 and 50, and one as far as 60 fathoms, and there is capital air in that end now; and it is 60 fathoms from any communication.

5698. Is there any brattice at all?—No; nothing at all but a simple drivage. There is no stall whatever.

5699. Are there any sollers?—No; there are two levels.

5700. Are the backs worked away at all?—No.

5701. It is a simple drift, how high?—About seven feet.

5702. And how wide?—About four feet. The width of an end you can hardly tell.

5703. You have gone more than 50 fathoms from a winze, and the air is very good?—Yes.

5704. How long after blasting can the men go in?—Within a quarter of an hour, without feeling any effect.

5705. (*Mr. Davey.*) Is that from a winze, or from a shaft?—From a lead lode. There is a regular storm of wind going through the lead lode. The draught comes this way (*describing the same*). I do not know an instance where you could drive again with as good air. I never saw it like it.

5706. Is it in granite here?—No; in clay slate or killas. There are two shafts on the lead lode, and the ground is nearly all worked away on this lead lode.

5707. (*Mr. Kendall.*) The air is taken from a drive between two shafts?—Yes.

5708. (*Mr. Austin Bruce.*) How far is that drivage from the end which you are working; how far is that end from the fresh air?—About sixty fathoms.

5709. Is it hot there?—No; I have heard the men in the mine say, that they do not know such an instance anywhere.

5710. (*Chairman.*) Are they working at that end now?—No; that work is all abandoned now. There is plenty of air.

5711. (*Mr. Kendall.*) Is it a rare instance?—Yes.

5712. (*Mr. Holland.*) Is that all in granite?—In killas granite.

5713. Is it much the same through the whole length of it?—Yes.

5714. What did it cost a fathom when you began?—I think we gave 4*l.* a fathom.

5715. What does it cost you now?—About 4*l.* a fathom.

5716. Does it cost you the same as when you began?—Yes, with the addition of the wheeling; the ground is much the same; we give more for bringing out the stuff.

5717. There is no deficiency is there?—No; there is no deficiency as to the state of the air.

5718. (*Mr. Kendall.*) As I understand, the only cost now at the end of the sixty fathoms is the labour of taking back the stuff from that end?—Yes; I believe we can drive the end as cheaply now as we could when we commenced.

5719. As far as air and other matters go it makes no difference?—No difference at all.

5720. (*Chairman.*) You are not working there now?—No; I would not say for a moment that you could drive another level much more than half as far. I do not know another such instance. We cannot drive such an end in the lower part of the mine, nothing like it.

5721. How far can you drive at the lower part of the mine?—We had it between thirty and forty fathoms. I found the air getting bad, and I put in an air machine; I fixed an air machine to the engine-shaft and had a waterfall; then I had another, and had three boys to blow the machine; and as soon as the men had blasted, the air was driven out.

5722. (*Mr. Holland.*) Were the men able to work at less per fathom, after blowing in the air?—We should not give them quite so much.

5723. Did you set it?—Yes.

5724. What difference was there?—I cannot say exactly. It will make a considerable difference whether men can work seven or eight hours, or are obliged to stop two or three.

5725. (*Mr. Austin Bruce.*) Would the difference cover the difference of the cost of the ventilation which you supplied?—More.

5726. (*Mr. Davey.*) I think you prepared these machines cefore there was an actual necessity for them; you saw it coming?—I saw that the air was getting bad. It was not that the air was so very bad, but it was the smoke, and in order to drive out that smoke for the men to make the most of their time, I put in an air machine.

5727. (*Mr. Austin Bruce.*) Do you think it always wise to put in an air machine, when it is wanted?—Yes; when it is wanted.

5728. I mean not only as regards the health of the miners, which of course you feel it your duty to look after, but as regards the pockets of the adventurers?—I am speaking of the advantage to the adventurers; of course it is better for the miners to have the smoke blown out.

5729. Have you ever worked as a miner?—Yes.

5730. Where?—In the western part of the county, in St. Just, and in this neighbourhood. I was 100 fathoms deep, at 11½ years of age, and I have been at it ever since.

5731. How is the ventilation at St. Just?—Balleswidden was the principal mine which I worked in, and there was no deficiency of air there.

5732. Have you ever worked in a bad end?—Yes, I have worked in close ends in three or four places. I worked in a closeish end at Tavistock, the nearest

mine to Tavistock, a little further on than Crelake; it was Crowndale. The air was bad there. I suppose we were off 30 or 40 fathoms.

5733. Did you complain to the captain of being short of air?—No; it was what we termed a closeish end, but not as some people describe it to be, a very bad air end.

5734. How long did you work in it?—About four months.

5735. How were you at the end of the four months?—Just the same.

5736. Did you suffer?—No; I do not know that it had any effect upon my health.

5737. Has your health ever been bad?—No, not from working under ground.

5738. How long were you working under ground?—From 11½ years of age till I was twenty-one.

5739. I suppose a large portion was scarcely hard work?—Yes, it was hard work.

5740. What work had you to do when you first went underground?—When I first went underground, I went to work with tributers at a share. I think I had a third part of a man then.

5741. What work did they make you do?—I was chiefly had to attend them with things and to break up their tamping and fill the quills. They used then to blast the holes, not with safety fuses, but with quills, and I had to get the powder and fill the quills, and all that sort of work.

5742. What was the next work which you did?—Then I went to wheel the stuff back from the tributers.

5743. How old were you when you began that work?—I suppose between twelve and thirteen.

5744. How long did you stop at it?—Until I was about fourteen.

5745. Then what did you do?—I then went to work in the end with men.

5746. What work did you do there?—Driving on the level on tut-work. I went on tut-work three or four years, I think, and after that I went to tribute.

5747. What work did you do? Did you only hold the borer, or did you strike?—I did both; not both at one time, but I changed over.

5748. Is the state of your men's health here good?—Yes, I think very well.

5749. Do you see any difference in different mines, in the state of health?—Yes; you will find that some men, when they get up to about forty, and from that to fifty, appear to feel the effects of working under ground. Whether it is the effect of working under ground, or whether it is brought on by any other complaint, I do not know.

5750. Have you any men here above forty?—Yes, several.

5751. What is the age of the eldest man working under ground?—I cannot say; the oldest must be more than fifty, I should say.

5752. Is he pretty strong and hearty?—Yes; it is a man of the name of Trevedish; he has his three sons working with him, he must be passing fifty, I should think.

5753. Have you now many cases of consumption?—I do not know that it has come under my particular notice, that it was brought on from working under ground in poor air, or any thing of that sort.

5754. Have you not known that formerly, when you were in the west?—I have known men in consumption, but what it has been brought on by I do not profess to understand.

5755. Do you consider, on the whole, mining to be a healthy employment?—I do not consider it as healthy as working on the surface, by a great deal.

5756. What, do you suppose, is the cause of its being less healthy?—Owing to the impurity of the air, I should think.

5757. Would you attribute a part of it to climbing?—Perhaps so.

5758. Climbing up from deep levels?—Yes, I should think so.

5759. Did you yourself feel the effects of climbing from deep levels, after a hard day's work?—It would naturally make one a little tired, when one gets up; but if they go slow, I do not know that it is much worse than their working.

5760. When you were young, did you go slow?—No; I believe that I was wild enough; they used to tell me so.

5761. But you were never any the worse yourself?—No, I do not know that I was.

5762. Was your father a miner?—Yes.

5763. What age did he live to?—He is living now; he is nearly 70.

5764. Did he work long as a miner?—Yes.

5765. Did he become a captain like you?—Yes; I will not say exactly his age, but I think he is very nearly 70. Perhaps you have seen him; he is at Craddock Moor.

5766. (*Mr. Kendall.*) When you worked in those places, in bad air to which you have referred, would it, according to your opinion now, have been more economical if the agent had employed some artificial means to supply pure air?—Yes, I think so. If they had continued that end, they would have been forced to do so, I think; but it was stopped.

5767. Were not some artificial means due to the men before you stopped?—I do not know. It was not what you would term a very bad air, but yet it was getting quite bad enough to have an air machine put in.

5768. And it would have been necessary, if you had proceeded with it?—Yes; and for aught I know the agent meant to have an air-machine put in.

5769. Generally speaking, do agents as a matter of economy use artificial means when they find that the air is bad?—I should think so. They ought to do so for the good of the adventurers as well as for the health of the men.

5770. You have seen a good deal of mines in one place and another, did you ever know an agent refuse to use artificial means after an application was made to him, and he was satisfied that there was bad air?—I do not know that I can state a case.

5771. In your experience, do you know any cases of gross neglect, where the agents, for the sake of the men and for the sake of the adventurers, ought to have forced in air by artificial means, but did not do so?—No; I do not.

5772. (*Mr. Holland.*) Do you not know many cases where the men think that there should be fresh air and the agents do not?—That may be the case.

5773. Very frequently?—Not very frequently.

5774. (*Mr. Austin Bruce.*) Your father was a captain early in life, I dare say?—Yes, when he was about 23 or 24.

5775. Long before you were born, then?—No, not very long before I was born.

5776. What is your age?—Passing 30.

5777. And your father is 70?—He is between 60 and 70. It was not very long before I was born, perhaps he was about 24 or 25.

5778. He was a captain, and had been long a captain before you began to work?—Yes.

5779. What sort of education did you get?—I was at school until I was eleven years and a half old.

5780. Did you go to school afterwards?—No.

5781. Did you do any sort of head-work afterwards besides that immediately connected with your mine?—I do not exactly understand what you mean.

5782. Did you carry on your education at all?—Yes.

5783. (*Mr. Holland.*) Did you go to an evening school?—I think I was at an evening school a little while; however, not long.

5784. (*Mr. Austin Bruce.*) Have you any children?—No.

5785. Is it usual for the captains of mines to put their sons to school now, generally speaking?—Yes, generally.

5786. Until what age?—That rather depends upon their pocket.

5787. From your observation, at what age do they

generally put them to work?—It all depends upon the position of the mine agent; some will keep their children at school until they are perhaps 16 or 17, and some even older, and others are necessitated to put them to work as soon as they are able to work.

5788. If a mine agent keeps his son at school till he is 16 or 17, does he then put him to work?—Yes.

5789. As a tut-worker or a tributer?—He would put him down first of all to do what is termed a boy's work; perhaps to clear out some levels or something of that sort, and then he would go into work with other men at tributer or tut-work.

5790. Until he shows himself fit, if he ever does show himself fit, to be an agent?—I do not know as to that; getting to be an agent or not all depends upon circumstances.

5791. Does it mostly happen that the sons of captains become captains?—I do not know.

5792. Have you any men working as miners in your mine, who are the sons of captains?—No, not now. I had one about a month or two ago. I do not think that we have any one here now.

5793. (*Mr. Holland.*) You stated that the air was bad, but not very bad, in which you had worked?—Yes.

5794. Do you mean that a candle would burn in it?—Yes.

5795. You call it bad, then, before the candle gets dim?—I call it very bad before it will put out a candle.

5796. But before it gets dim; before you have to slope it, in order to make it burn?—Yes, it is bad then.

5797. Very bad?—Yes.

5798. You also said that when the wind blew from the west, you had one current in the mine, and that when the wind blew from the east the current was the opposite way?—Yes; but that is only above the 40 fathoms; that has nothing to do with the state of things down in the actual working of the mine.

5799. Which is the best for the mine?—I do not know; there is very little difference.

5800. Would it not be the best if it always went the same way?—No, I think not; I do not know that it would make any difference whatever. It is not as if it was a current which would pass down to the working part of the mine. I was asked about the up-cast and the down-cast in the shaft; the up-cast and down-cast below are always the same.

5801. (*Mr. Austin Bruce.*) Is there an advantage in their being always the same?—Yes; I should think there was.

5802. (*Mr. Holland.*) Would it not be easy always to make the wind go in the same direction in the mine, though it may be different on the surface. For instance, by a wind sail to turn towards the wind, and always bring the current down the same shaft. Have you seen that done?—I have seen it put up many times, but I have never seen it done in order to keep the current always in one direction.

5803. Is it not commonly done in Cornwall?—I never saw it.

5804. Nor anywhere else out of Cornwall?—No; I never saw it either in Cornwall or out of Cornwall.

5805. Have you not heard that it is a very common thing to be done in the northern mines?—No. What do you mean by the northern mines, the coal-mines?

5806. Yes, some of the smaller coal mines?—I do not know anything at all about them; in fact I do not know that I ever heard of its being done. I have known many instances where sails have been put up to convey the air down the shaft, but not to keep the air a particular way in that shaft.

5807. Have you not seen a malt-house ventilated in that way?—No.

5808. Supposing that such a plan were found to to answer well in Northumberland, do you not think that it would answer well in Cornwall?—Yes, I should think so. I do not see why it should not.

5809. (*Mr. Kendall.*) Which do you think would make the best practical mine agents, those who go underground very early, say at 10 or 11, or those who are kept longer at school and go underground at, say 16 or 18?—I do not know. I should almost take just between the two ages.

5810. You would not have them put underground too early or too late?—No.

5811. You think that if they went too late they would not undergo the necessary work?—I would not give much for them if they are only put down when they get up to 17 or 18. I would rather have them underground at 14 or 15.

5812. You would take the mean? You would keep them rather longer at school?—Yes.

5813. And let them go underground at about 13 or 14?—About 14; and then up to 14 I think that a youth ought to learn just as much as would be required of him in his station in life. Then, of course, he ought to improve a little on that afterwards.

5814. (*Mr. Davey.*) You think that a captain's son, at 17 or 18, would not condescend to the drudgery which is necessary to make him a working miner?—I do not know; perhaps he would. For my part, I should say 14, or at least not at all above 15. Let him take the work by the handle; that would be the best way for him to thoroughly understand mining.

5815. (*Mr. Holland.*) A man would only work about eight hours a day, would he?—About eight hours a day.

5816. Would he not have a good deal of leisure in the rest of the day for study, if he chose?—Yes.

5817. He might read or cypher two or three hours a day easily?—Yes.

5818. Do they generally do so?—No; I am sorry to say that that is generally neglected.

5319. What do they do with all their leisure time?—In some places they have little gardens which they cultivate.

5820. Not all that time?—No; it will not require all the time. At other times I suppose they sit down, and it is too frequently the case that they idle about their time. However, the agents have no power over the men; as soon as they leave the mine they are free.

5821. (*Chairman.*) What do they learn under 18 that a man could not learn after he was 18, with regard to the business of a mine?—Generally speaking, when they are put underground at 18, they are men, and they want to go in and take men's places at once; but if they are put underground at about 14, they will take the work at the beginning and go right through with it. I do not mean to say that for a moment, that a man will be disqualified because he does not go undergrounnd before he is 18; I do not mean to say that such a man might not learn and become a good practical man; but I think the chances are more in favour of a boy who goes underground at 14 or 15.

5822. But a well educated man at 18, with an observing mind, might become a very good captain?—Yes; and I have no doubt there are many such.

5823. Without having gone through what you call the drudgery of boys' work?—Yes; but I think it is necessary for a man to know a little in order to set the work to others.

5824. But still he could learn that, I suppose?—Yes.

5825. With respect to the machines, have you a boy for each eight hours?—Yes; when we have the air machines.

5826. Does that machine require to be driven quickly?—No, not very fast.

5827. Does it require him to be kept constantly at work?—No.

5828. How often?—Perhaps in spells of about a quarter of an hour at a time, and then he might strike for a quarter of an hour. When they blast he would be wanted to work it round pretty fast, perhaps for half an hour.

5829. They call to him at that time?—Yes; they come to that place. They always place the machine where there is good air.

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Capt. T. Taylor.

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5830. The machine is to blow the powder smoke out?—To blow in the good air and to force out the smoke and the foul air created by the men being there and by the blasting.

5831. But the chief object is to get rid of the smoke?—In getting rid of the smoke you get rid of the foul air.

5832. Do you suppose that all mines have these machines in them?—No; in some places they are not required. In fact, we have no machine to work now; we do not require it.

5833. But should there always be one in the mine ready?—They are very simple to be constructed.

5834. Do you always have one ready in the mine when it is wanted?—No; not at all times. The one which we took out very likely would not go in again, because it is worn out, and then we should have another.

5835. Who makes them?—They are made on the mine.

5836. How long are you in making them?—The carpenters would make a machine in three or four days; that is to say, the carpenters and blacksmiths. They are chiefly fan machines; but in many places they are better than that, where they work their machines with the engine and draw a regular storm of air.

5837. That you consider much better?—Yes; there is greater power.

5838. Why is that plan not generally adopted?—It is not at all times that you can get it so that it will suit, and it is bad perhaps to connect it with the engine shaft.

5839. It is more expensive?—Yes.

5840. Is the air taken down in pipes?—No.

5841. It merely goes down the main shaft?—Yes; it is forced in from there.

5842. But is it ever forced in through pipes?—Yes; it is not taken down from the surface, but from the engine shaft in through the pipes. Generally speaking, in the engine shaft they get the air very good.

5843. (*Mr. Holland.*) That is the down-cast shaft of course?—Yes.

The witness withdrew.

The Commissioners took the following evidence at Kelly Bray mines:—

A Miner (No. 1) examined.

A Miner (No. 1).

5844. (*Chairman.*) How long have you been working as a miner?—I went to work underground when I was 10.

5845. How old are you now?—In my 59th year.

5846. At what work have you worked principally, tribute or tut-work?—Tut-work chiefly.

5847. In what part of Cornwall?—About from St. Austell; I worked for a great many years about.

5848. In what mines there did you work?—The East Crinnis, and Old Crinnis, and another mine; that was the first of my commencement.

5849. Did you ever suffer from working at tut-work?—No; nothing of any consequence.

5850. Are you working at tut-work now?—Yes.

5851. Did you ever work in any poor ends?—Yes, I have worked in poor air.

5852. Did you feel it?—I felt it then for a time; but it passed away again.

5853. How did you feel it?—I felt it in my stomach and in my head.

5854. What did you do when you felt it?—I was laid up one time for about three weeks. I believe that was the longest time that ever I was laid up since I have been underground.

5855. Did you go back to the same work?—Yes; I went to the same place again.

5856. Where was that?—That was at Landiscot.

5857. (*Mr. Kendall.*) Now called Fowey Consols?—Yes.

5858. (*Chairman.*) Was the air the same when you went back?—No; the place was holed; ventilated.

5859. You were driving an end then?—Yes.

5860. Do you know how far that end was when you were taken ill, from the nearest winze?—We were in, I suppose, somewhere about 70 fathoms from the shaft.

5861. Between the shaft and that there were winzes, were there not?—No; there was no winze at all there.

5862. So that you drove 70 fathoms without any air but from the shaft?—Yes.

5863. Was there any cross-cut?—No.

5864. Were you driving a cross-cut?—No; we were driving upon the course of the lode.

5865. Just clearing it away for the tribute-men?—Yes.

5866. About how long ago is that?—I suppose about 27 or 28 years ago; over that, it must be 30 years ago.

5867. Was anything done to give you air while you were working?—No; we holed. There was another pair that was driving from another part of the mine.

5868. But till the other pair met you you did not get air?—No.

5869. You went back again to the same work?—Yes.

5870. And at that time the others had finished the hole?—Yes.

5871. Where did you work after that; do you remember?—I worked there for a short time, and then I went back to East Crinnis.

5872. Did you work in any poor air there?—No.

5873. Did you work as a tut-work man there?—Yes.

5874. Do you remember any other mine where you worked in poor air?—No; I do not know that I do particularly.

5875. If there was poor air now in any mine at work should you give it up?—Yes; I should not think of working in poor air now. I am too far gone in years.

5876. But would a young man go on working although it was poor air?—Yes; it would depend upon the means for getting money, or anything of that sort. Sometimes a man will work a little more than he will at other times.

5877. Are they paid more where it is poor air?—Yes, sometimes.

5878. For the sake of earning a little more they would work in poor air?—Yes, many men would.

5879. Then they stand a chance of suffering from it?—Yes.

5880. Have you any sons?—Yes; I have two sons.

5881. Are they working?—I have one in America, and one is in the north part of England.

5882. Were they miners?—Yes.

5883. Had they suffered at all?—No; not from poor air.

5884. (*Mr. Kendall.*) You are now 59; do you take a man's place?—Yes.

5885. Do you consider yourself in full strength now, an able-bodied man?—Yes.

5886. As I understand you, you once drove 70 fathoms without any fan or any artificial means at all?—Yes.

5887. How long did you work there before you felt ill?—I was there, I think, about ten months in that level.

5888. During the ten months, taking an average with reference to smoke in the end, how long did the smoke lie there before you could go back again to work?—Sometimes longer than others.

5889. Take an average?—I can hardly say. We generally cast a shot of two holes together; then we stop a very little bit, and if it was not exactly clear

when we went in, we should take our waistcoat or something and brush about to clear the smoke to come to work.

5890. Taking an average, taking one time with the other, how long was it before you went in? — About half an hour.

5891. And then sometimes if you found that the smoke did not go fast enough you took your coat or waistcoat and blew it out?—Yes.

5892. When you were there did you complain to the captain at all about bad air?—Yes, very often; but in some places there are hardly conveniences to throw in air.

5893. Before you got ill did you talk to the captains about it?—Yes, at different times.

5894. What did they say?—They said that they knew that the place was bad, but that it could not be ventilated for some time, and so on.

5895. That you must push on?—Yes; and do the best we could.

5896. You have seen a great many men. In your experience do many of those whom you have seen, in your opinion, suffer from bad air?—Yes.

5897. In Landiscot do they suffer much from bad air?—Yes, I suppose so. I have not been there for a great many years.

5898. From what you see generally in mining are agents more careful in sending in air by machines than they used to be?—Yes; I cannot find any fault with the agents.

5899. Are they improved now from what they used to be?—Yes; I believe they are. I believe that almost every agent is willing for people to have as good a place as he can possibly make for them.

5900. Since you can recollect is there an improved mode of ventilation?—Yes, I think there is.

5901. Do you find a good deal of fatigue from climbing now?—No, not in our mine. Our mine is a shallow mine.

5902. What is the deepest mine you ever worked in?—Landiscot was the deepest.

5903. What depth was that?—I do not know the depth there now.

5904. When you were there what was the deepest level in which you worked?—I worked at the 90 fathoms there.

5905. 90 fathoms under the adit?—Yes.

5906. What is the adit?—About 40 fathoms, I suppose, to one shaft, to Coates's shaft.

5907. Used you to feel it very fatiguing to come up?—Yes.

5908. It was smart work?—Yes.

5909. Used the men at all to wait for the 2 o'clock bell to strike? How did you manage about getting up in time?—I could get away. We used to go by the jobs that we did, in general, shooting so many holes, and that like.

5910. And could you judge pretty nearly the time by the holes themselves?—Yes; by our work, and so on.

5911. How used you to manage if you got up a little too soon?—Sometimes we were not allowed to get up too soon.

5912. How did you manage then; supposing you left work a little too soon, and found that you were too early, where did you stop before you got up; supposing that you ought to be up at two o'clock, and you found just as you got very near the surface that it was only half past one, what should you do?—Go right up.

5913. (*Chairman.*) Have you never been fined for being too soon?—I cannot say that I never was fined, because I have been.

5914. (*Mr. Kendall.*) Was it the habit for the men to wait a little down in the large shaft in order to see that it was two o'clock?—There is a place for people to rest a bit before they get up.

5915. What should you think that the miners suffer most from, from bad air, or from catching cold through coming to the surface hot?—I do not know. There are a great many places where people work in a very hot place, and people might be liable to catch cold, and such a thing as that.

5916. (*Mr. Austin Bruce.*) When you were fined how long were you up before the time?—Some time; it would depend upon time; it might be half an hour, or just like that.

5917. Supposing you were up 10 minutes before your time, would you be fined then?—No.

5918. When you were in that long level which you were speaking of, was a fan put in after you left?—No; they holed. There was another level that was coming from another part of the mine, from another shaft.

5919. Could you see any difficulty in putting a fan, in that case?—I do not know, I am sure.

5920. Why should a fan have been more difficult there than anywhere else?—There are many places where things ought to have been made better than what has been in times that are past, without a doubt.

5921. Are you the oldest man in this mine?—No.

5922. There are others older than yourself working below ground?—Yes, there is another man down to our level, I believe. No, I do not think that he is hardly so old as I am.

5923. Is there any older than you?—No; not in this mine.

5924. Are there many of about the same age?—Yes; about the country there is, no doubt.

5925. But in this mine?—No; I do not know that there are.

5926. Are any of the men who were of the same age as yourself still working as miners?—Yes.

5927. Where are they working as miners?—I do not know; in different parts of the country, men that I have worked with.

5928. Is it a very common thing for a man to be still working under ground as a miner at the age of 59?—No; it is not; not upon the average.

5929. Have you been working lately as a tut-work man?—No; only this month. I have worked upon tribute in this mine for the last 14 months before this month.

5930. (*Chairman.*) Why did you give it up?—I do not know.

5931. (*Mr. Austin Bruce.*) What end is there in this mine furthest from a shaft or a winze?—It is not far. This mine is a good air mine.

5932. (*Chairman.*) How far is the nearest winze? About 12 or 14 fathoms, I suppose, or something of that sort.

The witness withdrew.

A Miner (No. 2)—examined.

5933. (*Chairman.*) Have you been long working in mines?—Yes, about 27 years; from my childhood up.

5934. In this county?—Yes; always here, within a few miles, except six years, when I was in Germany.

5935. How long have you been in this mine?—About two years since I came home from abroad.

5936. What mine did you work in before you went abroad?—Here, about eight years before I left.

5937. Have you worked in any other mines besides this?—Yes, at Holmbush mine. I have worked at different mines about this neighbourhood, all within five or six miles.

5938. Have you worked in any mines where you have had bad air at all?—No; excepting Holmbush. I did not work there long. I worked in one end that was rather bad air, only about five or six months.

5939. How did you know that it was poor air there?—Because it affected my breathing.

5940. Did it affect the candles?—Yes.

5941. If the candles had burnt well, should you still

St. Austell. *A Miner (No. 2).* 24 April 1862.

have thought it poor air?—We found out by the candles that it was poor air, certainly.

5942. That is the way you judge?—Yes; and we could find it to be poor air by breathing it.

5943. Do you feel any difference when it is hot air?—I never worked when the air was hot.

5944. Did you find your breathing affected before you saw the candle fail?—I do not know that I did.

5945. What was the effect upon yourself?—In climbing, when we do climb the ladders in the shaft, we feel our legs ache more than in good air.

5946. Is there any other feeling?—No other feeling more than that. I did not work in it long, only five or six months; that was at the hole at the winze that was coming down on me; this winze was coming down on me.

5947. Were there any means to throw in air to you?—Yes; as soon as this winze was holed.

5948. But not before then?—Not before.

5949. Did you complain about it?—I cannot say; it is so many years ago since I worked in poor air; it must be nearly 15 or 16 years ago.

5950. Would you work in poor air now if you knew it?—No.

5951. You would give it up?—Certainly.

5952. You think that it would injure your health?—Yes; poor air would injure anybody's health; but I do not think that it injures the health so much as is considered.

5953. What then do you consider injures the miner's health?—I am sure I cannot say what it is.

5954. Do men work in poor air still?—I have no doubt that they do in many places, but not in this mine; this is a very good mine.

5955. I suppose you would always prefer going to a mine where the air was good?—Yes.

5956. Are you working on tut-work here?—Yes.

5957. Are any of the men in the same pair with you older than you?—I think two are older than me.

5958. Have they been long here?—I cannot say; they have worked here ever since I have been here, in the last two years, and how long before I cannot say.

5959. (*Mr. Kendall.*) When you were at Holmbush, and there was bad air, how many men were working in a bad end at that time?—I am sure I cannot say whether there was any person except in the end which we were working in. I was never told whether there were more or not.

5960. Surely if there were other bad ends you would hear something from the men about their being bad ends?—I might, but I cannot say. It is 16 or 17 years since I worked there.

5961. And you say that the mine here is a well ventilated mine?—Yes; it is good everywhere. There is not a bad air place in the mine.

5962. (*Mr. Fulke Egerton.*) You said that you thought that the bad air did not do so much harm as was generally supposed?—I fancy so, but I cannot say. I never worked at it long myself.

5963. Do you think that the climbing of the ladders does harm?—I am sure I cannot say. Perhaps it would if they were climbed hard; but if men take their time in climbing I do not think that it injures the miners a great deal.

5964. (*Mr. St. Aubyn.*) What do you think does harm; if it is not the bad air or the ladders, what do you think it is?—I am sure I cannot say what it is.

5965. (*Mr. Fulke Egerton.*) Do you think that men are likely to catch cold on coming out of the mine before they change?—Men working in a very warm place are more liable to catch cold than people working in cold places. Mine is a very cold mine.

5966. You do not yourself come out of the mine very hot?—No.

5967. Not even after climbing the ladders?—Climbing the ladders here does not make a person hot at all. They are slanting, except just 40 fathoms, and the shaft here is very cold.

5968. (*Mr. Kendall.*) You have a nice dry here, have you not?—Yes, we have a very good dry.

5969. And the mine is a dry mine too?—A very dry mine.

5970. (*Mr. Austin Bruce.*) Is the shaft up which you climb up-cast by which the air returns?—The draught plays down one way and up the other. The shaft is divided into two. In fact we have two shafts in our mine.

5971. Is the ladder by which you come up in the up-cast shaft or in the down-cast?—It is in the one that the engine is in; the one in which the lode is working; not the one that we draw our stuff in.

5972. Does the return air come up with you or not?—It comes up where we come up.

5973. Does that add at all to the difficulty of climbing?—Not at all.

5974. Has not the air sometimes a good deal of smoke in it?—No, there is very little smoke in this shaft. The smoke does not come up the shaft where we come up, but up another shaft a little further on, and it goes as deep as the mine. It is the second shaft. The air goes down one way and up the other.

5975. (*Mr. Holland.*) Does not the smoke come up the up-cast shaft?—Very little comes up that shaft. Sometimes when the wind gets round it makes a little difference.

5976. Did you not state that after you had been working in bad air your knees trembled under you?—No, I never said so as to this mine.

5977. Did you not say that after working in poor air, you found your knees trembling under you when you came up the footway?—Yes; that is what I said.

5978. Do you think that they trembled more than usual after working in poor air?—There is greater difficulty in travelling after working in poor air; in climbing.

5979. Did it make you pant more?—Yes; it affected my chest more than usual.

5980. Did it make your heart beat more than usual?—Yes.

5981. Did it make your head throb more than usual?—Yes.

5982. Altogether you found the labour, after working in poor air, more than usual?—Yes.

5983. (*Mr. Holland.*) Do you know that miners are a sickly race?—Some of them are, and you will find in every race that there are sickly men; but I do not know whether there is so much of that in other labour as there is with the miners.

The witness withdrew.

Captain Silas James examined.

Capt. S. James.

5984. (*Chairman.*) How long have you worked as a miner?—I am now 57 years of age, and I went to work underground when I was about 11 years of age.

5985. How long did you work underground before you became a captain?—I became an agent when I was about 40 years of age,

5986. You have been 17 years an agent?—Yes.

5987. Were you an agent anywhere else before coming here?—Yes.

5988. In what mine?—A mine in the parish of Beer Ferris in Devon. The mine was called Green Valley.

5989. What description of mine was it?—A lead mine.

5990. What depth was the lowest level?—Fifty-seven fathoms deep, I think.

5991. What is the deepest mine that you have ever worked in?—I think this mine here.

5992. What is the depth of this mine?—The deepest point is 135 fathoms.

5993. What are you working at now ?—The deepest level that we are working at now is the 85 fathoms.

5994. How many shafts are there in this mine ?—Four.

5995. Which is the footway ?—There is one footway for the Western mine, and up the other engine shaft is the footway for the Eastern mine.

5996. There is no protection between the footway and the pumping shaft ?—No.

5997. Have you never had any accident there ?—No.

5998. Do you not think that there ought to be some protection between the pumping shaft and the footway ?—If there was, nothing would stop an accident ; if the beam was to break there must be a pretty protection to stop it. We put rails on the ladders to keep everyone safe.

5999. For the protection of the men should there not be some protection between the ladders and the shaft ?—We have rails at the bottom and top of every ladder.

6000. But none at the side ?—No.

6001. How many men have you working underground ?—We have somewhere about 50 underground now. We have not so many as we had a little back.

6002. Have you ever had occasion to use any artificial means of ventilation here ?—At a particular time we have when we have had a long level, and have been making a communication to a level above by winzes and like that ; but then we keep a fan machine, and that does not occupy more than a month or two.

6003. What is the longest level that you have ever driven here ?—One level at the Eastern mine now, I think, is about 70 fathoms east of the shaft, and that is done by a fall of water from the adit. We have communicated from that by a winze, and that is first-rate air.

6004. (*Mr. Kendall.*) As I understand, you are now 57 ?—I am in my 57th year.

6005. And you worked 29 years underground as a common miner ?—Yes.

6006. Did you work mostly upon tribute or upon tut-work ?—The greatest part of my work in the first commencement was in engine shafts. Then I worked a great deal upon tribute. I worked in the Great Huel Towan as a sumpt man ; that was the first place I ever worked in a shaft ; I was there for nine years.

6007. How deep did you go in the sumpt shaft ?—The deepest point in that mine was 132 fathoms.

6008. How is your health now ?—First-rate; capital. I would not mind climbing the ladders ; I go underground now three days a week.

6009. Can you go up and down the ladders as well as ever you could ?—Of course not so well as when I was 20 years of age ; but better than scores of men. I can climb now from the bottom of this mine to the top without stopping, if I like.

6010. (*Chairman.*) And you do not feel it ?—Of course I feel that I breathe shorter ; but nothing to be alarmed at.

6011. (*Mr. Kendall.*) You are not, of course, as strong now as you were when you were a young man ; but do you feel it very fatiguing to come up from the bottom of your mine now ?—No ; not at all.

6012. You feel able to do it ?—Yes.

6013. And well able to do it ?—Yes.

6014. When you go under ground, I suppose you visit almost every pitch ?—Yes, generally.

6015. And you generally go to the bottom of the mine ?—Yes ; particularly to that mine up there. At this mine we are not working at the bottow now ; but it is not long since I have inspected and have gone through both mines in one day, from the bottom level to the top.

6016. What is your bottom level now?—One hundred and thirty-five fathoms ; but we are not working there.

6017. How deep are your deepest workings now?—Eighty-five fathoms.

6018. And that is how far under the adit ?—We have no adit at all here.

6019. When you go down three times a week, you generally go to the very bottom of that mine, and visit all the pitches ?—I went six days last week ; every day of the week.

6020. You say that you go probably three times a week, but sometimes six times a week ?—I went six times last week.

6021. Though you are 57, do you feel able to do that work now without inconvenience ?—Yes, certainly ; and many times I go down in this mine, as I have no agent here but myself, and visit all the pitches in this mine ; and go up and down the 70 fathoms again all in one day.

6022. After having done this mine, which is 85 fathoms deep, you view the 70 fathoms mine ?—Yes ; and view every place, and come up afterwards.

6023. And set to the men ?—Yes.

6024. After that, I suppose you feel a little tired ?—Not particularly.

6025. (*Mr. Davey.*) How long would it take you to climb 70 fathoms in a quiet way ?—About 20 minutes.

6026. (*Mr. Kendall.*) Was your father a miner?—Yes.

6027. How old was he when he died ?—Passing 81.

6028. How long was he an agent of a mine ?—About 25 years.

6029. Up to what age was he an agent of a mine ?—Till he was 72.

6030. How late did he go underground ?—Up to that time.

6031. Of what mine was he agent ?—The last mines he was in were the Tamar Mines.

6032. How deep were they ?—To the 212 fathoms, I think.

6033. Did he ever go as deep as that ?—Yes.

6034. That is a rare case, is it not ?—Yes.

6035. (*Chairman.*) Have you been employed as agent to inspect other mines ?—Yes, several times.

6036. In what part of the country ?—The Tavistock United Mines, the Devon and Courtenay, the Tavey Consols, Huel Arthur, Huel Edward, Holmbush Mine, Redmoor Mine, and Kitthill Mine.

6037. Are any of those mines deep mines ?—Not particularly; Holmbush is the deepest.

6038. Are those established mines ?—Yes.

6039. (*Mr. Kendall.*) Turning over a good deal of ore ?—Yes.

6040. (*Chairman.*) In those mines, have you found any poor ends ?—No ; not particularly.

6041. But there have been some poor ends ?—Certainly ; there is occasionally dead air in mines. but it is always the agents' wish to try their utmost to get ventilation as quickly as possible.

6042. But delay occurs in getting ventilation ?—Yes ; and it will be so as long as a mine is a mine.

6043. (*Mr. Kendall.*) You hold this mine to be well ventilated ?—Yes.

6044. Are the other mines as well ventilated as this ?—Yes ; generally.

6045. (*Chairman.*) But there are some which are not ?—Yes.

6046. (*Mr. Holland.*) How do you judge that the ventilation is bad ?—Because a candle will not burn.

6047. Is it not bad for you a long time before it gets bad for the candle ?—No ; the candle will find it out first.

6048. (*Chairman.*) In any of these mines, did you see that the candle would not burn ?—I have been down in the deep levels at 170 fathoms in Holmbush ; of course it is warm below, but the air is middling.

6049. How long can a man work in those levels ?—For eight hours.

6050. (*Mr. Davey.*) How long is it since you inspected Holmbush ?—About two years ago.

6051. (*Chairman.*) What heat was there then ?—I do not know exactly. I inspected Holmbush twice.

6052. (*Mr. Davey.*) Did you find the air impure there ?—No ; I cannot call it impure at all.

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6053. (*Chairman.*) But it was hot ?—Yes.

6054. (*Mr. Davey.*) Do you not know that you may have heat, and at the same time good ventilation? —Yes ; you may have a current of air passing round a good many times.

6055. (*Mr. Holland.*) You can have heat with air passing round and round ?—Yes.

6056. But you do not call that good air do you ?—Yes.

6057. When the air gets hot, is it not a proof that it is the same air coming round again ?—No ; as it goes down into the deep mines, of course the air is warm, and as it traverses the deep mines it is warm.

6058. (*Mr. Davey.*) But the heat of the earth will not destroy much of the quality of the air ?—No.

6059. (*Mr. Holland.*) When there is a flow of air through the mine, do you not find it cooler ?—The greater the circulation, the cooler it is of course.

The Commissioners took the following evidence at Holmbush mine :—

A Miner (No. 1.)
A Miner (No. 2.) } Examined.

A Miner (No. 1) and A Miner (No. 2).

6060. (*Chairman to Miner No.* 1.) How long have you been working here ?—Between four and five years.

6061. Where have you worked before ?—I have worked at several mines before I worked here.

6062. Do you work at tut-work ?—Yes ; I and this man are comrades ; we work together.

6063. Are there any bad ends here ?—No, not that I am aware of.

6064. How deep do you work ?—Ours is the bottom end ; there is a hole close behind me.

6065 So that the smoke gets away quickly?—No.

6066. What other mines have you ever worked in ? —I have worked in Huel Maria and in another mine.

6067. Did you ever work in any mines in poor air? —No ; I never worked in poor air in my life.

6068. Do you inquire before you go to a mine what the air is ?—Yes ; I generally inquire of the men what sort of a place it is to work in, so as to know before I go to work.

6069. I suppose you would not go to work if you knew that there was poor air ?—No, I should not wish to work in poor air.

6070. Do you know that any of your comrades have ever worked in poor air and suffered from it?—I do not know that I have heard them say anything about it. It is the poor air that injures us.

6071. (*To Miner No.* 2.) Have you worked in poor air ?—Yes, I have before now.

6072. How did it affect you ?—It made my legs ache and my stomach bad.

6073. How did you first find it out ?—My legs ached very much in climbing up ; my candle would not burn very well unless it was put on the side.

6474. Did you go on working ?—Yes, for a good while. The mine is drowned now ; it is the Kerris mine, in Devonshire ; it is the South Tamar Consols.

6575. How long did you work there ?—Four or five years.

6076. How long did you ever work in poor air ?— Two or three months before I could see the chance of getting a better place.

6077. What level was it in the mine that you were working in ?—Only to the 70 fathoms.

6078. Were you driving an end ?—Yes.

6079. Were there any means to improve the air ;— No, not there, for the time.

6080. Did you apply to have any means ? Did you ask the agent for any means ?—No.

6081. But you went on working ?—Yes.

6082. Did none of the others complain ?—No, not to the agent, because it was too far off to get any other air than what we had.

6083. You knew that they could not get air there? —Yes.

6084. Have you never seen any machine for supplying air ?—I have before now, but not there.

6085. They had not any there ?—They had them there in some parts of the mine.

6086. Why did not they give it you ?— I am sure I do not know.

6087. Did the agents know that the air was poor air ?—Not so well as we did, because they were not there so often as we were.

6088. But I suppose they did know that there was poor air ?—Yes.

6089. Did you feel it after you left ?—No, no much.

6090. Did you never feel your breath affected ?— Yes ; I have felt my stomach ache.

6091. But not since you left ?—No.

6092. I suppose you would not go again into poor air if you knew it ?—I should not like it if I could help it.

6093. Did they pay you more for working in poor air ?—We had tolerably good wages there.

6094. (*Mr. Davey.*) What object had they in driving this level ?—They were driving for lead.

6095. Were they driving on the lode or on the cross-cut ?—They were driving on the lode. There was a lode, but they were not working it for a time.

6096. Were no winzes sunk from the level above ? —Not for a long way back from where this end was.

6097. How far back ?— Perhaps 50 or 60 fathoms.

6098. You say that there were no means of throwing in air ?—No ; because there was no end in from the shaft, so far as that was.

6099. But why could they not throw in air from the shaft, either by a soller or by a fan ?—It was too far back ; it was 70 fathoms back from a winze, and the shaft, I suppose, was 100 fathoms from that.

6100. What air was it where the winze was ?— It was better.

6101. Could not they apply a machine there ?— They never did. The end where I worked was stopped for want of air ; the air was so bad there that we could not fire a hole or keep a candle burning.

6002. Have you worked in bad air anywhere else ? —No.

610. You are not obliged to work in bad air ?— No ; but when a man wants to get a living he wants to work somewhere or other.

6103. Are you obliged to do it because you cannot get work elsewhere ?—Sometimes a man might be so, and sometimes a man could get a pound a month more there than elsewhere.

6104. Might it not be also that you worked in bad air for the purpose of getting more money ?—Yes.

6105. Could you have worked in the mine at any other place. On the setting day could you have taken another bargain ?—Yes.

6106. Where it was better ventilated ?—Yes.

6107. But you preferred this for the purpose of getting a pound a month more ?—Yes, sometimes.

6108. (*To Miner No.* 1.) You said that you never worked in bad air ?—No.

6109. But you always found that you could get places which were well ventilated, to work in, instead of working in bad air ?—Yes.

6110. (*To Miner No.* 2.) Do you think that there were any other places in the mine at South Tamar which were badly ventilated ?—There was no place which was so bad as in that end ; that end was driven the furthest from the draught of any that were there.

6112. You are now working here at Holmbush ? —Yes.

6113. What kind of ventilation is there here ?— Tolerably well where I am working ; I do not know much about this mine ; I have only been here about two months.

6114. In what level do you work ?—The 170 fathoms.

6115. Upon tut-work or tribute ?—(*Miner No.* 1.) Tut-work.

6116. How far is your present end from a winze or a shaft ?—Only about 10 fathoms from a winze.

6117. And therefore, you have of course very good air ?—Yes. (*Miner No.* 2.) A draught.

6118. How far do they generally drive a level before they get to a winze ?—(*Miner No.* 1.) It is warm, and they get the air quicker.

6119. Before the air gets dead, do they push with the winze so as to get down in time ?—Yes ; I have known winzes down before the end has been got in.

6120. (*Chairman.*) Is the air here warm ?—It is warm, but not so that men could not work ; I have been working there four years, and it does not hurt me a bit.

6121. You work naked, I suppose ?—Yes, sometimes ; and sometimes we have a thin thing on. Some work naked and some do not.

6122. (*Mr Kendall.*) What you mean by working naked is having your trowsers on, and only being naked down to your waist ?—Yes.

6123. (*Chairman to Miner No.* 2.) How old are you ?—About 28.

6124. You have never suffered from what you have been working in ?—No.

6125. (*To Miner No.* 1.) Do you climb the 170 fathoms ?—Yes.

6126. Do you feel anything from climbing to affect you ?—No.

6127. You do not mind it ?—(*Miner No.* 2.) We should stop to rest. St. Austell

6128. Does climbing the ladders affect your breathing ?—No. *A Miner (No. 1) and A Miner (No. 2).*

6129. Do you come up quickly ?—We take our time coming up.

6130. (*Mr. Davey.*) How long do you think that it takes you to come up quietly from the 170 fathoms to grass ?—(*Miner No.* 1.) About half an hour ; we can come up in less. (*Miner No.* 2.) It would take half an hour to come up steadily. 24 April 1862.

6131. (*Chairman to Miner No.* 1.) Are you fined if you come up to grass before the bell rings ?—We cannot tell what the time is exactly ; we are oftener behind than before.

6132. (*Mr Davey.*) Do the men accumulate near the surface just before the bell rings ?—No.

6133. They are not afraid of coming up before their time ?—No ; they would sooner come up than stop, if they should be before time ; a man cannot tell the time exactly.

6134. Supposing the men came up half an hour before time, would they be spaled ?—I do not know that I ever knew a man spaled for coming up so nigh as that.

6135. You are sometimes after the time and sometimes before the time ?—Yes. (*Miner No.* 2.) Then they carry one against the other.

The witnesses withdrew.

Mr. John Borlase examined.

6136. (*Chairman.*) How long have you been at this mine as agent ?—About 15 months. *Mr. J. Borlase.*

6137. Were you captain at another mine before that ?—Yes ; I was at Huel Prosper in Breage ; I was at the Great Brigan Mine by Redruth about six weeks, and then I was removed from there here.

6138. I suppose you have worked underground ?—Yes.

6139. For how long ?—I have been at the mining from my childhood up.

6140. What age are you ?—45.

6141. Have you ever inspected any other mines ?—No, I never did much of that ; but I have been engaged in several different other mines, mines in the western part of Cornwall, in the neighbourhood of St. Just and Gwinear.

6142. What is the deepest mine that you have ever been in ?—This is the deepest.

6143. What is the depth of this ?—It is more than 200 fathoms from the surface ; the adit level is from 10 to 12 fathoms.

6144. Are you working the lower portion ?—Yes.

6145. About how many men have you underground ?—I think underground and at the surface we have altogether somewhere about 220 or 230 ; we have not got a great many at the surface ; we have a good many children, and it would take some time to go into the calculation.

6146. Are most of the men tributers ?—The greatest portion of them ; but there are several tut-work men driving the 160 fathoms end west, and the 165 fathoms end east, the 40 fathoms east and west, the 20 fathoms east, and the 10 fathoms east.

6147. How far are they driving from any winze or lode ; what is the greatest distance ?—Our end is going on about six fathoms west of a winze ; we put another winze there.

6148. Do you put a winze before you drive ?—Yes, before the end gets in. We have good ventilation here ; there is not a large mine in the county better ventilated than this is.

6149. Is there any particular shaft which is upcast or down-cast, or do they vary ?—We have a diagonal one ; but we have two shafts. We sank the down right, and the diagonal close on the course of the lode, and we had cross-cuts from one to the other, so that there was a communication.

6150. Is there one shaft up-cast and the other down-cast ?—Yes.

6151. Is it always the same ?—It varies sometimes.

6152. Can you account for that ?—I do not know that I can exactly. The shaft is divided from the whim shaft to the engine shaft ; you sometimes find that the draught goes down the whim shaft and up the engine shaft, and sometimes, if the wind should happen to tack a bit, it goes quite the reverse.

6153. (*Mr. Davey.*) You say that the mine is generally well ventilated ?—Yes.

6154. Have you any end at all where the air is rather bad ?—No ; we have not got such an end in the mine.

6155. Then you usually prepare for the air being impregnated by sinking a winze before the end ?—Yes.

6156. Can you always do that by water ?—It is rather expensive, but we go as far as we can with water, and we have communication as soon as possible.

6157. What is your usual distance from one winze to another ?—Sometimes we get winzes ten fathoms, and sometimes fifteen or twenty fathoms, according to circumstances.

6158. If it is rich in metal, it goes a little closer ?—Yes ; circumstances alter cases.

6159. Do you find any difference in the air, when the lode is rich and when it is poor ?—We find it a great deal warmer when the lode is rich, but I believe that the air is as pure.

6160. You say that you have been an agent for some other mines in the West ?—Yes.

6161. How are they generally ventilated ?—The mines that ever I was in are ventilated very well. In the last mine where I was we sank winzes regularly at every fifteen fathoms.

6162. Do you find the men sometimes come to complain of bad air, without cause for it ?—Sometimes they will complain in consequence of a little stuff in the level. It is not at all times that you get the levels clear, and then you find the air a little light.

6163. Supposing a man came to you to complain of the air being imperfect, what would you do ?—I should get it clear as quickly as possible.

6164. You would take notice of it ?—Quite so. Being accustomed to it, and knowing what it is to be

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deprived of good air, we do our best to get the mine clear of all stuff.

6165. But you very frequently find that the air is not so good as it otherwise would be, in consequence of the neglect of the workmen in clearing the levels? —Yes, and then we use our authority and make them clear the levels.

6166. Have you not been obliged to spale them for not clearing the levels ?—Yes.

6167. Therefore if the air is bad it is from their own neglect ?—Yes.

6168. Have you seen that frequently ?—Yes.

6169. You say that you have spaled them for it? —Yes ; but in this mine we set all our trammers and manage it ourselves.

6170. What is the worst ventilated mine that you ever had ?—The worst, I think, was a mine in Wendron ; there was the cold damp there.

6171. What was the name of the mine ? — Huel Ruby. It is a cold damp.

6172. Do you find that in the levels or in the pitches ?—All through the mine.

6173. Not a continuous damp, but after, perhaps, Monday morning, or something of that kind ?—It generally continues damp ; perhaps it is more so on Monday morning than when the men get to their places, and in the usual way of working.

6174. Did you find any difficulty in getting the men to work there ? — No, not a great deal ; we only worked there for about four years.

6175. What was the cause of that mine stopping, was it from poverty ?—From poverty ; it was a large lode and very poor.

6176. Could you account for the damp staying there ? — It was in the granite country, and the granite was in flat blocks, and the cold damp was always like a cloud of thick rain.

6177. Could not you dispel it by fans?—That might have been done, but it was never applied, and when you got away from the engine-shaft on to the course of the lode there was naturally cold damp.

6178. How long is it since that mine was suspended ?—About twenty years.

6179. What is the general age of your miners, working in this mine ?—I should think that the general age of those whom we have now in the mine is from 35 or 30 to 40.

6180. What do you suppose is the age of the oldest man ?—I think the oldest man that we have in the mine now is 50 years of age.

6181. Have you many of that age ?—No.

6182. Do you employ many boys ?—Not a great many.

6183. At what age do they go down ? — About thirteen years of age ; we do not allow them unless a parent wishes to have his own child with him, and then we let him do so.

6184. (*Chairman.*) What height do you drive your level ?—Seven feet high.

6185. You say that sometimes the men have complained of the accumulation of stuff; would one day's work stop up the level sufficiently to impede the ventilation ?—No.

6186. How often do the captains visit?—Every day. I have been down to-day to the bottom of the mine.

6187. If you saw stuff accumulating, should you not make the men remove it before it becomes injurious, as impeding the ventilation ? — We do so. We have nine trammers in this mine, and we send them where they are required. We know every day where the stuff has accumulated, and we send them at once to take it away.

6188. That is not done in all mines ?—No ; in a good many mines the men wheel their own stuff, and they put it off as long as possible.

6189. If the agent who was properly looking after the mine saw that, he would not let it accumulate, though it was the men's duty to remove it ?—No ; he would insist upon its being removed.

6190. Therefore the agent was to blame as well as the men, for leaving it to such an extent ?—We are sometimes obliged to be harsh with them to make them remove the stuff.

6191. Still if the agent had found fault with it in time it might have been removed ?—Certainly.

6192. But your plan you think better ?—Yes ; we have nine trammers in this mine, and we keep them at work.

6193. I suppose that it comes to the same thing in the end as to expense ?—Yes ; a man who takes his work under the idea that he must pay for that, must have more for doing it, and in the other way it is taken off.

6194. So that it is not more expensive to adopt the better system ?—No. I think the better system is of the most advantage both for the men and for the mine.

6195. (*Mr. Kendall.*) Did I understand you rightly, that in some mines men are expected to roll away their own stuff ?—Yes.

6196. And that in consequence of neglecting to do so at the proper time, a deficiency of air is produced ? —Yes.

6197. An agent may remonstrate again and again, and tell these men to clear their levels, and they neglect to do so, and at last, when remonstrance is in vain, you are at times obliged to impose a fine on them before they will do it ?—Yes.

6198. (*Chairman.*) But the agent could have imposed that fine on them before it got so bad as to impede the air ?—Yes, if he liked to take harsh measures, but he does not like to do so.

6199. But if it is injurious to the health, he ought to have done it ?—Yes.

6200. (*Mr. Davey.*) You are here provided with trams upon all your levels ?—Yes, all our levels are carried seven feet high and four feet wide all through the mine.

6201. But in many mines they have not trams ?— No.

6202. And it is in places where they are obliged to wheel out this stuff that they get this bad air ?— Generally so.

6203. (*Chairman.*) When men complain to you about anything, what is the first step which you take ?—We try to remove it.

6204. Do you go down and inspect it?—Yes, we go down first ; if any person objects, we generally go and see what is to be done. I would never put another man where I would not go myself.

6205. I suppose that in some mines, where you are driving to the end, it is difficult to supply fresh air, and to prevent the poor air ?—There we put in air machines, and take the foul air back, and throw in good air to them.

6206. Have you any air machines in this mine ?— Only one, and that is of no use ; we did apply that for a little while.

6207. Have you ever seen any mines where any other artificial means were employed for ventilation ? —Yes, water-falls.

6208. Do you think that you can ventilate any end which is driven however long by those artificial means ? —You can throw in air, and no better air can be produced than by a water fall ; a stream of water will produce good air.

6209. If you had this stream of water to what extent could you drive an end ?—It has been driven 150 fathoms, and if you put in your levels high enough you can put in air sollers at about a foot up from the bottom of the level.

6210. Do you think that a good plan ?—Yes, it will throw a double current of air ; it will come in one way and back the other.

6211. And you think that that ought to be done ? —Yes, where there are no chances of winzes, and where the levels are a long way off.

6212. We have been told that in many mines a winze has been driven to reach the level, but that in the mean time the air has been bad ?—Yes, then you can put in air sollers.

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6213. Can you cool the air if it is hot?—Yes; the fresh air coming in will drive out the other air.

6214. Sometimes when the air is very hot you think it advisable to apply air sollers?—Yes, if you are a long way off from any winze.

6215. (*Mr. Kendall.*) You have had very great experience as a working miner, what is your experience as to the supply of air when it once becomes impure; do they at once, generally speaking, apply artificial means to render it pure, or do they allow the men to work there for some time in impure air in order to save expense?—We get the things in as quickly as possible; when we go down ourselves, if we cannot stay we do not wish the men to do so, and we use means to remedy that evil.

6216. Do you know any case where agents have neglected to artificial use means when the men have complained?—None ever came under my experience.

6217. (*Chairman.*) But I think you said that you had not been employed in other mines?—No.

6218. (*Mr. Kendall.*) I speak of your experience not as an inspector but as a miner?—Yes.

6219. And you have worked in many mines?—Yes.

6220. (*Chairman.*) As a miner you have worked in poor air yourself?—Yes.

6221. Often?—Not a great deal.

6222. In what mines?—I do not know that I have worked in any worse than the one I spoke of just now, the Huel Ruby.

6223. But you said that there was a great deal of difficulty there?—Yes; we have a place here now, but it is unavoidable, we cannot help ourselves; circumstances, as the old man said, alter cases; we do not wish the men to stop down more than three hours.

6224. At what level is that?—At the adit level.

6225. You say that the men there can only work three hours?—They can work longer, but we do not request them to do so; we have been down there ourselves, and find that we cannot keep ourselves in it, and we are putting in air sollers to avoid the inconvenience; we have only one man there in 24 hours, so that the place has a long time to cool itself, and the air becomes pure.

6226. Are you putting in one of your air machines there?—We are putting in an air soller.

6227. (*Mr. Davey.*) How far is that from any shaft?—It is only about 50 fathoms from the shaft to the Callington mines; it is in an adit level.

6228. (*Chairman.*) How long have you been at work there?—Only a week, so that it is a mere nothing.

6229. Still you think that there are other mines where there might have been a great difficulty?—There might have been, but it has not come under my notice.

6230. From your great experience in working as a miner should you not think that there is in any mine an end where there is great difficulty in ventilating it?—In Trenow Consols I have worked somewhere about 10 years ago; we had a level there, and we had no opportunity of getting up and down in it because it is under the sea, and there I went down and put air sollers; it was 150 fathoms from the shaft, and after putting in the air sollers we had very good air, but the air was dead before that.

6231. From your experience it is your opinion that all ends, however poor or hot the air is, can be ventilated?—I think that there are means to be used.

6232. Then you would think that where means are not used they ought to be?—Yes.

6233. And whose blame is it if they are not used?—It is the agent's blame I should say; I should take the blame to myself.

6234. (*Mr. Davey.*) Did I rightly understand you to say that this adit level has only been working for one week?—Not more than about a week.

6235. And in that time you are putting in sollers?—Yes.

6236. (*Mr. Kendall.*) In the meantime one man is there in a day?—Yes.

6237. How long do you think it will be before you will get the sollers in?—He is putting in the sollers with him.

6238. (*Mr. Davey.*) He is not working in the end?—No; there is a shaft down 40 fathoms, and we have been down the shaft, and there are about two fathoms of water in; we have gone back to the adit to clear the tail of the audit.

6239. (*Mr. Kendall.*) And you are carrying in air sollers?—Yes, and removing the rubbish back upon the air sollers and getting a draught to follow the men.

6240. Then you are not actually working in the end yet?—No.

6241. But you are taking the very best mens that you can to get pure air for the men?—Yes, we are taking the very best means that can be adopted for the ventilation; the men are taking the air in with them.

The Witness withdrew.

Adjourned.

PENZANCE.

Wednesday, 30th July, 1862.

PRESENT:

The Right Hon. Lord KINNAIRD, K.T.	RICHARD DAVEY, Esq., M.P.
NICHOLAS KENDALL, Esq., M.P.	P. H. HOLLAND, Esq.
JOHN ST. AUBYN, Esq., M.P.	

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

Captain ROBERT DUNSTAN further examined.

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6242. (*Chairman.*) I believe that since you appeared before the Commission you have been engaged in examining one or two mines?—Yes; several mines.

6243. Can you give us the result of any of your experience in those mines with regard to their ventilation?—I can just tell you what happened to myself in one of the mines in going down the mine.

6244. Will you name the mine?—Huel Emma, in Devon.

6245. (*Mr. Kendall.*) How long since is this?—It was the Friday after last Good Friday.

6246. (*Chairman.*) Were you employed to examine that mine?—At that time I conducted that mine—I was the manager of it.

6247. For what purpose did you go down the mine?—I went down to value the mine.

6248. On the day to which you have referred you went down that mine will you state to the Commission the condition as to ventilation in which you found that mine?—I will state the fact and you must judge as to the ventilation; there did not appear to be any want of ventilation; there was a very good current of air in the level above.

6249. Will you state the level?—It would apply in the same way to all levels under the same circum-

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stances; this was the 70 fathoms level. We were sinking a winze in the bottom of the 70 fathoms level. The winze had been sunk three fathoms, but the men had been keeping holiday during the Easter week. I did not know that they had been keeping holiday. I went hastily down the winze, and found that my candle became extinct in a moment. It nearly cost me my life; I had a very narrow escape of my life. We miners call it a damp. The damp had been formed during the absence of the men. There was no fault in the ventilation of the mine, because there was a fine current of air. It was between two draughts that the winze was sinking; there could not be any fault in the ventilation of the mine. How to account for the formation of the damp is beyond my skill.

6250. How did you go down?—By a rope, as we ordinarily do.

6251. (*Mr. St. Aubyn.*) Down a winze?—Yes.

6252. (*Chairman.*) What other men were there with you in the mine at the time?—The Captain of the mine was there and the miner who worked in the winze; but they were in the level, not down with me. I was the only one down in the winze.

6253. How far did you go down? Did you go down to the bottom as far as they had sunk?—Yes; I went down 18 feet only; that was the depth of the winze at that time.

6254. You landed at the bottom?—Yes.

6255. How long were you there?—Not a minute. I found my life going; of course I could not stay there. The candle became extinct when I got about eight feet under the brace, *i. e.* below the level; but I do not think that I was there two minutes.

6256. The candle went out before you got to the bottom?—Yes; the candle went out as soon as I touched the damp, of course; it acts upon the candle like water would.

6257. Had you any feeling as you were going down?—There was not time to tell. As soon as I got to the bottom I found my senses going away.

6258. How did you give notice to the men?—I knew what it was immediately, and I said "Pull me up."

6259. And they wound the rope up?—Yes. The captain took me by the collar and landed me on the brace.

6260. Did you lose your consciousness?—No; I never lost my consciousness; the time was too short.

6261. When you came to the level what did you do?—I lay on the level a little while, and then they raised me up and moved me forwards and backwards, and so on. It occurred to me that I had lost circulation for some time.

6262. Have you had any other such instances in the same mine?—Never.

6263. Is that called poor air?—That is called a damp. It may be the same in kind but different in degree; this is the extreme degree.

6264. How would you distinguish one from the other?—I could live in poor air but I could not live in a damp.

6265. How would you describe the difference?—It may be hard to describe it; the damp has lost all vitality. The poor air may retain a portion of vitality, so that a man may live.

6266. Is the candle the criterion for both poor air and damp?—No; a man can live when the candle will not burn. I have many times myself, in my experience, lived where the candle would not burn; but the effect of the damp, that is the carbonic acid gas, is beyond question to extinguish the candle instantly; it does not extinguish life quite so instantly, because in the air cells we retain a portion of life of course, and it must kill that life first. The candle is not the only criterion, poor air has a very bad smell with it which is very injurious to the miner.

6267. In your opinion, if the men had been working there that damp would not have accumulated?—No, of course not.

6268. What would have prevented its accumulating?—The circulation.

6269. Have you had any similar instance in any other mine?—No; not to the same extent.

6270. But have you experienced it?—Yes; in my life.

6271. Have you been down any other mine since where there was a similar case, where the air was visibly bad or poor?—Not to the extent of that.

6272. But you have been down other mines since you were before us?—Yes.

6273. Were these mines, which you have been down since, in Cornwall or Devonshire?—That mine was in Devonshire.

6274. Where were the others that you have been in where the air has been poor?—In Cornwall. The air is always bad in mines, more or less; it depends upon the ventilation.

6275. I suppose you mean in close ends, or winzes, or rises, or do you mean in all parts?—The bad air is not confined to close ends; what I have stated is a sample of it, because here was a small winze sinking only three fathoms under a current of air, and the air does not go down; the same air is at the back and the bottom. There is more bad air in general than people account for in consequence of air not rising or falling into the places where the men are working.

6276. In your opinion, if, instead of thus sinking a winze, it had been a rise, would the air have ascended?—No; it is just the same.

6277. Have you ever turned your attention to any remedy for that peculiar state of things?—We remedy it; we cause a circulation; that is the way in which we remedy it.

6278. (*Mr. Kendall.*) Do you fancy that the same kind of air as you speak of now would form in the back of a rise as it would down below?—Just the same. I have experienced as bad air in rising as in sinking.

6279. Did you ever experience the same deadly feeling as you experienced in Huel Emma?—Not to the same extent. In Fowey Consols I once experienced a very queer sensation in bad air.

6280. As I understand you, in Huel Emma you were in a drift where there was a pure current of air?—Yes.

6281. But in sinking a winze below that about 18 feet, during the absence of some men, there was an accumulation of what you conceive to be carbonic acid gas?—Yes.

6282. The only thing that I am rather puzzled at is your fancying that the same gas would form in the back; you think it would?—Yes; I have experienced very bad air in backs. I have seen backs in which I could not carry a light.

6283. Were you sick after you came up from that winze into the level in Huel Emma?—I was sick after I got into the level, and it relieved me.

6284. (*Mr. Davey.*) You have said that you have never seen an instance of it to the same extent before?—I have not.

6285. Have you seen anything like that damp in any other mine?—Yes; I have seen damps, but I was never down in them. I was caught here because I did not expect it.

6286. You went down before the other agent to inspect the mine?—Yes; he was with me as far as the level. I was putting prices on the work. I have seen damps, but we can generally see them with the eye, and then we do not go down into them; we send down a candle.

6287. How do you manage to see it; in what peculiar way does it show itself?—It would form like a film or a fog; you could see it like a white hoar fog.

6288. It is not very common to meet with those damps underground is it?—Yes it is. I have seen many of them; I never was in one before.

6289. You say that you never saw one in a rise?—I have been in rises where I could not carry a light up. What may have been above it I cannot

tell. I was never caught before as I was in this instance.

6290. You say that you could work where a candle would not burn?—Yes; I have found many places where a candle has been obliged to be stuck some feet behind me.

6291. If there is some rich ore, more particularly black ore, have you not been obliged to keep the candle some feet behind you?—I do not think that the ore has anything to do with it.

6292. (*Chairman.*) Have you known it?—No; and I have worked in all kinds of copper ore.

6293. (*Mr. Davey.*) Have you never found any instance where the richness of the lode injured the purity of the air?—I have never attributed it to that.

6294. When the men have left their tools on the Saturday, for instance, have you ever found that by the Monday morning they have been covered with a white damp?—I have never observed it.

6295. You have, of course, seen cases where they have been covered with green?—Yes; but that does not proceed from air.

6296. (*Mr. Holland.*) What does it proceed from?—It proceeds from the carbonate of copper.

6297. Do you think that there has been much exaggeration about the badness of air?—I do not know what has been said about it.

6298. Have you heard much about it?—The question has not been discussed. We miners know what bad air there is. I do not know what may have been said about it in other places. There is a great deal of bad air in mines.

6299. Is it very frequent?—Yes.

6300. In almost all mines?—In all mines more or less.

6301. In parts of all mines?—Of course.

6302. Not throughout all mines, or do you mean that?—When a main is taken up from a shaft and driven 10, 20, 30, or 40 fathoms the air becomes more and more foul of course, until there is ventilation.

6303. Is it a frequent thing in all mines?—It must be so from the nature of the case.

6304. (*Chairman.*) What is the difference between what miners call poor air and light air?—All poor air is light.

6305. (*Mr. Kendall.*) How many years altogether have you been working at mines as agent and as working miner?—Forty-five years, working man and agent.

6306. What age are you now?—In my 55th year.

6307. How is your health now?—Just as you see it.

6308. Is it not very good?—Yes, pretty good generally.

6309. Do you find many men much stronger than you are now?—I do not try them, but I do not find them so generally.

6310. Then the poor air has not hurt you much?—I was a tributer in Fowey Consols for 18 years.

6311. (*Chairman.*) How long have you been agent?—Eighteen years. I was seven years in the Bodmin mines, and three years in the Tamar mines in Devon on the banks of the Tamar. I have been a working miner 27 years.

The witness withdrew.

Note.—Liskeard, 21 Feb. 1863.—Your Lordship will please observe that there are many degrees of poor air in which the miner has to work, which is more or less injurious to his health; and although it is only in extreme cases of poor air or damp where the life of the miner is quenched out, yet I am of opinion, that a man cannot work in poor air without being injured by it to a lesser or greater extent, according to the amount of labour performed, and quantity of air inhaled.

I remain
Your Lordship's humble servant,
ROBT. DUNSTAN.

Captain RICHARD H. WILLIAMS of the Charlestown United Mines further examined.

6312. (*Chairman.*) I believe that at my request you have been making more particular calculations as to the way of working, the cost of putting up, and the general expense of your plan of ventilation by water, as described to the Commissioners on a former occasion?—I have.

6313. Will you describe your plan?—I sent your Lordship a tracing of it. I think that I described the height of the fall in my previous evidence. The water has a fall of 80 fathoms through a pipe of 1 inch and 1¼ inch diameter.

6314. (*Mr. Kendall.*) What sort of pipe?—Gas piping. The cost per foot of that pipe is for the 1¼ inch 5½*d.*, and for the inch 4½*d.* per foot. The pressure of water at the bottom of the fall of 80 fathoms is over 200 lbs. to the inch. The air launder in which a jet is placed is 14 inches square at the mouth and 8 inches at the discharge end, connected with which are galvanized iron pipes of 7½ inches diameter, costing 4*s.* 9*d.* a fathom. The quantity of water required to keep the machine at work is 11⅔rd gallons per minute. The cost of pumping that water up out of the mine is 1¾*d.* per hour. The temperature at the point of ingress of the air when the machine is at work is 71 degrees, that is taken on a mercurial gauge; at the point of egress it is 77 degrees. After the machine had been stopping six hours, the temperature at the point of ingress was 71½ degrees, and at the point of egress 78 degrees. From the point of ingress to the point of egress of the air it is 50 fathoms. There is no winze or communication for 50 fathoms. I believe that those are all the particulars.

6315. How do you ascertain the cost of pumping?—I make up the total number of gallons which the engine is pumping per hour; then taking the quantity of coals which it is consuming per day, I reduce it to hours, and then ascertain the value of the coals and bring it into pence, and dividing that by the number of gallons will show the cost per gallon of lifting the water.

6316. (*Mr. Holland.*) Does that include all the expenses; there are other expenses besides coal?—I take all the expenses. The items of expense in the pumping charges are, coals, candles, oil, tallow, gaskin, and cotton waste. I have worked this apparatus for the last 8 or 10 years myself.

6317. (*Mr. Davey.*) What is the name of the mine?—The Charlestown United Mines is where his lordship saw it; but I have also worked it at St. Austell Consols Mine.

6318. What mines are the Charlestown Mines?—Tin.

6319. Do you not always find the air very much cooler in tin mines than in copper mines?—Yes.

6320. (*Mr. St. Aubyn.*) Is the apparatus still working in both those mines?—Yes.

6321. (*Mr. Kendall.*) What is the greatest distance that you have ever been able to throw air with that machine?—The greatest distance that I have ever required it has been 100 fathoms; but I have put a rise through to the Charlestown mines 20 fathoms, and the commencement of the rise was 80 fathom off the point from which we took the air.

6322. From your jet?—Yes; and we put the rise through 20 fathoms under the lode.

6323. Whilst you were going through that distance of 80 fathoms and progressing with your rise, was the air invariably good while that engine was at work?—Yes; very good indeed.

6324. There was no complaint?—None at all.

PENZANCE.

Capt. R. H. Williams.

30 July 1862.

6325. There was no dull burning of the candle ?—Not the least.

6326. (*Chairman.*) Therefore, in your opinion, where a winze is driven merely for ventilation it would be much cheaper to put this pipe than to sink a winze ?—Yes.

6327. (*Mr. Davey.*) Have you ever tried it or seen it tried in a copper mine ?—No ; although about three years since I sent a part of the apparatus, namely, the rose and the cock part, to Captain Richards of the Devon Great Consols, and also a drawing of it ; whether he fixed it there and used it I do not know, but I believe so. The only difficulty which there is to contend with is having a point at which you can take off good air. There is no difficulty with this machine in throwing in the amount of air.

6328. But you must first get it from a shaft where there is an abundance of air to spare ?—Yes.

6329. (*Chairman.*) I presume that you can draw air to the jet at as great a distance as you can throw the air ?—Yes. For a very long time in Cornwall we have used wooden air pipes, and men in putting them in sometimes give them a blow too much, and they open the sides a little, consequently they have been so imperfect that I have found that in drawing air with the wooden pipes, we have been taking in air all through the level, so that we have had a very strong blast, at the end of the air pipe, but it has sent an impure air to the ment at work But if the pipes are tight, as we are now making them with galvanized iron, there is not the least difficulty.

6330. What is the cost of the galvanized pipe ?—I am giving 4*s.* 9*d.* a fathom for a 7½-inch pipe.

6331. You could make that to draw air down to the jet as well as to throw it ?—Yes. With the first machine which I put in I took the air 30 fathoms above the level. The machine is working 124 fathoms under the adit level.

6332. How far is the furthest end from a shaft and from ventilation, where this is at work ?—Fifty fathoms.

6333. How long is the smoke, after a blast, getting away from the end of the level where the men are working ?—We found that in five minutes the smoke was gone sufficiently for the men to go to work, and in 10 minutes the air was perfectly clear ; there was not the least smoke any more than there is in this room.

6334. (*Mr. Davey.*) In fact you force in air ?—Yes ; from the great velocity with which the air is sent through the pipe, it is as it were condensed ; the air goes in in a larger volume than its actual contents according to the weight of the atmosphere, from the great velocity with which it passes through the pipe, so that when it comes to the end it expands. I think that the forcing in of fresh air is advisable.

6335. (*Chairman.*) Have you any doubt that the process of ventilation would keep cool the end of a copper mine ?—I have not the least doubt of it, if the air could be taken away from a shaft.

6336. If a pure supply of air is introduced at one end behind the jet you think that it would be sufficient to cool a hot end ?—I think that it would cool it to a certain extent.

6337. (*Mr. Davey.*) Could you get air from the surface? In many of these copper mines it is impossible for you to get cold air to blow in, it is always hot ; could you draw air down ?—For a given distance I think you could.

6338. To what extent do you think you could do it ?—I have done it for 30 fathoms ; but of course we should have to force down the atmosphere, which has always a tendency to ascend. If pipes were constructed to the surface from the end this jet would not be required, because the action of the atmosphere would play of itself ; the rarified atmosphere of the mine would ascend through it, provided the pipes are continued up some 30 or 40 feet above the level of the top or colear of the shaft.

6339. (*Chairman.*) We want it the other way ?—This could draw out the air from the end instead of drawing it in. I have been in a mine to the 240 fathom level, to the bottom of a shaft where the air has been quite cold, and the men have been filling the kibbles with their jackets on. I have stepped from that shaft into an end where the temperature has been 97 or 98 degrees. No machine of any kind was used when I went into this end. The level was suspended. I have no doubt my jet would reduce the temperature and enable the men to work with comfort.

6340. (*Mr. Kendall.*) What mine do you refer to ?—Fowey Consols.

6341. And you have found that at 240 fathoms deep, in some of the main shafts, it was actually cold at the bottom ?—Yes ; I have come out of the main levels and have buttoned up my coat.

6342. (*Chairman.*) There your machine would supply good air ?—Yes ; but in the case of cross levels, perhaps the heat would be something like 80 or 85 degrees ; but then, I think that with this jet, blending the water with the air, cools it. The water is a sort of mist, it is something like a steam, the water is almost decomposed as it were, so that it cools the air. I believe that the air coming out at the end of the pipe is colder than that which enters it.

6343. (*Mr. Kendall.*) What is the distance of the jet of water ?—From 20 to 30 feet, and ejected with great force.

6344. (*Mr. Holland.*) Have you tried any other form of jet than that ?—I have tried larger ones ; but I find the size used to answer the best.

6345. (*Chairman.*) How long have you been at Charlestown United Mines ?—From their commencement.

6346. How many years is that ?—Since March, 1859.

6347. I believe that your men in blasting always use cartridges ?—Yes.

6348. They make them themselves down below ?—Yes.

6349. Have you ever had an accident from blasting ?—We have had no serious accident since the mine has been at work.

6350. Will you describe what was very nearly being an accident the other day ?—A pair of men had an upper hole ; that is to say, bored up in the back of the level, and the hole was very ragged, and they put their bag up, and put up three plugs of tamping. There was one man holding the bar and the other was driving it up, and they saw the fire come out of the hole, and they just fell back, and it went off bringing part of its burthen ; that was by cutting the fuse—the ragged hole cut the fuse.

6351. In your opinion, would not that have been avoided if they had used either a copper or a bronze tamping rod ?—Perhaps it would.

6352. Would it be desirable to have a tamping rod which would not create a spark by striking against the side ?—Yes.

6353. (*Mr Holland.*) Would that be a heavy expense ?—It would be very expensive in large mines. I have thought of a plan of having a copper tube the size of a tamping bar, and putting an iron bar in it so as to have an outer casing for the bar. I sent some iron to Birmingham, and had it galvanized, and tried some experiments with it, but I found that that galvanizing very soon rubs off. By the other plan we should have the stiffness of the iron bar to beat with and we should have the copper tube.

6354. (*Mr. Kendall.*) Have you any idea what the extra cost would be if you had the tamping iron cased in the way that you have suggested ?—I should say that one bar in that way would cost ten of the others.

6355. Even in this modified form ?—Yes.

6356. What is the cost of the present tamping iron ?—About 4*d.*

6357. Then I suppose that a copper one would be about 3*s.* 6*d.*?—I should think that it would.

6358. How long would that last?—I suppose that the copper would wear faster than the iron.

6359. But how long do you think that that might last?—I should that think it would last six months; a large portion of the copper would be still to be re-sold. This is only just an idea which has suggested itself to me, and I have been trying some experiments in the way of tamping bars lately. I think that a proportional length of the tamping bar might be made so as to have the full size of the iron up about 3 inches from the flooring, that is, the flooring to be 3 inches long, and to have the bar from the top of the flooring upwards its usual size. When the bar becomes short it is of no use, and is thrown away.

6360. Taking it in the most expensive form it would not cost much more than 7*s.* a year in order to ensure against striking fire?—I should not think that it would.

6361. (*Chairman.*) The men at present pay for the wear and tear of their tools?—Yes; we should have to be very careful, and perhaps make some different arrangements with respect to copper tamping bars, because copper is so easily disposed of.

6362. If you make any experiments will you furnish the Commission with the results of your experiments?—Yes.

6363. (*Mr. Holland.*) I understood you to tell us that by the use of a jet the temperature of the air sank from 78 degrees to 71?—No; it increased from 77 degrees to 78. It was only one degree increase of temperature after stopping six hours. Then the machine had been idle only six hours.

6364. Did you notice the temperature of the water?—No, I did not.

6365. Would there be much increased cost in bringing cold water down instead of the mine water?—That would depend very much upon circumstances; it would be a very great cost to be brought down from the surface in a very deep mine, but then you generally get at some point in the mine water moderately cool.

6366. Could not you get water trickling down the shaft, which is mostly surface water, at a temperature of about 40 degrees?—Yes; 40 to 45 degrees.

6367. If that was got it would lower the temperature in the mine?—Yes, undoubtedly, and there is no doubt that the air going out at the mouth of the pipe is of a much lower temperature than what is going in, because the water is cooling it. The water absorbs any excess of impure gases contained in the air.

6368. What is the quantity of air driven in?—About 2,000 gallons of air in a minute. I have only roughly estimated it.

6369. That 2,000 gallons of air in a minute is driven in by 12 gallons of water?—Yes.

The witness withdrew.

Note on 6338.—I cannot see any necessity of drawing down air from the surface, as all mines have good air in the main levels, although thick and hot. Yet a candle will burn well and bright. The water jet, as I have constructed it, so blends the air and water together, that it cools the air, and entirely frees the air of powder smoke; consequently, I think, if in the ends of our deep mines we could get the air equal to what is passing through the main levels, the evil would be cured, and the ventilation as far as practicable made perfect. I beg to call particular attention to the testimonial I have received of the effect produced by one of these machines I have recently supplied to Great Wheal Baddern Mine.

Captain JOHN TRURAN examined.

6370. (*Chairman.*) I believe you are the manager of the Ding-Dong Mine?—Yes.

6371. How many men have you working underground?—There are about 91 men working underground.

6372. The formation of the rock in your mine is of a peculiar character, is it not?—I suppose it is.

6373. The men work it not only by blasting, but also by chiselling?—Yes; they chisel out the centre of the lode.

6374. And then I believe they blast the sides?—Yes; there is a soft centre to the lode.

6375. How do the miners take it out?—The miners call the instrument a picker.

6376. It is in fact like a chisel?—Yes, it is; they chisel it out; they use a hammer, and cut away the centre of the lode, and bring it out, it being soft in the centre, and then they blast the sides.

6377. In chiseling out the centre part do they make a great deal of dust?—No doubt.

6378. (*Mr. Davey.*) Is the ground generally very dry?—Yes; it is generally very dry.

6379. What is the nature of this fair part of the lode?—It is steatite more particularly; there is a soft substance in the centre of the lode, and there is what we call antimony; but that I suppose will be found to be mica chiefly; it is a sort of oily substance softer than the surrounding rock and of a different character.

6380. You say that it is a sort of oily substance; would you get much dust from that?—The coating, as we call it, is very hard, and the end becomes filled with dust; that is, it rises very thickly about the mens' faces.

6381. Do you find that that dust affects the men much in their breathing?—Not in their breathing I think.

6382. How does it affect them?—It does not affect their breathing I presume immediately; but the miners are affected slowly. I do not think it is perceptible at first, not perhaps until several years have passed by.

6383. Are any of the men affected with what is called miners' disease?—Yes; some of them are.

6384. Do you attribute that to the dust?—Not altogether.

6385. (*Chairman.*) Two or three of your men have died lately, have they not?—Yes; not long since.

6386. Did you attribute their deaths to the dust or to any other cause?—We could not ascertain that, we had no means of ascertaining that.

6387. Is your mine well ventilated?—Yes; it is well ventilated as a mine.

6388. Are there not two or three other men who have been affected to whom you have given work on the surface?—Yes.

6389. (*Mr. Kendall.*) As I understand your evidence you have a very hard thin lode which you blast?—Yes; but sometimes the lode is not hard.

6390. You can blast it?—Yes.

6391. What is the average size of the lode?—About six inches.

6392. In the centre of this lode of six inches there is a part which is softer than the other parts of the lode?—Yes; generally.

6393. Then in order to facilitate the operation of blasting, and to make more room, you create a hollow in the centre of it by chiseling it out?—Yes; that is what we do.

6394. Is the soft part mineralized or not, generally speaking?—The soft part is generally mineralized, but not always.

6395. Do you generally save that or not?—We save that if it is mineralized.

6396. Take, for example, 10 holes; out of 10 holes do you save the part which is chiseled from one?—The chiseled part is not allowed to go with what is brought from the hole; the chiseled part is not mixed.

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6397. Is that because the chiseled part is generally speaking less mineralized than the blasted part?—No; it is more mineralized, but not always, it is generally said to be mineralized; it is of course selected; they take care of it; if it is not mineralized in the judgment of the miner then it is thrown away with the refuse.

6398. Generally speaking you would say that nine-tenths of what is chiseled out is thrown away with the refuse?—That would depend upon the character of it.

6399. Take an average of six months; is a quarter part of that which is so cut out saved?—I do not think that a quarter part in our mine is saved.

6400. Have you ever had that part which is chiselled out analysed in order to see what it contained?—Never.

6401. Then you do not know whether it contains noxious particles or not?—We presume that there is nothing more in it than what might come from the granite decomposing, or a little steatite; there is no arsenic I suppose, or rarely; no copper.

6402. It creates a small kind of dust being so very hard?—Yes; it is ground out sometimes; when it is hard we grind it out; the chisel reduces it to an impalpable powder.

6403. Do you conceive that the men must inhale some of this powder?—There can be no question of it, I think.

6404. But whether that amounts to inhaling anything more than the ordinary dust you do not know?—It is nothing more; we suppose so.

6405. Have you fancied in your own minds that this dust has been injurious or not?—It is our impression that it is injurious.

6406. What do the medical men say upon that point, or have you brought it under their notice?—Yes; it has been mentioned to them; but they have never been underground; we mentioned it to Mr. Bolitho.

6407. Have you ever known a case of this kind, that a man has become ill while employed in chiseling out this stuff, and has been then sent to some other part of the mine where he has become better, and then upon being sent back again to the first place has been taken ill again?—The last man who died in that neighbourhood was one of our miners; he was taken ill, and he remained at home for a little while. He came back again to work; we could not persuade him to give it up; and he then had a relapse, and he was very soon carried off.

6408. Have you ever had a man in your employment who was taken ill whilst employed in chiseling, and who was sent away under the idea that his illness was caused by that mode of working, to another part of the mine where there was no chiseling going on, and where he got better, and then returned to his former work and got worse again?—No.

6409. (*Mr. St. Aubyn.*) Have you ever known a man who was working in a bad part of the mine where his health suffered, and who was then sent to work in another part of the mine where his health improved?—They will improve if they have been working in a close part of the mine, and if they go afterwards into a part of the mine which is better ventilated. If they begin to fail a little underground you will find that they will improve if they come to the surface.

6410. (*Chairman.*) Do the men who work in the close ends suffer in their health?—Yes; there is no question about it, from working underground.

6411. (*Mr. St. Aubyn.*) Have you ever tried the plan of removing them to another part of the mine where there was less dust?—No; we do not suffer as to that; these men who died had not always been in the dusty part of the mine.

The witness withdrew.

Mr. RICHARD QUILLER COUCH examined.

Mr. R. Q. Couch.

6412. (*Chairman.*) I believe you are surgeon to several mines in the neighbourhood?—Yes.

6413. Have you been so for many years?—Yes.

6414. For how many years?—For 13 years.

6415. During that time have you turned your attention very much to what is termed the miners' disease?—Yes; very much.

6416. I believe, in the course of your practice you have for some time been making a record of such cases?—Yes; I have been making a record of every case that occurs.

6417. Will you be so good as to furnish the Commission with a copy of such record as you may have made?—I will.

6418. Do you consider that the disease called "miners' disease" is consumption or not?—If by consumption we mean tubercular phthisis, then I should say it is not.

6419. Does this disease end in tubercular consumption?—Very frequently.

6420. Have you had any opportunities of making post mortem examinations in such cases?—Yes; perhaps in 20 or 30; but it is very difficult to get them.

6421. But you have had some opportunities?—Yes.

6422. Is the opinion which you have formed as to this disease based upon the post mortem examinations which you have made, or upon the cases which have been brought under your notice?—The post mortem examinations have either confirmed or altered my previous ideas of the disease.

6423. Should you say that consumption generally prevailed in this part of Cornwall amongst other persons not miners?—Yes, I should. I think it does, but in considerably less numbers.

6424. In what district should you say it prevailed?—The district that I have particularly examined has been West of Hayle, and across the country to Marazion.

6425. *Mr. St. Aubyn.*) Do you mean west of a line drawn from Hayle to Marazion?—Yes.

6426. (*Chairman.*) Does that include any portion of an agricultural district?—Yes; St. Buryan and St. Leven, which are purely agricultural.

6427. Have you observed any difference with regard to consumption between the agricultural districts and the mining districts?—Yes; much difference.

6428. In which district does consumption most prevail?—Tubercular disease, or any disease approaching to disease of the chest, is occasional, and rarer in Sennen, St. Leven, and St. Buryan, than to the north of that which includes the mining district.

6429. Have you made any investigations as to the fishermen?—Yes.

6430. Have you observed that among the fishermen there is any tendency to tubercular disease?—Yes.

6431. Is that to a greater or less extent than amongst the agricultural population?—I think it is rather more than amongst the agricultural population; but considerably less than among the miners. I can furnish the data to the Commissioners upon which I found that opinion. I have made out the particulars for five years, and as I understand it, the fishermen are more liable to that disease than the agricultural population, and the miners are more liable to it than the fishermen; but I can furnish the Commission with the statistical proportions; they are already drawn out; a summary has been made for five years.

6432. You will be kind enough to furnish the Commission with that information?—Yes.

6433. (*Mr. Holland.*) Have you data to prove that there is an excess of tubercular consumption among fishermen as compared with agricultural labourers in this part of the county?—Yes.

6434. (*Chairman.*) Have you any data upon which you found your opinion that the miners are more affected with diseases of a similar kind?—Yes.

6435. (*Mr. St. Aubyn.*) Leaving the particular cause of death out of the question, do you find that the ratio of mortality is greater among miners than among fishermen?—Yes.

6436. Is it greater among fishermen than among agricultural labourers?—Yes.

6437. Independently of death caused by violence or accidents?—Yes; speaking of deaths from disease.

6438. (*Mr. Holland.*) Thoracic disease?—No, all diseases; I say that there is also an excess of tubercular disease among fishermen over agriculturists.

6439. And amongst miners over fishermen?—Yes.

6440. (*Chairman.*) How would you account, in the first place, for the excess of the disease amongst miners, and then amongst the fishermen?—It must arise, I think, from the nature of their occupation. It is not confined to this district; but it is so throughout the county. I have generally supposed (but it must only be taken for a supposition) that it arises from undue exposure, and the impossibility of getting that shelter and other comforts which fishermen are unable to get as compared with agriculturists.

6441. Then what should you say with respect to the miners?—I think that the occupation of the miners predisposes them to diseases of the chest; but to enter minutely into that subject I should have to go into the record of my cases.

6442. (*Mr. St. Aubyn.*) The general conclusion at which you have arrived is that the difference in the ratio of mortality among these labouring classes is caused by the nature of their occupation?—Just so.

6443. (*Chairman.*) Will you be kind enough to describe to the Commissioners the nature of the miners' disease as far as it has come under your observation?—The first indications of ill health are very obscure, extremely gradual in development; so gradual that the miners themselves never acknowledge it. You will find that the first symptom, perhaps, of the disease will be pain at the pit of the stomach, or an inability to climb the ladders with the usual rapidity; the muscular power becomes less than it has been in times past; and then, if I keep them at grass for a fortnight or three weeks, I find that they regain that muscular power, and they say that they are able to climb the ladders again with the same elasticity as before, and they will go on in that state for years without any apparent diminution of health, if the air be good.

6444. You say that they will go on in that state for years; but if they return again to mining do they suffer a relapse?—Yes.

6445. Do you, as a medical practitioner, when they come to you suffering from ill health, advise them to give up mining for a time?—Frequently, and especially if I find they are not improving under treatment. I find also—for I have had 1,100 or 1,200 men weighed—that if, before going down a mine, they are weighed in the same dress in which they come to the mine, and then work underground for six or eight hours, and are again weighed in the same dress, they have decreased in weight very considerably on coming to the surface, and if, the next day, I find that they have not regained the weight which they lost the day before, I advise them immediately to stop.

6446. That is in the case of those men who consult you as patients?—Yes; it is not the case with all miners that they regain on going down the second day the weight they lost the day before; but taking the average of all the mines in this district, or the 16 or 17 where I got the captains to weigh the men for me, and taking into account the shallow workers with the deep workers, the decrease is about 3 lbs. and 3 quarters; but if the deep workers only are taken into consideration the decrease in weight then amounts to very nearly 6 lbs. and sometimes more than that. With regard to the captains who go underground only occasionally, I find that they sometimes decrease in weight from 10 to 13 lbs. in the same number of hours.

6447. What is the greatest decrease that you have known to take place in the weight of a working miner?—About 7 lbs.; but in that mine they have been going from a shallow level to a deep one; after that the decrease in weight becomes greater; before that the decrease has not been so great. The nearer they are to the surface the less they decrease in weight, I think. I have small books provided I have arranged in a tabular form. I have given them to the captains, who have weighed the men on going down, and then entered their names and weights, and when they come up again they have weighed them again.

6448. The utmost loss of weight which is recorded is 7 lbs. in the case of a labouring man; what has it been in the case of a captain?—In the case of Captain Thomas Roberts there was a decrease in weight of 10 lbs., and in the case of another person the report made to me showed a decrease of 13 lbs., but he was a very stout man.

6449. Do you know at all the depth at which the man worked who lost 7 lbs. in his weight?—He worked, I think, at about 180 or 200 fathoms in a close end.

6450. Do you think that if a man worked in a close end at a shallow level, there would be any difference as compared with a man working in a close end at a deep level?—I think that they would lose more weight in a deep level.

6451. Should you attribute that to the exertion made in ascending?—It is much hotter below, and they lose more weight in proportion to the closeness of the end as well as the depth of the level; there are many circumstances to be taken into consideration. I think they lose it chiefly in work. In hot deep mines they lose more in reality than I have stated, for a large supply of water is sent down and much is drunk by the men.

6452. In any of the cases in which you have had the men weighed was there a man-engine to ascend by?—No; they all climbed up the ladders.

6453. Do you think that that would tend to diminish their weight?—I find that in a case where there is a man engine, at Wheal Reeth, the boys actually now get out of the man-engine and climb up between the lifts in order to give themselves a little exercise.

6454. (*Mr. Kendall.*) As I understand you, it is beyond all doubt that the miners, as a body of men, are less healthy than either the agriculturists or fishermen?—Very much so. Even healthy miners are more frequently on the sick list than other labourers.

6455. Does that bad health, on the part of the miners, in your opinion, arise from simple causes or from complicated ones?—I believe that there are several causes to which it is to be attributed, but chiefly to bad ventilation.

6456. Amongst them I presume you would enumerate the climbing up the ladders?—Yes.

6457. And perhaps also the want of drys?—Yes; the want of drys at the surface.

6458. And then, perhaps, also their mode of living, too many of them huddling together in small rooms?—Yes.

6459. Can you suggest any other causes which you think affect their health?—The first is, I think, a want of ventilation below the surface; that I think lays the foundation for all the mischief. That is why I think that the men, apparently in the enjoyment of good health, become blanched, their skin becomes sallow, and frequently assumes that kind of appearance which Dr. Addison calls the bronzing of the skin; and on examination, in several cases in which they have sustained injuries to the hand from jammings, I have placed the blood under a microscope, and I have found that the red corpuscles are very pale, and very much shrivelled, showing a deficiency of blood power. That is before they give any indications of disease, or before they complain.

6460. Would that arise as much from bad ventilation in their dwellings as from climbing, or from the

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perspiration being checked, because there were not proper drys for them to go to?—I put it down principally to their working at deep levels with bad ventilation, and for this reason I find that the engine-men, and those who work at the surface, and whose mode of life otherwise is of the same character, do not suffer from the same diseases.

6461. You have been, I believe, underground a good deal?—Yes, very frequently, and I find that the men are better taken care of than I was led at first to expect.

6462. Have you been through deep levels?—Yes, and think that much mischief is caused by the men themselves, by their throwing the "deads" or rubbish in the levels, so as to block out the ingress of fresh air.

6463. Is the natural ventilation fairly good in the mines which you have seen?—There is no system of ventilation in any mine I have seen. Where there are many shafts, the ventilation is very good, except in "ends" or backs of levels and winzes, as well as crop cuts. In Botallack, which is worked under the sea, there is a diagonal shaft going to the bottom. By this means, the ventilation is much better than before. But it is impossible thoroughly to air all places so situated. In one mine where there was only one shaft a few years since, the ventilation was dreadful, and all the men had failing breath, and on going to other and colder mines died from pneumonia and phthisis.

6464. How did you ascertain that the ventilation in that mine was bad?—I first enquired of the men, and took their accounts when they came to consult me without any reference to any enquiry afterwards; and they invariably described the ventilation as being excessively bad, as judged by their own standard of the "candles would not burn." This mine was unfairly bad.

6465. What do you mean by the terms "unfairly bad"?—I mean that there was a single shaft, and the mine was worked down into a deep pit, the levels running east and west of it, without any other ventilation, and very few winzes; and the health of the men was very bad.

6466. That would appear to have arisen from a desire to save money at the expense of the men's lives?—I will not give any opinion upon that; but I should hope not. The adventurers lived out of the county.

6467. You say that there were no winzes, or very few?—There were very few, and only one shaft.

6468. (*Chairman.*) Who was it that prevented you going down that mine?—The gentleman is dead now; but I could never get access to the levels, and even after I was appointed surgeon I never could get an opportunity of going down nor obtain any return of the ages of the men; in fact, I could get no information from the mine, except what I got from the men.

6469. As a medical man, you had no real opportunity of judging of the disease which afflicted the men?—Yes, I had; but I had no opportunity of judging of the state of the mine except from the reports of the men.

6470. Do you consider it your duty to enquire into the state of a mine?—When I find that there is much disease in it I do; and I must say that the captains are always willing and anxious to remedy any defect when it is mentioned to them.

6471. You make it a point of giving them notice?—Yes. I always talk to them about it, for the purpose of making alterations.

6472. (*Mr. Kendall.*) Have you any suggestions to make to the Commission with a view to improving the ventilation in the mines?—There are many suggestions to be made. Some of the miners are injured by accidents, for instance, by explosions; and I have tried to invent something in order to remove the tamping from the holes, but they object to use anything new, and will not even use what has been proved to be good; the captains have often to complain.

6473. What is it that you would substitute?—Instead of taking the tamping out in the usual way, I would use a thing something like a cork-screw, to be worked in the same way that a carpenter works an auger, to go down to the bottom, and then drawing it out almost like a cork from a bottle; you may not take all of it out, but it would be so loose that water could be thrown in on it and so prevent explosions.

6474. (*Mr. St. Aubyn.*) You have mentioned the circumstance of the men losing a great amount of weight in going down a mine, do you weigh them yourself?—No; the captains of the mines weigh them, or the managers of the mine; the local agent of a mine.

6475. Have you every reason to believe that the weights were correctly taken?—I asked them to do it to avoid doing it myself, and that they should make their own returns.

6476. Are you just as sure that they were correctly taken and recorded as if you had done it yourself?—I was weighed myself two or three times in their scales, and I found that I was the same weight with the exception of a quarter of a pound that I was in Penzance before I left.

6477. Do you believe that their scales were correct?—Yes; and their weights.

6478. You have no reason to doubt the correctness of their reports?—No.

6479. You have mentioned a number of causes of disease which are peculiar to miners, and with regard to the miners' disease, which you cannot call tubercular consumption, you think that that is chiefly produced by bad ventilation?—Yes.

6480. Are not miners subject to diseases of the heart?—Yes.

6481. To a considerable extent?—Not to such an extent as you might expect to find. I found those cases more at Camborne than here, where the mines are deeper.

6482. The deeper the mines are the more you find diseases of the heart prevail?—Yes; I would say affections of the heart.

6483. In mines where the men come to grass and go down again by ladders, would not the climbing rather produce affections of the heart?—Yes, I should think so; certainly the climbing would aggravate the disease if it had once set in.

6484. Are you not of opinion that climbing great heights by ladders from great depths, is calculated to produce an unhealthy action of the heart?—Yes. I think that the blood of the miner is decidedly in a state of impurity during the operation of climbing; while in the act they draw themselves up by their arms, and not by their feet; and then that impurity of blood is rendered still more impure by the cessation of respiration during the act of climbing; so that the state of the blood is rendered more unfit for circulation by the absence of respiration in the ascent.

6485. Then this action of the heart, caused by climbing supervening on the unhealthy state in which the blood of the miner is for want of ventilation aggravates disease?—Yes.

6486. Do you not think that any system by which climbing from great depths could be avoided would materially improve the condition of the miners?—Yes; and I may mention a case that occurred only a day or two since. A man was working in Wheal Reeth in a very close end, and disease of the chest was coming on. He went to work and was put in another place where he was lifted by a man engine, and he recovered, I should think, in less than a third of the time that other men labouring under the same disease would have recovered in. They were ascending to another shaft. I find that continually the case where the man-engine is employed, the men do not suffer so much, and they recover more quickly than they do when they have ladders to ascend.

6487. Have you put down in writing any observations as to the comparative state of health of miners in places where the man-engine and the skip are used and where the men ascend by ladders?—The man-engine has been so recently introduced into this district that I think it can hardly have produced any effect upon the health of the miners engaged; but they recover better and more quickly where the man-engine is used than without.

6488. (*Mr. Holland.*) After their lungs have been affected?—Yes.

6489. (*Mr. St. Aubyn.*) The skip being of still later introduction you have probably not made any observations upon the effect produced by its use?—Very few men come to the surface in the skip in this district.

6490. Do you attend any mines where they use the skip?—Yes, Wheal Reeth; and I see many men from Levant, where they employ a skip.

6491. You say that the men do not use it, do they prefer coming up by the ladder?—I do not know why, but there has been an objection and a difficulty in getting the men into the skip.

6492. Do you mean to say that where the skip is in use the men do not use it but come up by the ladders?—No; I have no experience upon that.

6493. You stated I thought in a former part of your evidence that they sometimes got out of the skip?—No, out of the man-engine.

6494. Upon the whole you are decidedly of opinion that either the man-engine or the skip, if they were introduced, would materially improve the condition of the working miners?—I think so.

6495. (*Mr. Davey.*) You did not give any reason why the men left the man-engine in order to ascend by the ladders?—They said that they found themselves so cold from coming from a deep level between the lifts, that they would get the advantage of running up the ladders until they reached the next lift to get themselves warm.

6496. It was not done from distress?—No; from mere wantonness, and only by boys.

6497. You stated just now that you had not found that the engine-men were affected in the same way as the men working underground?—Yes.

6498. I believe it is generally the case in Cornwall, when a man has been injured underground that he is set to work at the engine?—Yes.

6499. And the question is whether by working at the engine, and therefore at the surface, he becomes benefited?—He does become benefited. There are some cases in this neighbourhood of men who have been young, and have been so benefited when they have gone to work at the engine. The only indication of miners' complaint has been blood in the expectoration at intervals and from cold.

6500. How long have you been practising among the miners?—I think about 13 years.

6501. Have you found any difference in the health of the miners during that time?—Yes; I think that they are improving.

6502. Do you think that they are improving much?—Yes. I think that the young men do not show the same indications of disease that the old ones have done.

6503. Do you think that the miners are degenerating as a class?—I do not think that a period of 13 years is enough to indicate that.

6504. You say that the men lose weight in going up and down a mine, and that the loss of weight in the captains has been much greater than in the working men?—Yes.

6505. How do you account for that?—In the case of the captains, from their going underground so rarely as compared with the men. I do not now speak of the underground captains, but of the managers or residents of the mines who go underground perhaps only once a week to examine the mine.

6506. You do not speak of the captains?—No.

6507. Do you consider that they are in a worse condition from want of exercise?—They are very much stouter from not going underground. You rarely find an underground miner with any superfluous fat upon him.

6508. You have stated that you have been frequently underground, do you ever see much dust rising?—In the dry ends I have; but generally speaking, they have been wet.

6509. As a general rule I suppose the men cannot be injured much by imbibing the dust in working?—Under the microscope I discover dust, or at least I discover minute particles of granite and of other rocks where they have been working, mixed up with the sputa. Dr. Peacock was down here, and I have at his suggestion taken the expectoration and placed it under a microscope, between thin layers of glass, and I have found minute particles of stony dust.

6510. That could not have occurred except in very dry ends?—No, at least I presume so; where the rock is struck, and it is dry, although it may get wet afterwards, a blow will produce a dry cut, and dust may arise then. But very frequently in the expectoration of the miners we find these minute particles of dust, as I may call them.

6511. (*Mr. Kendall.*) Did you ever analyse the ordinary expectoration of a man on a dusty day?—Yes, and I have found dust there as well, but not angular particles of stony.

6512. (*Mr. Davey.*) Are you aware whether the places in which those men worked were wet or dry?—No.

6513. (*Mr. St. Aubyn.*) Have you examined the expectoration of those miners who have been working in wet ends?—Yes.

6514. Have you found an absence of dust in their expectoration?—I cannot say that I have particularly noticed it; I have not entered it, whether they have been working in one or the other. I have given them a bottle with a screw top, and I have said "When you get to the surface and you find any "expectoration is coming up, put it into this bottle, "and screw it down, so that no dust from the sur-"face shall get into it;" and allowing for some getting in, yet the quantity has been greater than with the ordinary precautions would have entered into it.

6515. You say that you have examined the expectoration of miners who had worked in dry ends, and there you found minute particles of granite?—I should say that I have examined the expectoration of miners without reference to whether they worked in dry or in wet ends, and frequently find in the expectoration angular dust.

6516. You cannot say from your own microscopic examinations whether there is more dust in the expectoration of those who have worked in dry than in the expectoration of those who have worked in wet ends?—No, I cannot.

6517. (*Mr. Holland.*) Are the mines here chiefly granite mines?—Yes, chiefly so; just on the borders of the slate with the granite.

6518. Although the floor of the level might be wet the rock itself would be dry?—Yes; but I have not made sufficiently minute observations as to the proportion or quantity of dust in a particular mine; I have not noticed it.

6519. You have stated that the miners' disease terminates in phthisis, is that a general observation?—It is a general observation. I do not say that every case terminates in phthisis, but only occasionally; I look upon miners' disease not as consumption, that is tubercular disease, but that the miners from their habits are so strongly predisposed to it that unfavourable circumstances will develop it.

6520. You are no doubt aware that there is somewhat less than the average amount of consumption among miners below the age of 30?—No, I do not know that.

6521. Assuming it to be the fact that there is less than the average amount of what is called consumption among miners below the age of 30, does not that

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seem to imply that miners are not more liable to consumption than ordinary men ?—I doubt the fact.

6522. But assuming that to be the fact ?—I doubt it.

6523. Do you doubt the accuracy of the returns made by the Registrar General ?—I doubt the fact of the Registrar General knowing whether it is tubercular disease or not.

6524. Is hemoptysis a common symptom in miners' consumption ?—Yes ; I have had eight cases since this day week.

6525. Take, for example, 100 cases, would it occur in 50 of them ?—No, I think not.

6526. Would you not find hemoptysis in 50 cases out of 100 of common phthisis ?—No, not here.

6527. Do the miners suffer much from hectic in the advanced stages of miners' consumption ?—No.

6528. Have they often symptomatic diarrhœa ?—No.

6529. When the disease is tolerably far advanced in miners and their occupation is changed, is not the disease frequently suspended ?—Yes.

6530. Is that commonly the case in ordinary consumption ?—No, I think not here ; when you speak of consumption I presume that you mean tubercular disease ; I think where it is pretty far advanced it occasionally will be suspended, but in the majority of cases it will not be, it will progress.

6531. At what age do miners generally become consumptive and die ?—I stated just now that the tendency of miners' disease was not consumption in the ordinary meaning of the term.

6532. At what age do the miners die of what is called miners' complaint ?—That will depend upon the mines they are working in and the influences they are under ; the average age, referring to deaths from all causes, in this district is about 44 to 47.

6533. (*Mr. St. Aubyn.*) That is amongst miners ?—Yes.

6534. (*Mr. Holland.*) That is about the age at which miners' consumption is most fatal ?—Yes.

6535. Ordinary phthisis is much more fatal early in life, is it not ?—Yes.

6536. Ten or twenty years earlier ?—Yes, very frequently.

6537. Does that seem to show that miners are peculiarly liable to phthisis ?—When you take that in connection with this, that the miner who is subject to the miners' complaint takes cold, and I have a case of that kind now. A young man at St. Just, called Harvey, was labouring under the miners' disease, and I had examined him not very long before as a matter of enquiry ; he was a healthy miner and I think about 25 or 26 years of age ; he was working in a shaft where there was good air, he having been placed there in consequence of having worked in a foul end where he had got the miners' disease, it was developing itself, not consumption ; he then fell from a board into the water, he caught cold, tubercular disease immediately developed itself, and he died.

6538. Have you been so fortunate as to be able to make many *post mortem* examinations ?—Not so many as I could wish to have made.

6539. How many have you made ?—Not more than 30.

6540. In how many of those 30 cases do you think there was tuberculous deposit ?—I should think in perhaps about half or rather more ; I should observe that they were selected, or at least I rather pressed the matter because I thought there was tubercular disease. The first few cases that I examined were tubercular, and in those cases that I thought tubercular, I rather pressed to have them, and I found that they were so.

6541. The number of cases in which there was tuberculous deposit would be above the average ?—Yes, it is not a fair average.

6542. The conclusion I should draw would be that tuberculous deposit was the exception and not the rule in miners' consumption ?—I have stated distinctly that tubercular disease is not the result of the miners' occupation, but it is the effect of it under unfavourable circumstances afterwards.

6543. But that effect is produced in the minority of cases and not in the majority ?—I wish distinctly to be understood to say that I do not think tubercular disease is the necessary result of the miners' occupation.

6544. (*Mr. Kendall.*) You have stated that you have sometimes heard of the men leaving the man-engine and getting on to the ladders. and then again ascending by the man-engine ?—Yes.

6545. I suppose that they get stiff and cold coming up by the man-engine ?—Yes.

6546. Is it not probable that in some cases the man-engine may be almost more dangerous than the ladders when the men come up from very hot ends through a cold shaft without having any exercise ?—No. If the drys were good at the surface I think that the man-engine would be a greater benefit, but the man-engine is a benefit under all circumstances.

6547. (*Mr. St. Aubyn.*) You do not think that the chance of catching cold while standing on the lifts would do away with the advantage that is derived from the man-engine ?—No; I think that the man-engine is a great benefit to them.

6548. (*Chairman.*) Is it not important to have changing houses near the ladder ways ?—Yes.

6549. (*Mr. St. Aubyn.*) You have mentioned the case of a young man whom you examined and found perfectly free from tubercular disease ?—Yes.

6550. He tumbled by accident into cold water, and rapid consumption set in, from which he died ?—Yes ; it was not immediate, he had an attack of inflammation in the upper part of the lungs, which in some six or eight weeks ended in tubercular disease.

6551. His death resulted from the effects produced by falling into cold water ?—Yes.

6552. Do you think that real consumption set in more quickly perhaps on account of his predisposition to it from having worked underground ?— Yes ; and I give that as an illustrative case.

6553. Have you observed in the mines with which you are connected that the drys are kept in good order ?—Yes ; the agents are erecting new ones in some of the mines with which I am connected.

6554. Do you find that there is generally a disposition to improve the condition of the mines ?—Yes ; if I speak to the pursers I find very little difficulty in getting my suggestions attended to. If you speak to the underground captains they sometimes forget. It is not done by the adventurers.

6555. If proper representations are made in the proper quarter do you find that there is every disposition to provide for the comfort of the miners ?—Yes.

6556. (*Chairman.*) Are those mines with which you are connected legitimately worked, or are they jobbing mines ?—There are some of a jobbing character ; but in others the shares are so large that they very rarely change hands.

6557. Have you found any difference, on proper representations being made, in the attention that is paid to them ?—Yes ; I think that those persons who are *bonâ fide* miners take more care of the health of the miners than persons who are in to-day and out to-morrow.

6558. You have stated that you think there has been an improvement in the health of the miners, judging by the younger ones ?—Yes.

6559. Do they go at a younger age to the mines now than they did formerly ?—No. I think that they go underground at 10 years of age. I have known two cases in Balleswidden go underground at eight years of age ; but that is an exception. I inquired of Mr. Young, at St. Ives, and he told me that the health of the miners was the same precisely as it had been when he was a young man ; he is connected with the old deep mines ; but his experience and mine do not agree on that point. I find the miners better in health.

6560. Do you find their health better in the shallow mines ?—Not merely there ; but in the new mines.

6561. The experience of Mr. Young was that there was not an improvement ?—Yes.

6562. Is the health of the miner likely to be more affected if he goes underground at the age of ten, or if he goes underground at the age of 17 ; in other words, would he become more accustomed to it by going underground younger ?—That varies very much. If an agricultural labourer goes underground at the age of 23 or 24, and works in a deep part of the mine, he is more rapidly affected than a man who has been working in the mine from a boy.

6563. As far as you can judge, the circumstance of going underground at 10 years of age rather acclimatizes the miner than otherwise ?—Yes.

6564. Have you arrived at any conclusion as to the ages of the working men in the mines ?—I have published one or two short papers on that subject, from the returns I have obtained at the request of Mr. Fox ; he wished me to publish them to the Miners' Association, and I think I may say that the average age of the males engaged in underground work is rather below than above 30. At St. Just I find that the average age, including the timber men, is 28 ; but excluding the timber men, the average age sinks down to about 26 and 27. Some time ago a gentleman connected with mining, said that he could not believe it. His son was appointed under the Census Act to take the census of that district, and I asked him to make a return, which he said he would do. He told me afterwards he was sorry to have to report that the average age of the whole of the miners in St. Just was 26.

6565. The average age was below what he expected to find it ?—It was below what I have stated. I have taken four or five of the most important mines, and left alone the others in order to save trouble.

6566. (*Mr. Kendall.*) You have given the average age of all the working men and boys ?—Yes.

6567. How low does that go down ?—Down to the age of 10 ; but I think there ought to be something put in the balance against that, and for this reason, that a number of able-bodied men from St. Just have emigrated to California and to other places ; but then I think that the average age of the working miners would be below 30 in this neighbourhood.

6568. (*Chairman.*) Would any difference, do you think, be made in climbing the ladders if the space between the bars was 10 or 12 inches ?—I think that the smaller the space between the bars the better.

6569. Can you state from your own knowledge what amount of money the men contribute to the club ?—I do not know exactly ; but I am acquainted with the working of the clubs.

6570. Referring to the working of the clubs in the mines with which you are connected, is relief given in case only of accident, or in case of sickness also ?—It is only given for external and visible hurts ; that is the phrase which they employ.

6571. In all the mines with which you are connected that is the case ?—Yes.

6572. Is the club-money left entirely in the hands of the pursers to manage ?—Yes. There is one mine where, I believe, the club itself is in a state of bankruptcy ; but still the adventurers pay the money, although they have no money in hand.

6573. When a man is laid up suffering from miners' disease, does he receive no assistance ?—I believe not.

6574. Then what means has that man of obtaining a sufficient supply of necessary food when he is out of work ?—I suppose the union.

6575. In the cases of the men whom you have attended, do you think that they would have recovered sooner if they had been supplied with more nourishing food during the time they were out of work ?—I have adopted the plan in the mines with which I am connected, of very frequently requesting the captains just before the pay-day or the account, to have soup and broth sent to these men, and in case there should be any meat left behind, that it should be given to these sick men.

6576. There is no regular provision made for a man if he is out of work ?—No.

6577. Do you not think that such a provision would be very desirable ?—Yes, most desirable.

6578. (*Mr. Kendall.*) You are aware that in every mine there is a club, and you have known many mines which have stopped. Do you think, upon the whole, that the club is a matter of profit to the men or to the adventurers ?—I am afraid that it is to the adventurers in jobbing mines.

6579. Do you know of any case in which a mine has stopped working when the club money has been divided ?—I know of a case in which a mine has stopped when the club money and the doctor's money, a surgeon never having been appointed, have been thrown back among the parties to pay for a dinner that was given at the closing of the affair.

6580. I suppose it was a small amount ?—No ; it went pretty well to pay for most of the expenses.

6581. (*Mr. Davey.*) You do not know of any instance in which the club-money has been divided among the men ?—Never. But I have made no enquiries on the subject.

6582. (*Mr. Kendall.*) I suppose there would be very great difficulty when there was a balance in hand in fairly paying it back to the miners, as they are a shifting population ?—Yes ; but it might be distributed among the sick connected with the mine at the time of its stopping, or given to a general fund for the benefit of miners.

6583. (*Chairman.*) Would it not be desirable that the club money should be used in affording relief in case of sickness, and not only in the case of accident? —Yes. I think it should be applied in the case of all sickness, as a good deal of that arises from the nature of the occupation of the miners, and when that is the case, I think that the club money should be used in affording relief in the one case as well as in the other.

6584. (*Mr. Davey.*) Would you not require a much larger sum to do that ?—No. There are some mines in this neighbourhood, which, so far as the club is concerned, are in a state of bankruptcy ; but in others, I believe they have 400*l.* or 500*l.* in hand; and if the club was made a combined club the redundancy in the one would counterbalance the deficiency in the other.

6585. If they began to work in a new mine, then, of course, the payments to the club would increase ; but if it were a mine that had been worked for many years, so many demands would be made upon the club that it would become bankrupt ?—It might, if accidents were numerous.

6586. (*Chairman.*) Would it not be very desirable that something in the nature of a dispensary should be established at which the men could obtain relief ? —Yes. There is one class of diseases to which no reference has yet been made, and that is diseases of the stomach. I have found in my experience that before any disease of the chest occurs the stomach becomes disordered, and the miners complain of pain in the head ; to such an extent does the stomach become affected that they cannot bear any pressure. This has struck me besides disease of the chest, and there is a general disinclination to work on the part of the miners, for there is great prostration of the nervous system ; the pulse beats not more than 48 or 50 in a minute, the depression is great. I believe it first arises from the stomach.

6587. From breathing bad air or poor air the miners become first affected in the stomach ?—The first visible effect has been in the stomach. The appetites of the miners then become very much impaired, and they are incapable of taking that food which is fit for them, and in fact, the foundation of very serious illness is laid.

6588. (*Mr. Kendall.*) Are you of opinion that their occupation produces indigestion ?—It is not that ac-

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tually; there is actual disease of the stomach, and they cannot bear any pressure.

6589. Is it inflammatory?—It is excessive tenderness.

6590. (*Chairman.*) In this district do the miners take down into the mines with them cold pasty or bread and butter?—They sometimes take down with them bread and butter, and sometimes cold pasty.

6591. But that is a heavy thing, is it not, for the stomach in a delicate state?—Yes, it is. There is one question which Mr. Holland proposed to me this morning, as to which I think some misunderstanding has occurred, in relation to the mortality of the children. Mr. Holland supposed this morning, when I referred to the mortality of children below five years old, that it was a low mortality upon the births; but on looking at my papers I find what I suspected, that that is not the case. I find in my reports that a certain number of children belonging to miners die below five years old, and therefore it is a per-centage upon the deaths of the children, and not upon the births of the children, to that statement I adhere. Many die very early; but if they survive that age, they live on in health.

6592. With regard to the dietary of the miners, the agricultural labourers, and the fishermen, which of the three, in your opinion, lives the best?—The agricultural labourer. He has a stomach to digest his food; but the miner could not digest what the agricultural labourer does.

6593. Which of the two spends most money upon his food?—I believe the miner does.

6594. Do you think that the miners are amply fed?—I do not think so.

6595. I mean considering the work they do?—I do not think that they digest the food which they get, and they want a better class of food.

6596. (*Mr. Kendall.*) Although the miner spends more, yet he requires more, and also a better class of food?—Yes. There is a woman who is living about four or five miles from this place, and she has a husband and four or five boys, who are all working in a mine, and I have made the calculation that they are earning from 11*l.* to 13*l.* or 14*l.* per month, and yet they have not a chair to sit down upon; there is scarcely a cup or a saucer in the place, and as for a bed, what they have got would be a disgrace to the poorest persons in the kingdom. But there are many others the reverse of this.

6597. Do you think that is attributable to intemperate habits?—No; I cannot account for it.

6598. (*Chairman.*) But that, I presume, is not general?—No.

The witness withdrew.

Mr. JAMES RICHARD QUICK examined.

Mr. J. R. Quick.

6599. (*Chairman.*) How long have you been practising in Penzance. Between eight and nine years.

6600. Have you had the charge of any mines as the doctor?—Yes.

6601. Of how many mines have you had charge?—15 or 16 at different times. I should mention that I resided at St. Just between 12 and 13 years, and at Chasewater 4 or 5 years, before I came here.

6602. During that time have you had more or less practice in mines?—Yes.

6603. Are you also surgeon to clubs which are not miners' clubs?—Yes.

6604. You have had considerable experience in this district especially?—Yes; I have.

6605. Should you wish to confine your observations to this district?—Yes.

6606. Have you turned your attention specially to the disease which is called miners' disease?—Not specially, but it has always had a considerable share of attention.

6607. Have you kept any register of the cases?—No; I have not.

6608. Have you made any investigations into the disease by means of *post mortem* examinations?—I have never had an opportunity of making one, there is always such an objection to it amongst the miners or their friends.

6609. I suppose you think it is desirable to make such examinations?—Very so.

6610. How have you arrived at your conclusions as to the nature of the disease; merely from the symptoms?—Yes; assisted by the stethoscope.

6611. Will you have the goodness to describe to the Commission what you consider to be the miners' disease?—Chronic bronchitis, or a thickening of the lining membrane of the air passages.

6612. Does the disease usually end fatally?—Yes.

6613. Does it ever lead to consumption?—No.

6614. You are of opinion that it is quite independent of that?—Yes; it is quite a distinct thing from consumption.

6615. Have you never, in your practice, seen any cases in which it has ended in tubercular consumption?—Not as a consequence.

6616. Do not you examine those who are afflicted by the stethoscope?—Yes.

6617. Have you never discovered in any of those cases that the disease was tubercular consumption?—No.

6618. Have you found any cavities in the lungs?—Not in what is commonly called miners' consumption.

6619. Have you met with many cases of real consumption in this district?—Yes.

6620. Does that disease prevail amongst the agriculturists or amongst the fishermen?—They are all liable to it; we get it in all classes.

6621. Do you find it in any one class more than in any other?—I do not know that it is so. I cannot speak from observation upon that point.

6622. Do the cases of miners' disease prevail to a great extent?—After a certain age a large proportion of miners have it, more or less.

6623. At what age should you say that they were generally affected by it?—After the age of 20 years, seldom before.

6624. You think that there is more of it after the age of 30?—Yes.

6625. When a miner comes to you complaining in that way, what course do you recommend him to take for the purpose of preserving his health?—If he can give up the work we recommend it by all means.

6626. Do you recommend a man not to go down into a mine again?—Yes, if he can avoid doing so.

6627. Are they not sometimes obliged to go?—In many cases they are obliged to do so.

6628. For what reason are they obliged?—For the want of other means of obtaining a living.

6629. Therefore after you have warned them of the consequences of going down into a mine again they are compelled for want of other means of obtaining a livelihood to go down?—Yes; many of them are, but some may be able to obtain their living by taking a small farm, or by some other means on the surface. Some of them after giving up going underground will go to work on the burrows, are exposed to the cold, and consequently do not obtain the benefit that they would if they were engaged in other employments.

6630. In those cases do you ever endeavour, at the mines with which you are connected, to obtain employment for them on the surface?—I sometimes direct the attention of the agents to such cases. When a man has become disabled underground, if they can possibly find a place for him to work in at the surface they do so.

6631. When a man is merely affected slightly and comes to you in the first instance, what do you recommend him to do?—To rest, and use the means

that generally relieve such cases. If an advanced case, to seek other employment.

6632. You do not mean the case of a man who is merely slightly affected?—No; perhaps he would not do so, he might endeavour to get work at a shallower level than he was working at before.

6633. In cases where you have seen the men and warned them that the disease would continue if they went to work below, do you think that if they did not go down the disease would be arrested?—I do, if in an early stage.

6634. You think that the disease would be stopped?—I think it would not progress, perhaps they might not get much better, but they would continue to live many years if they gave up working underground.

6635. Being obliged to go to work underground the disease gets worse, and it ends in the early death of the miner?—In some cases it ends in an early death, but not always. Some miners work on in suffering for many years, which they may do by selecting a well-ventilated place. Some mines are worse than others.

6636. Do you think that there is any difference between the tutwork men and the tribute men in the way in which they are affected?—I cannot speak of any difference. I have not remarked it. I should not know one from the other by his appearance.

6637. When the miners come to you do not you enquire where they have been working, and whether at tutwork or at tribute work?—Not always; if they work underground I think the work is very much the same. They use a mallet in boring.

6638. What, in your opinion, produces the diseases?—The disease is produced by several causes; such as breathing in an atmosphere rendered impure by powder smoke, combustion, dust and exhalations from the ground, climbing, and boring, and changes of temperature in going from cold to hot, and vice versâ.

6639. Do you mean in coming up and going down the mines?—Yes, and as well while working underground; if a man has been working in a very hot place, after a time he comes into a draught to cool himself; that is one of the causes that I think would operate in producing the disease.

6640. Have you been down many of the mines?—No; I was down once only.

6641. Have you not turned your attention particularly to the causes of the disease, and considered what are the best remedies for it?—I have considered both, and have found that, although the disease is not cured, it is often very much relieved by emetics, alteratives, expectorants, and counter irritation.

6642. Do you think that the food which the miners eat at all affects the men, or has anything to do with it?—Yes; many of them live very hardly, and are thereby rendered more susceptible of disease. Those who have health have generally very good health.

6643. Do you think that the kind of labour which they perform requires any better food to sustain them than they get?—In many cases I have no doubt that it does; some of them are in better circumstances than others, and have very tolerable food.

6644. When they are out of work, and suffering from illness, and come into your hands for treatment, what provision is there for them?—I am not aware that there is any, in the mines, if suffering from temporary illness only.

6645. If he is suffering from bronchitis, or from miners' disease, does he receive any assistance then? If completely disabled by disease or infirmity they are generally provided for in the large mines, but always so, in all mines, if disabled by an injury. A great number of them are members of benefit societies, and receive pay from them whenever lawfully disabled.

6646. Otherwise there is no provision, I suppose, but the union for a man who is ill?—I do not know that they have any means provided for them, and unless they have some of their own they must have parish relief.

6647. As a patient, I presume you would think it desirable that a miner should have good food while under treatment?—Yes.

6648. But there is no provision of that kind for them?—If a man meet with an accident he is allowed a certain sum monthly during the time he is disabled, if sick he has weekly pay from his sick club.

6649. (*Mr. Holland.*) I think you stated that you had a large number of men in your charge both as ordinary club patients and as ordinary mine patients?—Yes.

6650. A large proportion of both classes come to you?—Yes.

6651. Is there a much larger proportion of chest disease among the miners than among the other men?—Yes; I have here the 16th annual report of the Polytechnic Society, which contains a paper on this subject from St. Just, and which shows that out of 63 deaths, of males above 10 years of age, 34 were from diseases of the chest, and of these 28 were miners and 6 not.

6652. So that three fourths of the deaths from diseases of the chest were amongst miners exclusive of accidents, one fourth being not miners?—Rather a larger proportion, about 4 to 1.

6653. Is the chest disease among miners chiefly that disease which you recognize as the miners' complaint?—Yes.

6654. But does the result of your own observation correspond with that report?—Yes, I think so; pretty nearly for that district.

6655. Of the chest diseases which you have seen among miners, has a large proportion been that which you recognize as the miners' complaint?—Yes.

6656. Are you certain that that miners' complaint is but rarely true phthisis?—I think it is never so.

6657. (*Mr. Kendall.*) In your opinion, does miners' consumption ever degenerate into the other disease?—No.

6658. You do not think that it predisposes the miners to tubercular disease?—No. If there be a tendency to tubercular disease previously, it might hasten its development.

6659. (*Mr. Holland.*) In practice, are the two diseases easily distinguishable?—Yes.

6660. And they vary very much in their history?—Yes.

6661. Is not spitting of blood a very rare symptom in miners' consumption?—Yes; it is not a very common symptom. We meet with it occasionally.

6662. Does it occur in one case in six?—I cannot say exactly.

6663. Does not spitting of blood occur in a much larger proportion in cases of phthisis?—Yes.

6664. A very much larger proportion?—Yes.

6665. Is not hectic of rare occurrence in miners' consumption?—Yes.

6666. Is diarrhœa a frequent consequence of miners' consumption?—No.

6667. Is it a very rare consequence?—It may occur occasionally; we do not expect it as a regular symptom.

6668. Is there much pain in miners' consumption?—Not generally.

6669. Is there much less pain than in phthisis?—There is less pain, unless there is any complication. I am speaking of the disease itself.

6670. Is pain more frequent in phthisis than in miners' consumption?—Yes.

6671. When the disease is considerably advanced, and the miners can change their employment and work at grass, is there a fair chance then of arresting the progress of the disease?—Yes, or, at least, in retarding it.

6672. When phthisis is far advanced can the disease frequently be arrested?—No.

6673. These are clearly distinguishing marks between the two diseases?—Quite so.

6674. (*Mr. Kendall.*) As I understand your evidence, you are satisfied that the miners' disease and

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true phthisis are distinct and separate diseases?—Yes.

6675. Are you able to state, from having in your practice attended both agricultural labourers and miners, and from having seen cases of true phthisis and miners' consumption, what is the average duration of the one as compared with the other? Or, in other words, after a man is attacked, is the miners' disease longer in causing a man's death?—Yes; it is generally very much longer; it may last for many years.

6676. Take the average in a given number of cases of true phthisis, and the average in a similar number of cases of miners' disease, what should you say was the duration of life after the first attack?—I am not prepared to answer that question.

6677. Have you come to this conclusion, that the miners' disease is of a much more lingering character than true phthisis?—Yes; decidedly.

6678. You are of opinion, I think, that the miner's life is shorter than that of the agriculturist?—Yes; it is generally so.

6679. Of the two, which do you think is the most careless of life; the miner or the agricultural labourer?—The miner.

6680. Although his life is confessedly shorter, yet he is less careful of it than the agriculturist?—Yes.

6681. What is your opinion with regard to the food of the miner? Do you think that he requires better food than the agriculturist?—Yes.

6682. Do miners live better on the whole than agricultural labourers?—No.

6683. Comparing the wives of the agricultural labourers with the wives of the miners, do you think that the miner's wife is as attentive to her husband's food, and as careful in the management of his domestic affairs as the wife of the agricultural labourer?—Some of them are, but there is a great variety in both classes.

6684. But take them on the average?—I should say, taking them on the average, yes. There are, of course many of them who are not so.

6685. You think that they make a shilling go as far as the wife of the agricultural labourer?—Yes, very many of them do.

6686. (*Mr. St. Aubyn.*) Is the principal part of your practice among miners?—Not at present.

6687. How many mines do you attend at the present time?—I attend at only two mines now. I have attended more until lately.

6688. I think you stated that you had only been once underground?—Only once.

6689. You have not made any *post mortem* examinations?—No.

6690. And you are not acquainted with the operations of a miner underground so far as they affect his health?—I have an idea of it, but not from my own observation. I fancy just what it is.

6691. Have you ever made practical experiments on the condition of the men before going underground, and when they have afterwards come up; such as weighing them, or analysing their blood or their expectoration?—No; nothing of the sort in any way.

6692. (*Mr. Davey.*) I think you stated that the miners were obliged to work in foul air as they cannot get any other place to work in?—I stated that many were obliged to continue their work underground, not in foul air.

6693. Do they not receive better wages when they work in these bad places?—I think they do.

6694. Are you aware whether they work there from choice, and because they do receive better wages?—I suppose they do, and that the extra wages are an inducement.

The witness withdrew.

Adjourned to St. Just at 12 o'clock to-morrow.

ST. JUST.

Thursday, 31st July 1862.

PRESENT:

The Right Honourable Lord KINNAIRD, K.T.	JOHN ST. AUBYN, Esquire, M.P.
NICHOLAS KENDALL, Esquire, M.P.	P. H. HOLLAND, Esquire.

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

Captain RICHARD BOYNS examined.

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6695. (*Chairman.*) Of what mine have you charge?—Huel Owles.

6696. Have you charge of any other mines?—Yes, I have had the management of another mine this last week or two, but I cannot make much report of that yet.

6697. What is the produce of Huel Owles?—Tin.

6698. How many men are employed underground?—About 170.

6699. Is it a long established mine?—The present working has been from 1834. I have been in the mine from that time.

6700. Is it a deep mine?—Not very deep. We have several shafts down from 160 to 170, the deepest shaft would be 175 fathoms; that is the deepest pit in the mine.

6701. How do the men ascend and descend there?—By footways.

6702. And ladders?—Yes.

6703. What is the distance between the staves of the ladders, are they 10 or 12 inches?—Principally a foot; in this last year or two we have introduced some 10-inch distances. The miners do not like the short distances.

6704. Which do you think is best?—I think that the foot is quite as good as the 10 inches.

6705. Are there any hot levels in the mine?—I do not know of any part of our mine but what is in a good state of ventilation.

6706. With regard to the heat, have you ever ascertained the heat of any of the levels?—No; our miners can work with all their clothes on comfortably; in some mines they throw their clothes off, they are not required to do that in our mine, ours is rather a cool temperature; but what the temperature is I am not exactly prepared to say. I think the principal reason of that is because we have cross-cut from one lode to another. We are working on six or eight lodes, and a great many of the parallel lodes are being cross-cut, which is quite as good if not better than bringing down a shaft from the surface.

6707. Are there any particular shafts which you know of that are down-cast or up-cast shafts?—I have observed a current of air coming up and passing down slightly.

6708. Is there constantly the same up and the same down-cast, or do they vary according to the wind and weather?—I think that there is a variation. I have been struck with the current going down and

coming up, but I cannot say that it continues regularly. I do not think it does; I think that it varies.

6709. If it changes, and there is no regular up-cast; does that air circulate constantly through your cross-cuts and your winzes, without coming up at all to the surface; may not that be the case?—I should fancy that it came up. Where we have so many cross-cuts it must get up in some way or other. I can hardly see how it can come up where there are very few shafts in a mine; I think that it would die away.

6710. And circulate through them?—Yes, I think it would.

6711. How far would you say that it would be safe as regards ventilation to drive a level from a winze or a cross-cut?—30 or 40 fathoms in most cases would be quite far enough. Sometimes we can drive 50 fathoms better than we can drive 10 or 15.

6712. You cannot account for that?—I cannot.

6713. Are you speaking now of the same mine?—Yes, in our own mine. On the average we can drive 20 or 30 or 40 fathoms very comfortably.

6714. How do you judge as to being able to drive further or not?—The burning of the candles is one test.

6715. Have you any other test?—We find that we cannot breathe very well when we get into bad air.

6716. You have no test but the burning of the candles or the feelings of the men?—We are governed generally by these.

6717. Do you ever try whether the draught ascends or descends the winze nearest the level; whether the draught is up or down the winze which communicates with the level in which you are working?—I think that it is up in most cases. I am not prepared to answer that question with confidence, but I think that the draught would pass up.

6718. You have not tested it?—No.

6719. (*Mr. Holland.*) You have not particularly observed it?—No.

6720. When you find that the candle goes out, and that the men are suffering, do you use artificial ventilation?—Yes.

6721. But not invariably?—Always when required.

6722. Do you think that it would be desirable to do it as a regular rule?—I think very much can be done by turning the draught, as in the coal mines for instance.

6723. (*Mr. Kendall.*) By sollering?—Yes. There is a winze in our mine now where we have put in woodwork on purpose to stop the draught from going up and to send it on.

6724. (*Mr. Holland.*) That is a temporary stoppage of the winze?—Yes.

6725. (*Chairman.*) Do you soller at the side and bottom, or the top?—In this case it is put in at the top for safety.

6726. Have you found that the soller when put in has created a sufficient current of air to allow the candles to burn, and the men to work without suffering?—Yes, quite. I have scarcely known an instance of a candle going out in our mine for the last 20 years. We are in the habit of sinking so many winzes, and have so many shafts from the surface; I think we have nearly 20 shafts in the mine. We do not know much about bad air; we profess to be in a good state of ventilation, and that is one reason why I am not prepared to answer any difficult question upon the subject. Our ventilation is decidedly good.

6727. (*Mr. St. Aubyn.*) What is the greatest distance in Huel Owles from any close end to a winze or shaft?—I do not think that we have ever driven above 60 fathoms.

6728. But you find that even in close ends 50 fathoms from a winze there is no difficulty in a candle burning?—We are often compelled to bring down a winze, or some other means, before we have driven anything like that distance. We have driven nearly 30 miles of levels, and as much as 50 fathoms without artificial ventilation.

6729. That is an extreme case?—Yes.

6730. Ordinarily speaking in your average working what is the distance?—About 20 or 25 fathoms would be as far as we should think of driving.

6731. And you never find that a candle burns badly at that distance?—We have found that at not more than 10 fathoms, and sometimes when the lift has been put down and the ends only just pitched off, the air very indifferent. When the miners have complained to me that the air has not been good, I have called the attention of the under-ground captains to it, and they have given a similar report that the air has been bad, although such a short distance from a draught. That, however, is a very rare instance.

6732. (*Chairman.*) When were you last down the mine?—I have not been in the habit of going down lately. I have never had much underground work except dialling.

6733. Did your health suffer much from going underground?—I am not prepared to say it did; but the doctor advised me not to go underground, as I have been subject to pleurisy.

6734. The underground captain, I suppose, could speak more to this point?—Yes.

6735. Will you give me the names of your underground captains?—John Halls the senior captain and William Rowe. I have laid out the surface work entirely.

6736. On setting days a list of rules is referred to, is it not?—Yes.

6737. Have you a copy of that list with you?—No.

6738. You can furnish it?—Yes. Our rules are stuck up in three or four places in the mine, constantly, and we refer the miners to them every setting day.

6739. With regard to candles; what do the men pay for the candles?—9*d.* per lb.

6740. And how much for the powder?—The same.

6741. Those are bought wholesale by the mine, I suppose?—Yes.

6742. What is the average price for which you get candles and powder?—Candles, I should think, at about 6*s.*; from 5*s.* to 6*s.* Of powder, 54*s.* or 55*s.* is about the average.

6743. Is there any peculiar kind of powder which you use?—We have been supplied from Kennall Vale I believe from the beginning. We have tried a new sort of powder from Davey, Brothers, and our miners did not like the powder, it did not seem to have sufficient percussion quality. It was too slow in doing its work. The smoke, however, was not quite so much.

6744. Are the men allowed a certain quantity of candles each time they go down?—Two lbs. are delivered on Monday morning for the week.

6745. Are they never allowed any more?—Scarcely ever. A great many applications are made for additional candles, but we hold that all increase of consumption will come out of the adventurers' pocket.

6746. And therefore you limit it?—Yes. In some cases where candles have been stolen, and where men have been working a very long time, we have given more, but very seldom.

6747. What is the amount of money that the men pay for club-money?—One shilling. That includes the doctor and club; sixpence the doctor and sixpence the club.

6748. Is there anything paid to the barber?—No.

6749. I suppose that for sharpening the tools there is so much?—The blacksmith's charge is deducted with the materials. It is very small compared with what it used to be, since cast steel has been introduced into the mines.

6750. Are the tamping rods of iron?—Iron, with a composition of brass, copper, and some mixed metal, but latterly we have introduced oak sticks. We cannot get the men to do as we wish. When the

agents turn their backs, the men will very often charge their hole with the borer; they are very reckless in this respect.

6751.—These tamping rods are of composition?—Yes, a piece about two or three inches long, put on at the bottom of an iron bar.

6752. (*Mr. Holland.*) Is it bronze?— Yes.

6753. (*Chairman.*) And it is such that if struck against the rock it will not create a spark?—I have heard some of the miners say that they have seen fire when they have been using them.

6754. The object, of course, in furnishing them with these rods is to prevent a spark being created and igniting the powder?—That is the object.

6755. But you are not quite sure that the composition which you use has had that effect fully?—I believe it has. I have heard some of the miners say that they have seen fire in the hole. Some of our miners would strike fire with almost anything. We have engaged to supply them free of cost with oak sticks, which is the hardest wood, and the greatest portion of them at this time are supplied, on purpose to prevent accident.

6756. Is the oak stick considered by a miner heavy enough for that work?—That is a question upon which they differ very much. I can come to no decision at all upon it in my own mind. I have heard some of our best miners say that they can sufficiently tamp the powder with oak to blast the rock in this district, and that powder does not require so much tamping as some of our miners imagine, and I believe that that is a very prevalent notion.

6757. But there is an impression that they cannot tamp sufficiently with an oak stick?—That impression exists, but I am inclined to think that the powder can be tamped sufficiently with it.

6758. At all events an oak stick is another tool that they have to carry?—Yes, they would have to carry it down; it would be very little trouble to them to do that.

6759. Would an oak stick be substituted by you for the other tamping rod?—No.

6760. (*Mr. Kendall.*) They would take both?—Yes; the tamping should be put in on the powder with something stronger than an oak stick, I think.

6761. (*Chairman.*) Therefore you would consider the oak stick extra to the present tamping rod?—Yes.

6762. (*Mr. Holland.*) Is the oak stick used for pushing the powder down, and the tamping rod for driving the tamping?—Yes.

6763. (*Chairman.*) Has the safety fuse been introduced in your time or was it before your time?—Since my time; I cannot say how long.

6764. That has been of great use in preventing accident?—Very great; there is no question about that.

6765. Have you had any accidents from blasting in your mine in the last five years?—We had an accident not more than two months since, but it was not a serious one; the man has recovered nicely. The rock was blasted to the bottom of the hole, I believe. The man has gone to work again. We have had accidents in our mine; but not many considering we have been working a long time. From 1834 up to this time, only three men have lost their sight.

6766. Was that what induced you to recommend some other tamping rod; was it in consequence of an accident?—It was in consequence of the accident the other day. We cannot get the men to use the oak sticks. We have offered to supply them with as many as they will call at the carpenter's shop for; when one has got unfit, they can have another for asking, and yet they will not do it.

6767. How did the accident occur to which you have last referred; can you state the exact cause of it?—I think that the man was charging the hole with the borer; he fired the charge.

6768. (*Mr. Holland.*) While tamping?—Yes.

6769. (*Chairman.*) Do you use cartridges?—Scarcely ever.

6770. Only in wet places?—We have no wet places. This district is very free from water; it is a very dry district; and very few cartridges are used; I should think that a dozen would last us six months.

6771. Have you ever in your experience seen a cartridge made by a miner on the spot, and then put into the hole?—Yes.

6772. How are the doctors appointed?—By the adventurers.

6773. Is there any examination or qualification for a doctor to be appointed as a mine doctor?—I cannot say much about that. I think that it is done by interest principally. In some of the mines in the parish the men have the control so far as to make choice of their own doctors, and keep their own club, but this is a bad way of getting on. We find that these things do not last long; they are generally knocked up. Our club is a great benefit.

6774. Is the club money only for visible accidents, or is it applicable for sickness in the mine?—It was started at the commencement as a sick and hurt club, and we found that the expenditure was more than the income; then we had to bring it back to a hurt club, and it is that now; it just meets its demands as near as possible.

6775. Do the men who are blinded receive anything from the hurt club?—Yes; and will as long as the mine is at work I expect; we have not thought of reducing their pay, or cutting it off.

6776. Men who have left work from illness have no right to relief from the mine?—We have occasionally departed from the regular rule, and in particular instances have relieved them. There is a provision in the rule of the club that the full pay will be reduced if the club will not support it, and that they will receive in proportion as the club will afford.

6777. Are the rules of the club given to the men, or do they know them?—They are read to them frequently

6778. Are the rules of the club included in the rules which I have asked you to furnish?—No; they are a separate set of rules, and there are rules of the death club as well.

6779. Have you any objection to furnish those rules?—I shall be very happy to do so.

6780. With regard to payment, do you pay a pair with notes or gold or partly gold and partly notes?—Partly gold and partly notes.

6781. Do you think that the payment of notes may induce the parties to go to the public-house in order to get change?—I suppose so, in a very few cases; but many of the men would go to the public-house whether they got notes or not.

6782. (*Mr. Holland.*) Does the mode of payment induce them to go to the public-house materially?—No; I think not.

6783. You have said that the club money was originally for a sick and hurt club, and is now for a hurt club alone; does it about balance itself now?—Yes; that is, keeping on the hurt money and relief in a few cases of any serious illness or any great destitution where persons are not able to work.

6784. Is not that independent of the club?—We have power by a regulation that we can relieve those cases out of the hurt club.

6785. Then the hurt money is a little more than sufficient to pay for hurts?—Yes.

6786. And the balance is used for extreme cases of sickness?—Yes.

6787. When you drive a level 50 fathoms in advance of a winze, I suppose you have a soller; you cannot drive it without a soller, can you?—Yes, sometimes we can; but very often we carry a soller or bolt at the bottom.

6788. A kind of imperfect soller?—Yes; for instance, if it is a tramroad level in fixing the runners for a tramroad the soller is easily made, and by carrying the level a little higher we can carry a bolt underneath the tram.

6789. You spoke of some of the men saying that

sparks had been seen in working with a tamping tool which was made of mixed metal, do you believe that?—No; I have no confidence in that statement; although we do not know exactly what the metal is. For instance, we knocked up a cylinder which was worn out, it was made of nice soft yellow metal, and that has supplied us for a considerable time.

6790. (*Mr. Kendall.*) But you mix tin with it?—We put a little tin with it occasionally.

6791. Your club money is one shilling a month, of which sixpence goes to the doctor and sixpence to the man?—Yes.

6792. For that the doctor is obliged to attend the miner's family, is he not?—Yes.

6793. You have mentioned about your own mine; from your experience, and from what you have heard, do you think that there is good faith kept with the miners, as far as the club money goes, by the adventurers and the pursers?—Yes; I have no doubt that it is kept correctly; our account has been kept separate from the beginning.

6794. Without speaking of your own case, do you think that good faith is kept with the miners by the adventurers?—I should hope so; in our case it is kept to a farthing.

6795. You have great experience, and I know that you have great shrewdness, and I want an answer to my question, which I am sure you will give me, be it for or be it against the adventurers generally; I ask you fairly, do you believe, as far as you have heard, that good faith is kept by the pursers on behalf of the adventurers with the miners as far as club money goes, or do you think that in some cases profit is made by the adventurers out of it?—I do not know of any case where any profit has been made. I cannot answer that question. Our account has been kept to a farthing, and balanced every quarter.

6796. As far as your experience goes, the money which is usually charged to the miner is not much more than enough to meet hurt cases?—No.

6797. You tried to make it meet hurt and other cases, and it would not do it?—It would not support that.

6798. But now, as I understand you, you first of all make hurt cases a matter of course, and if you have a balance you apply that balance to the other cases?—Yes.

6799. So that the whole of the money is applied to the benefit of the miners in some way?—Yes; every farthing in our mine, and I shall be very glad to see it again fully established as a sick and hurt club, which we shall do on the first opportunity, and then if we have not the means to support that we shall be obliged to fall back on the hurt club again.

6800. In Huel Owles your working extends back to 1834, but was not Huel Owles worked long before 1834?—Yes; I know that my grandfather worked Huel Owles for some considerable time.

6801. When you began to work in Huel Owles there were considerable old workings?—Yes, very extensive old workings.

6802. And you resumed a great portion of those extensive old workings?—We did. The sea level was brought in from high water about three quarters of a mile. We have driven that sea level into all the tenements round there.

6803. From 1834 up to the present time, after making use of the old workings by cross cutting and so on, you have found the natural ventilation very good?—Very good indeed.

6804. And you have never known a case where a candle has gone out?—I have scarcely known a case.

6805. Do you not think that sometimes in this county there is false economy in not having cross cuts?—Yes, I am quite satisfied in my own mind that it is very bad mining indeed when cross cutting is neglected. With good ventilation the men can do 50 per cent. better labour.

6806. The non-use of cross cuts is a very false economy?—I think so.

6807. You stated that you have observed that there is a variation sometimes in currents, but those variations are not very capricious are they; they do not change every hour or two?—No; but generally these currents seem to me to be so very trifling that you can hardly detect whether the current is up or down; it is very slight so far as is detected from the surface.

6808. Can you tell from the nature of the current whether or not the foul air is (to use a mining phrase) wabbling about the different levels?—No.

6809. You think that it moves about?—Yes.

6810. It remains there you think?—No; I think that it will pass up the mine eventually; but then it moves about through the mine before it finds its way out. It cannot get up at once, that is very clear.

6811. It takes some little while to get up?—Yes. Where there is so much good air getting into a mine, the poor air must be driven away.

6812. You have very little water in your mine you say; if that be the case, if there be dust in any mine, you ought to have dust in your mine in working; did you ever hear the miners complain of the dust?—No; we have sufficient water to prevent dust.

6813. Did you ever hear in your life a miner complain of dust?—Never.

6814. Of swallowing dust from boring and so on?—Never. There is a dampness, but the water in the district is certainly very little.

6815. Generally speaking, are the miners healthy as a body or not?—Yes. I am prepared to say that our men are a very healthy lot of men.

6816. (*Chairman.*) You are speaking of your own mine?—Yes. I would rather make remarks upon our own mine than upon any other. I know very well that from the meat which our men carry down with them there cannot be much amiss with them.

6817. (*Mr. Kendall.*) Do your miners live better than agriculturists; do they spend more money on their meat?—Yes, I think that that is certain.

6818. What is the nature of their food; pasties?—No, they do not do much in pasties. They carry underground bread and butter, and a little light cake, but I think that most of them live pretty well at home.

6819. What do they have for supper when they get back; is not their evening meal their chief meal?—Yes; they get beef sometimes and pork steaks, and so on; they can manage to live very well.

6820. Taking them as a body they are very intelligent I know. Are they reckless in their mode of dealing with powder, and so on?—I think very much so; some of the oldest men in our mine are so. There is one man in particular now, a man with eight or ten children, a nice steady man as any in the parish, and yet the miners and the agents tell me that when he charges his hole, he will take up the first tool that comes to hand, whether it is a borer or a bar, and will knock away upon the powder with the full length of the arm, the same as if it had been a little soller. That is only one instance, but as a rule the recklessness is principally among the young men.

6821. But you mention this as a case which has grown up with the man's growth?—Yes.

6822. They are reckless about powder?—I think so. I think that if anything could be done to make them a little more careful in that respect it would be very desirable.

6823. (*Mr. St. Aubyn.*) To the best of your knowledge and belief have the adventurers of the mines ever derived a single penny of profit from the club money belonging to the mines?—I do not know of any instance where they have done so.

6824. To the best of your belief they have not?—I have heard some observations upon that question before; but I have never known a case where money deposited by the men has been put to the adventurer's account.

6825. You have read observations to the contrary.

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Do you believe those observations to have had any foundation in truth ?—I do not know that I have got anything in my own mind definite upon the subject. I have heard a talk upon the subject, and I know very well that it ought not to have been so if it has been ; not a single case has ever come under my own observation.

6826. With regard to the accidents from tamping, we know that the men are very reckless ; do you think it would be possible by any means which you could devise to prevent the men using their borers and bars in tamping ?—I fear not ; I do not see how an accident could happen in charging with an oak stick ; but if the hole should miss fire the miner would beat out htat hole again, and although it need not be done of necessity.

6827. You mentioned cases in which the men had oak sticks supplied to them, but that they would prefer an iron bar ?—Yes ; the ordinary tamping bar.

6828. You do not think that it is possible by any system of watching to prevent their using an iron bar ?—I do not think it is. After an accident they will come to their senses a bit and will use oak sticks, but they get a dislike to them in a little while.

6829. Supposing a rule was made that when a hole had missed fire in no instance should it be re-opened without the presence of the captain of the mine, and that a fine should be imposed if that rule was broken ; do you think that that could be carried into operation ? —No ; I think that even then they would risk the penalty of a fine.

6830. You think that they would open the hole again ?—I think they would. In the coal mines, for instance, a coal miner is not allowed to fire a hole unless one of the under-captains is present ; but the men manage to do it ; they are fined or brought before the magistrates if they do so.

6831. Where do you get the composition which you have attempted to introduce for tamping the hole ?— We have been supplied for years from an old cylinder, from one of our drawing engines which we threw out for a new one; it was very good metal.

6832. What was it made of ?—Brass ; very nice soft metal, very good metal.

6833. Yellow metal ?—Yes ; we have put a little tin with it occasionally, but the old cylinder as it was was very good metal.

6834. Have you had it analysed to know exactly what its component parts are ?—No.

6835. You cannot be perfectly certain without its being analysed whether it may not contain some particles of a composition which may strike a light ? —No, I am not prepared to speak positively, but I should not think that there was any iron in it. I dare say that it is made of good metal.

6836. But your opinion is only founded upon the appearance of it. You cannot say for certain that there is no iron in it ?—No.

6837. Then you have no guarantee that it is a perfectly innocuous metal to use for that purpose ? —No.

6838. (*Chairman.*) Is a man-engine introduced at all into this district ?—There is one in Levant.

6839. Has it answered there ? — Yes ; I should think that it answers pretty well in Levant, it being a deep mine, it is an accommodation to the miners ; but they must be very careful I think, in my opinion quite as careful as in coming up by ladders.

6840. Have you heard of any accidents there from the use of it ?—Yes ; two or three, and perhaps there may have been more ; I know that one of the agents lost his life in coming up some year or two ago.

6841. From missing his step ?—I do not know the particulars. I think that in stepping from the man-engine on to the platform he missed his step in some way ; he got crushed between the engine and the platform, and lost his life.

6842. Have you any personal experience of the man-engine ; has it been introduced into any mine with which you are connected ?—No.

6843. Has a skip been introduced ? — Only for drawing stuff, not for taking the men up and down. In Botallack it is used, I think, for that purpose. I do not think favourably of it myself.

6844. Have you ever used it yourself ?—No.

6845. You cannot speak of it from your own experience ?—No ; but I do not think that it is a proper way for men to go up and down, and especially if working with chain.

6846. Why not ?—I think that a chain may break at any moment.

6847. Supposing you were to hear that a skip had been in operation in a mine for the last 30 years, and that it had carried some hundreds of men up and down shafts, or pits, without a single accident ever having happened, would your opinion be altered as to the danger ?—Not at all ; I should still have the same opinion that it was not a safe transit.

6848. Are you talking of a one-link chain ?—Yes. If it had worked 100 years and had had no breakage, I would not trust myself a bit the sooner on that account. We have had a skip drawing stuff for several years, and have had scarcely any breakage.

6849. That is a single link chain ?—Yes.

6850. Supposing a chain was made of three links instead of one, should you then think it safe ?—No ; I have no confidence in iron to draw up men.

6851. But if it went on for 30 years drawing hundreds of men without any accident, and if you would not consider that a proof of safety, what in your opinion would establish the safety of any means of bringing up men ?—A man-engine.

6852. What would prove it to you to be safe ?—I should object to chain, because a crystallization goes on in iron, so that it may give way at any time. If working for 30 years without a breakage, the chain would have to be thrown out repeatedly in that time, I would not, therefore, trust my life to a chain. I think that after the footway, the man-engine is the thing.

6853. What do you think of a wire rope ?—I think that it is very much better than a chain.

6154. Would you think a skip safe with a wire rope ?—No ; because they are very liable to go off the road or trip. I do not think there is any safety in a skip as a transit for men. I am now speaking not of perpendicular shafts, but of underlying shafts. With a good rope and with perpendicular shafts, as in the coal mines, I think that that is quite as safe a way of conveying the men up and down as with a man-engine, and even more so because there is no changing. A man must have his wits about him with a man-engine to change every 10 or 12 feet. In a perpendicular shaft, I think that a skip would answer with a rope, but not with a chain. I would never go down in a mine with chain unless it was perpendicular, if there were a ladder road.

6855. You have been at Huel Owles since 1834. I think you said that three men had lost their eyes from blasting ; have any men lost their lives from blasting? —No ; I do not know of a single case.

6856. Have any lost their lives from stones falling or from the country coming away on them ?—Yes ; we have had a few accidents in that way, I think that two or three men may have lost their lives, but not more than that.

6857. Have any accidents occurred from the men falling off the ladders ?—Scarcely an instance. Our footways are kept in good condition. I have strictly urged this upon our agents.

6858. You are acquainted of course more or less with all the men who work in your mine ?—Yes.

6859. Of what age are they now, are they young men or old ?—The majority of them would be young men.

6860. Under 30 ?—Yes a return of that has been sent in from our mine.

6861. Do you find the men leave off work at an early age with you, and that they are obliged to retire at an early age from illness or other causes ?—No ; I have stated that I think that the men are very healthy indeed, and my reason for saying so is that they can

generally clear their allowance ; and can work good long hours.

6862. Are there many men in your mine who are affected with what is called miners' complaint, is it prevalent with you ?—Hardly a man, owing mainly to the state of our ventilation. There are some mines in the parish which are hot ; Levant and Botallack have been so.

6863. Your's is not a wet mine ?—No ; still we have pretty much water in different parts of the mine ; there is not a wet mine in the district.

6864. The men work to a good age with you ?—Yes, if they take care of powder and shot.

6865. And the mine is well ventilated ?—Yes.

6866. Are the men well provided for in respect of dries ?—Not very ; I have an objection to dries in a mine, and my uncle had before me. We are working in several parts, or over a large surface, and it is desirable that the men should change as near where they go down as possible, we have several changing houses ; but even if they had all to go down at one place, I should like to have different changing houses. There is nothing that I should dislike more than to have the whole of the Huel Owles men in one changing house. I think strikes and other evils may to a great extent be traced to this source.

6867. In the different changing houses which you have, is the accommodation for the men good ?—We have put up a dry in the last three or four months for 60 or 70 men ; they change in the boiler-house in some instances.

6868. Do you approve of that ?—No ; and yet it is a nice place for drying their clothes. The powder is kept outside under sheds. I do not think that the boiler-house is the place for the men to change.

6869. Have you it in contemplation to erect more changing houses in different parts of the ground ?—Yes ; but they will be small ones. The dry which we have put up is very good indeed for 60 or 70 men. We have a warm-water place where they can wash under cover. My principal objection to having one dry is, that it would get the men all together, which I should like to avoid as much as possible. We have 170 men underground and 36 boys ; in the whole, we have 245 men, 138 boys, and 66 girls, making 449.

6870. You say that you prefer separate changing houses, and that those separate changing houses should be near the footways ?—Yes.

6871. Have you ever thought whether it would be desirable to have a portable iron or wooden changing house which could be moved to the different footways ?—No ; we can put up a changing house at a little expense.

6872. What is the cost of putting up a changing house for 60 men ?—I have not gone accurately into the cost ; still I think 100*l.* would cover the entire expense.

6873. You talk about changing in the boiler-house. I suppose you think that that is dangerous to a certain extent in case of an explosion of the boiler ?—Yes ; and because the men will take often their powder with them.

6874. Is the water here injurious or not for the boiler ?—Our water is pretty good.

6875. You never had a boiler explosion ?—No ; but I think that better attention ought to be paid to the cleansing of boilers. We keep a memorandum of of it in our mine, and we work by rule in that respect.

6876. How often do you think that a boiler should be cleansed out ?—I think that it ought to be cleansed every four months ; it depends upon the condition of the water ; there is a little trouble in it, but a great deal of safety. I think the cleansing should be attended to regularly, to see that the thing is all right, and how the water is acting on the iron. We keep a regular entry of the cleansing of every engine in the mine ; we have seven working. I make our engineer keep an account of this, so that I may refer to it at any time.

6877. Do you think that that is generally done ?—No, I think not. It is my opinion that the time of the boiler being cleansed should be recorded in the counting house. Engineers are inclined to shrink from it, as it is hot trying work ; but it is work that should never be neglected.

6878. (*Mr. Holland.*) Is once in four months enough for safety when the water is impure ; do you know of any case where the water is so bad and so full of sediment as to require its being done oftener than once in four months ?—I know that there would be a thin cab inside the boiler in four months ; and if so, the sooner it is removed the better, both for safety and economy. There is a great deal of saving and a great deal of safety in this I verily believe that in the average of mines the time is twelve months instead of four. A great many men will, what they call, blow out the boiler, but there is no safety in that.

6879. (*Chairman.*) Have your boilers a water gauge so as to show what quantity of water is in the boiler ?—Yes.

6880. Is that general ?—I think so.

6881. Is the balance of your club money taken every year ?—It is balanced every three months ; we have a separate club account book.

6882. You stated that you did not know a case in your mine where the candle had gone out on account of the condition of the air ?—Scarcely a case.

6883. Is it reported to you by the captains when the air is bad ?—Yes. The captains in our mine keep a daily report of every place which they inspect. That is not general. Some agents have to send their reports to London ; our agents have to enter them in the report book.

6884. And it has never been reported to you that there has been an end so bad that the candle would not burn ?—I have scarcely known a case of the sort.

6885. (*Mr. Kendall.*) With regard to the tamping, suppose that you made a regulation that in no instance should any man when a hole has missed fire attempt to re-open that hole under a severe fine, notwithstanding that he would lose a great deal of labour, and the position of the hole and the value of the position; do you think that you could carry that out by fine and by order ?—I think not. I think that if the fine was to the extent of their month's getting they would carry out the same hole rather than put in another.

6886. (*Chairman.*) Would it be desirable to have it reported to the captain when a hole had missed fire ?—I think that the captains like to keep out of the way as far as they can.

6887. To what extent have you been working since 1834 ?—We are at this time driving 43 levels, by small pairs of men, in different directions in the mine. Our mine has been opened in levels and shafts nearly 30 miles. I think that that is more than any mine in Cornwall has done. In the last seven years we have been opening in our shafts and levels nearly a mile and a quarter a year.

6888. (*Mr. Holland.*) Actual driving ?—Yes ; and I think there are but few instances where a mine is being explored on a more extensive scale.

The witness withdrew.

Captain Thomas Trahair examined.

6889. (*Chairman.*) What is the name of your mine ?—Balleswidden.

6890. Have you the charge of any other mine ?—No.

6891. How many men do you employ underground ?—Over 200.

6892. On the surface how many have you ?—We have 450 altogether, I think ; that is, men, boys, and girls.

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6893. What is the youngest age at which the children work above ground?—Varying from 8 to 12 years of age.

6894. At what age do they go below ground?—We calculate at 14 years of age; from 12 to 14.

6895. Do you not allow them to go underground below that age?—No; no boys should go underground before he is 14 years of age.

6896. What is the greatest depth of level in your mine?—150 fathoms is our deepest level.

6897. What mode have you for the men to go up and down?—Some of our men go up and down in a skip and others a foot way, what we call the ladder.

6898. I believe that you have lately introduced the skip?—Yes, it has been working a year and a half or two years.

6899. Do the men object to use the skip?—They would like to go up and down in the skip very much oftener if we allowed them.

6900. Why do you not allow them?—We cannot allow them to go up and down and discharge, our work time will not allow it.

6901. Is it a single skip?—It is a double skip, and we can discharge plenty of work too.

6902. What regulation do you make with regard to men going down; is it at certain hours?—Yes, seven and two.

6903. I suppose that the tut-work men go down more than the tribute men?—It is more especially for the aged men; we let the young ones walk.

6904. Do you think that men having that means of going down can work below at a greater age?—Yes, certainly, it is a great benefit to the men.

6905. Do you think that it is a benefit for you to employ old and experienced men in working?—Certainly.

6906. Then the means of ascending and descending enables you to have more experienced men?—Yes, it does; and not only that, but we can get more labour out of every man by his riding up and down. We perhaps calculate two or three holes for a man to bore in a day. I think it is better for a man to ride up and down by the skip, and it will not harm him so much as if he put in an extra hole every day of his life. A man's walking fast in the footways is very injurious.

6907. How long does it take him to come up the ladder?—It ought to take from three quarters of an hour to an hour, but some of them come up in twenty-five minutes.

6908. You think that they injure themselves by coming up quickly?—Yes, just as much by walking fast in the footways as in damp ends. Very often when they are out the young men walk together, and one will not give way to another.

6909. I suppose you have no case in point of a man being injured where you can quite trace it to that cause?—No.

6910. How do you fill the skips?—We let our skip go just to the level of the soller; the top of the skip should come to the level of the filling soller, so that a man shall not heave at all, but only do it at the side.

6911. Have you a hopper?—No, I never saw one; our lode is very soft stuff, and you would be obliged to dig it out of the hopper again; we tip it into the skip.

6912. Would it not save time if you had a hopper that would, immediately on the skip arriving at the level, fill the skip?—I cannot see that it would; our lode is just like mortar, after our skip is up we dig it out with a pick; I cannot see that it would be any advantage to have a hopper.

6913. If any means could be adopted so as to fill the hopper quickly, it would give you more time, would it not?—Just so.

6914. And it would enable you to take more men up and down?—Yes.

6915. Do the men ever object to go down in the skip?—Never.

6916. Before it was introduced, did you ever hear that the men were likely to object to it?—I never saw any one ride in it before we put in one. All the agents go up and down in it, and we can get from the 140 in two minutes.

6917. How many men go up at a time in the skip?—Two.

6918. Have you two skips at work?—Yes, one going up, and the other going down.

6919. How is the skip hauled up, by a chain or a wire rope?—It is hauled up by a hempen rope, and at the end of that we have a double $\frac{5}{8}$ths chain; our hempen rope will heave up 30 tons.

6920. Have yon ever tried a wire rope?—No; but I have seen them at work.

6921. Do you see any objection to them?—They may be equally safe, as far as I know; and if they are as safe I also think that there would be a saving on the wire rope. You have not that amount of weight to heave.

6922. Therefore a wire rope would be a cheaper means of hauling up the skip than either a chain or a hempen rope?—Yes, certainly; you must do the one by steam, and it costs more to do it.

6923. Can you state to the Commissioners about the cost of the skip, and the apparatus?—A skip would cost about 20*l.* with catches to it, that is a patent skip; I can let you know.

6924. Have you ever seen a man-engine?—Yes.

6925. Have you ever gone down a mine in one?—never.

6926. How many men have you employed at your mine?—Over 200.

6927. Have you any close ends in the mine?—I do not know that we have one in the mine; we have plenty of shafts in the mine, something like 20 working shafts.

6928. Have you never been informed that there were ends in which a candle would not burn?—No; if there was any end of that kind I should see it myself.

6929. Do you employ no artificial means of ventilation?—No.

6930. How long is the powder smoke in clearing away from an end after the explosion takes place?—In seven ends out of ten, I think it is not more than five minutes clearing away.

6931. Will you be good enough to explain your plan of ventilation?—Yes (*explaining the same on paper*).

6932. (*Mr. Holland.*) Is the skip shaft vertical to the bottom?—Yes.

6933. Your mode of ventilation is to bring air from the shaft as near to an end as possible by a winze?—Yes.

6934. You do not try to drive it down a winze?—No, the object is to bring it up in this way (*explaining the same*).

6935. There is no one particular shaft which is always an up-cast shaft?—No; the draught is constantly going up the skip shaft, it does not go down; we have two or three shafts in those lodes.

6936. Do all your shafts go down to the lowest level; or how many of them do?—We have no less than two shafts in each lode going to our deepest level.

6937. Going to the lowest level of the lode?—Yes.

6938. To what distance have you ever driven from the skip shaft, before you had a winze?—50 fathoms.

6939. (*Mr. Kendall.*) How have you felt or how have the men felt at the 35th fathom?—The air is not quite so good there; we have no powder granite, or decomposed granite, it is there soft granite, and it is worked with a pick.

6940. Do you find that the air will percolate through the decomposed granite?—Yes; there is no blasting on this lode.

6941. Could the men work for eight hours at the 35th fathom before they hole?—Yes; I never saw it at any other; we have not been accustomed to go as far as that, but we might have done so.

6942. How far have you ever driven ?—From 30 to 35 fathoms.

6943. Have you known cases in which the men have been able to drive 35 fathoms without any inconvenience, before they have communicated with a winze ?—Yes.

6944. Would the candles burn well ?—Yes, just as well as in this room.

6945. (*Mr. St. Aubyn.*) What is the height of your level ?—It is seven feet high.

6946. What is the width of it ?—Four feet.

6947. (*Chairman.*) It is more safe to drive, is it not ?—Yes, the place is ventilated better.

6948. For the actual working is it desirable to give the men plenty of room ?—Yes ; we take away all the dirt.

6949. You have rules with regard to setting the work ; have you copies of those rules stuck up ?—Yes.

6950. Will you be so kind as to furnish the Commission with a copy of those rules ?—I will to-morrow.

6951. What do the men pay you for candles ?—9*d.* per pound.

6952. How much do they pay for powder ?—9*d.* per pound.

6953. Do you use any particular kind of powder ?—No, it is the common powder.

6954. Is there a specified quantity of candles allowed to the men ?—The quantity allowed is 2lbs. per man per week.

6955. There is a deduction made from the men for what is called club money ; will you state what that is ?—To the dead club each man pays one 1*s.* for burial. If a man dies or is killed in the mine each one contributes 1*s.*

6956. Is that only if the man is killed in the mine ?—If a man has died they must pay into that club.

6957. Is there any club fund for injuries ?—Yes ; there is a sick club to which they contribute 6*d.*

6958. Is that only for visible injuries ?—Yes ; not for sickness.

6959. How much is paid for the doctor ?—9*d.*

6960. Does the doctor attend the family of the miner or only the miner, or only the miner himself ?—He attends to the whole family.

6961. How are the doctors appointed ?—Our docter is appointed by the men, not by the adventurers.

6962. How is the election of the doctor made by the men ?—They call a meeting, and decide the matter by a show of hands.

6963. Do you think that the men are more satisfied with the medical men as they are selected by themselves ?—Yes ; there is no question about it.

6964. Is there no provision made for a man when he is unemployed on account of sickness ?—None whatever,

6965. Is there any account kept of the club money ?—Yes.

6966. How often is it balanced ?—Our account is balanced every month.

6967. Do the men know how it stands ?—They can know every month if they like to ask for it, they can come to see ; sometimes it will pay and sometimes it will not, and the purser advances the money if it will not pay.

6968. I suppose when it will not pay, it is because you have had more than the usual number of accidents ?— Yes ; there are more sometimes than at others, and then it will not pay. If we get a little stock of money in hand, instead of giving them 15*s.* or 20*s.* a month, the injured men, we give them 25*s.* a month, so as to take off all the surplus money.

6969. You do not take into account the whole amount for a year, but you ascertain what the balance is every month ?— Yes ; we bring up the accounts every month.

6970. If there is a large balance at the end of a month, you increase the allowance ?—Yes, that is our mode of dealing with it.

6971. If the balance was found to be smaller at the end of another month, would you diminish the allowance ?—No.

6972. (*Mr. Kendall.*) There is a certain sum fixed which the men are sure to receive ?—Yes.

6973. And if there is a balance in favour of the club, you increase the allowance ?—Yes.

6974. (*Chairman.*) And suppose the balance becomes smaller, you take off the additional allowance ?—Yes.

6975. But you do not reduce the allowance below a fixed sum ?—No.

6976. So that there never can be a larger accumulation ?—No. It is considered that it is their money, and that they ought to have it.

6977. Is that same system which you have described adopted in other mines ?—I cannot say that it is.

6978. (*Mr. Kendall.*) Have you known of clubs and witnessed the mode of conducting them in other mines ?—Yes.

6979. To the best of your knowledge and belief is or is not good faith observed towards the working miners by the adventurers and by the pursers ?—Generally so.

6980. Have you never heard of a case in which good faith has not been observed ?—No.

6981. Are you acquainted with the system which is pursued with regard to clubs in other mines ?—No, I am not. I do not know that they work them in the same way that we do.

6982. (*Mr. St. Aubyn.*) You can only speak with regard to the mine with which you are connected ?—Yes.

6983. (*Mr. Kendall.*) But you have worked in many other mines, have you not ?—Yes, in several.

6984. Where there have been clubs ?—Yes.

6985. (*Chairman.*) But you cannot state how those clubs are managed ?—No, I cannot. I rather think that there is a fixed sum. I do not think that they are on a sliding scale.

6986. (*Mr. Kendall.*) In any mine in which you have ever worked, have you ever heard any complaint made by the miners against the adventurers or the pursers as to their being unfairly dealt with with respect to the club money ?—No ; I do not think that the pursers ought to have anything to do with it. It is left entirely in our hands as agents, and the pursers have no more to do with our club than you have.

6987. Have the pursers anything to do with the club money in other mines ?—I believe that they have.

6988. But, to the best of your own knowledge and belief, the club money has never been made use of for any other purposes than for the men ?—Not that I know of ; at all events I am quite certain that it has not been in our mine. I cannot speak for others.

6989. (*Chairman.*) What is deducted in the bill for the barber ?—We have none in our mine.

6990. Do you pay the men in notes or in cash ?—Some of the money is in notes and some in gold ; about 300*l.* in notes, about 500*l.* in gold, and from 300*l.* to 400*l.* in silver.

6991. Do you suppose that the paying the men in notes induces them to go to a public house for the purpose of obtaining change ?—No ; I think that it makes very little difference.

6992. How many boilers have you ?—We have two boilers to each engine, to what I call our draught engines.

6993. How many have you altogether ?—We have seven machines.

6994. Are there 14 boilers ?—No, not 14 boilers ; to the pumping engines we have two, and to the winding engines we have but one.

6995. How often do you have the boilers cleaned out ?—Sometimes once in six months ; some of them will require to be cleansed three times as often as the others, some may require to be cleansed once in

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four months, while others will work very comfortably for 12 months.

6996. But how do you judge of that?—We judge of it in this way; we find that there is a foulness in the boilers by the bottom cock, but there cannot be anything amiss if the boilers are cleansed often.

6997. You think that that is desirable?—Quite so.

6998. Is there any dust in your mine caused by the men working with the pick?—No, very little; we have a little too much water to have much dust.

6999. (*Mr. Holland.*) In Lancashire there is an arrangement by which the steam boilers are inspected by engineers appointed for the purpose; do you think that it would be wise to introduce that system into this county?—We have paid engineers who come into our mine every week, and never miss.

7000. Do the engineers examine every boiler, its gauge cocks and valves, in order to ascertain that it is safe?—Our engineers inspect our engines every week. They are paid every month in the mine as much as any agent there.

7001. Referring to the skip, it of course saves the men a great deal of fatigue to be carried up and down the mine in the skip?—Yes.

7002. Cannot the men do more work in the course of a day than they did in consequence of it?—Yes; no question about it.

7003. Can you make any estimate of the value of that extra work so performed by the men?—No.

7004. Do you think it is considerably greater than the cost of so lifting the men?—Yes; the cost of so lifting the men is very little.

7005. But the value of the labour saved is very great?—Yes; more than the cost of lifting them.

7006. Would it not be good policy to increase the number of men you carry up and down at once?—We have talked of putting in four bars for the purpose of carrying more men at once, a skip is five feet long, and we calculate upon putting four bars 12 feet long to run in pairs with sets, so that we could take up 6 or 8 at a time instead of 2, and then the skip would act as a means of safety over the men's heads if anything should come away.

7007. There would be a sort of bonnet over the men's heads?—Yes.

7008. Which they have not got now?—No. We could easily put a cover on the skip.

7009. And you think there ought to be one?—Yes; but there is not on ours, and I never saw a cover on one yet.

7010. (*Mr. Kendall.*) Have any accidents occurred since you have been at Balliswidden?—Yes; perhaps four or five, or six.

7011. Of what kind were those accidents?—Generally speaking they were accidents which arose from tamping the holes, from charging them.

7012. Do not those accidents principally arise from the recklessness of the men themselves?—Yes, they do, in 9 cases out of 10.

7013. Is it or not your opinion that as a body the miners are reckless of life?—It is my opinion, and I am sorry to say it; I can give the Commissioners one instance. It is but two months since that a man got down five fathoms under the surface; his candle was out, and he was simple enough to attempt to take off a light from a man's hat who was coming up in one of these men's skips, and which was travelling at the rate of 140 yards a minute, and before he touched the man's head his arm was gone.

7014. Taking them as a body you consider them thoughtless?—Yes.

7015. With regard to the general health of the men in your mine is that very good?—Yes; the health of 7 out of 10 of our men is just as perfect as if they were working in this room.

7016. And that I presume is entirely owing to good ventilation?—Yes.

7017. You have frequent cross-cuts in the mine?—Yes.

7018. Do you find that the men will frequently rush sooner than they ought to do into the ends which they have blasted, or do you not blast much?—Not so much as we do in other parts of the mine.

7019. But where you do blast are the men very reckless?—Yes. After a hole has exploded they run in, as they are anxious to see what amount of ground has been broken.

7020. Is it your opinion that much of the illness from which the miners suffer arises from that?—Yes; I should think a good deal of it. It must affect them.

7021. From your experience amongst miners and their mode of proceeding, do you not think that a great deal of their illness arises from want of care?—A very great deal of it. I certainly do think so, and I am candid about it.

7022. What kind of dwellings have they in this neighbourhood; do they sleep too many in a room?—I do not think so. Their houses are small enough, but they are very clean and very wholesome. I think they live in just as wholesome a house as you will find in the county.

7023. Is Balliswidden a dry mine?—Yes; we generally get all our water at the bottom level.

7024. Do you work a good deal in the dry?—Our tributors are generally working in the dry.

7025. Do you find that there is much dust in your mine?—No; there is rather too much water for that.

7026. Do you never hear men complaining of the dust that is made in boring holes?—Never.

7027. Have you worked up to your present position from that of a common miner originally?—Yes; I have worked underground for 30 years from the age of fourteen.

7028. But have you worked your way up to your present position from beginning as a common miner?—Yes; I have done nothing else. I was only at home six months with fever.

7029. What age are you now?—44.

7030. How often do you go underground at the present time?—Three or four times a week.

7031. How deep do you go down?—I go down to the 140, which is the deepest level, although the mine is 150.

7032. How long have you been agent?—16 years last June.

7033. How long did you work underground as a miner?—I worked for 14 years underground as a miner.

7034. Do you often meet with stronger men than you are?—No; I do not think I do.

7035. Are you in full health and strength now?—Yes; I am just as able a man as I ever was.

7036. When you were working as a miner, did you take your night cores as well as the day?—Yes.

7037. Did you work eight hours a day?—Yes, and very often 12 hours a day.

7038. Was your father a miner?—No.

7039. (*Mr. St. Aubyn.*) I believe your mine was lighted by gas?—Yes.

7040. For how long was it so lighted?—For nine months; from six to nine.

7041. How deep did you carry down the gas?—To the 130.

7042. Was the mine well lighted?—Very well lighted.

7043. Why was that mode of lighting the mine discontinued?—Because it was very badly managed, they threw away a fortune; that is the party who started it; but it ought to have been in existence now in two-thirds of the mines in the county.

7044. The supply of gas, I believe, was in the hands of a company?—Yes.

7045. The adventurers had nothing to do with it except to pay for the gas which they consumed?—No.

7046. Under proper management do you think that

the gas would have paid?—Yes; and very much better than candles, I think; there is no question about it.

7047. Did you ever hear or observe that the use of gas had any deleterious effect upon the air?—No.

7048. Did you ever hear the men complain of it?—The men complained when the gas engineer did not attend to their work, and they found an escape of gas from a fracture; it was complained of then.

7049. But not before then?—No.

7050. That was because the tubes were not of a proper description, was it not?—Of course, the tubes got out of order in time.

7051. Do you think that there is anything in the nature of a mine, or in using gas in mines, which should prevent its being used with proper management?—I think that gas is as well to work by as candles. I would as soon work with it to-morrow. I never viewed a pitch with a candle so well as I did with gas.

7052. The adventurers paid a certain sum for the use of the gas?—Yes.

7053. Was it as economical to them as the use of candles?—Yes.

7054. Did the adventurers charge the men anything for the light?—Yes.

7055. The same sum as for candles?—No, not so much by a sixth part. Of course the candles would cost them 1*s.* 6*d.* a week—2 lbs. a week at 9*d.* a pound, and for the gas we charge them 1*s.* 3*d.* instead of 1*s.* 6*d.*

7056. (*Mr. Holland.*) Had they a much better light?—Yes.

7057. (*Mr. St. Aubyn.*) What did you pay per cubic foot for the gas?—Before they commenced to supply it we were to give them so much a year for the whole mine; I cannot tell you what.

7058. You made a contract with them?—Yes; we made a contract that they should light the mine with gas, and that we should pay so much a year after they had lighted up all the mine, but that was never done.

7059. Were the charges that you made upon the men sufficient to provide the amount that you had to pay to the company?—Yes.

7060. So that you lost nothing by it?—Of course we never did.

7061. The result of your experience with regard to gas is that if the company managed it properly it would answer to introduce gas into the greater part of the mines in this country?—Yes; if the mines were well ventilated.

7062. And further that it would be both economical to the adventurers and to the men?—Yes.

7063. Without any detriment to the air, or to their health, if it were properly managed?—There would be no detriment whatever.

7064. (*Mr. Holland.*) Do you know how many jets they use?—I cannot say.

7065. (*Chairman.*) You have stated that the illness of the men was very much caused by their own want of care; what is the illness to which miners are liable from want of care?—In the first place, I fancy that they should be a little more careful in going up and down the mine by their footways. I mean that they force themselves to an extent that they have no right to do. I fancy that it produces shortness of breath in a certain time.

7066. Can you give any other example of want of care on the part of the miners?—There is of course the rushing into the powder smoke.

7067. Is there any other cause which, in your opinion, produces illness arising from want of care?—I do not know anything more.

7068. Do you think that the illness of the men is ever produced by bad air or poor air?—Yes, I believe it is in some mines.

7069. Would any care on the part of the men prevent them suffering from that?—Not if they went into bad air.

7070. The only way would be not to work in it?—That is the only way to prevent it.

7071. Do you suppose that a miner would give up his work because he had to work in bad air?—I believe that some would, and that others would not.

7072. Do you not think that that would depend very much upon whether they could obtain employment elsewhere?—Perhaps so. It would depend upon what they were allowed to get in those places; where the pay is better in poor air ends, for the sake of that they will work there.

7073. You have stated that accidents happen very much from the men being reckless?—Yes.

7074. But would you not consider it right at the same time that every precaution should be taken to prevent the occurrence of accidents?—Of course, and they have got everything for that purpose; for instance, in the charging of the holes we have provided wooden sticks to put in on the powder instead of brass or copper bars; some have iron bars to tamp with; but we have wooden sticks to put in the tamping on the powder.

7075. Do all the men use them?—No, they will not do so; but they ought to do so.

7076. Have they any copper tamping rods?—Yes.

7077. Is there any danger in the use of them?—Yes, I think so.

7078. Will a copper tamping rod strike fire?—They have done so.

7079. Have you seen that done?—I have seen men who have done it in our mine. We were not in the habit of using anything else; perhaps with a little brass with it.

7080. Where did you procure those copper bars?—They were made in the mine; the bottom end of it is copper, about two inches long, with a bar of iron.

7081. Might it not have been some other part of the tamping bar that struck the fire and not the copper end?—It might have been.

7082. (*Mr. Kendall.*) Did you ever know an instance in which a man has refused to work in bad air, or when he has been compelled either to work there or to leave his work and the mine?—Never.

7083. Did you ever know a man complain of bad air, in order to get rid of a bad bargain?—Yes, I think I have.

7084. (*Chairman.*) I suppose that a man with a large family to maintain and not likely to get work elsewhere, would be obliged to go on working where he was, although the air was bad?—No; I do not think so in this part of the country. I cannot, of course, answer for other parts of the country.

7085. Have you never heard of men being urged to drive on by an additional payment being offered to them?—Never.

7086. Do you think that the men are not tempted to do so by a higher price being paid for their work?—Yes.

7087. A higher price is paid for it, is it not?—Yes. I have just stated that I cannot answer for other parts of the country; then they reduce the number of men from two or three in an end to one.

7088. (*Mr. Holland.*) Is it not very bad policy to have bad air in a mine?—Yes, of course it is.

The witness withdrew.

Mr. Alfred Chenhalls examined.

7089. (*Chairman.*) Are you in charge of any mine in this district?—No, I am not.

7090. Have you lived in this district for some years?—Yes.

7091. Have you been connected with mines?—Yes very extensively.

7092. As a shareholder in mines?—Yes.

7093. Are you a shareholder in mines in this dis-

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trict, or in other districts?—In this district principally, but I am in other districts also.

7094. Have you turned your attention to the working of mines especially?—Yes; it would have been impossible indeed for me to have done otherwise; it is always before me.

7095. Have you been much underground?—I have been underground occasionally.

7096. With what mines especially are you now connected in this district?—Wheal Owles, Levant, Botallack, and Bosorn, as an adventurer; a mine now called St. Just United, Bosweddan, Boscean and Bottowal United, and Carnyorth, as a lord.

7097. In any of these mines is there a man-engine used?—In the Levant mine there is.

7098. Are any other means employed to enable the men to go up and down in any of the other mines?—At Botallack they have a railroad, I should rather call it, than the skips, in the diagonal shaft.

7099. How long has that been in operation for the conveyance of the men?—For about four months, I should think; but I believe they have really not put on their proper waggon, unless they have done it very recently; there is a waggon that we intend to employ purposely for the conveyance of the men.

7100. Is it to be drawn up by a single linked chain?—Yes.

7101. It will go down an incline?—Yes; I have been to the bottom of the mine in a waggon.

7102. Are there any other mines in which there are means of going up and down for the men?—I have heard that they intend to employ a skip with patent catches in the event of the chain breaking, so that the skip may be secured from falling in one or two of the mines; but I believe there is none now in operation.

7103. Is a wire rope used at all in any of the mines?—We used it in the Levant mine, it cost us about 500*l.* as an experiment, and it altogether failed.

7104. The wire rope failed?—Yes, as an experiment. We had not the perpendicular shafts that a wire rope should be employed in; the angles of the shaft told very much against the strength of the rope; the friction that took place soon wore it out, and we have had several awkward breakages, and considerable delay and expense.

7105. Are the underlies very sharp?—Yes, in some of the shafts, although we thought that this was a pretty good shaft for employing it in; but we found even there that the underlie was too great.

7106. Had you guide rods for the skip?—Yes.

7107. And pulleys or rollers for the rope?—Yes, we had rollers for the rope at every angle.

7108. And yet you found that the rope wore out?—Yes; it was passed through a barrel of tar or of composition to preserve it and to prevent its wear as much as possible, but it was with us altogether a failure.

7109. Was it by friction that the rope was worn out?—Yes.

7110. Was that the only mine in which a wire rope has been used?—Yes, in St. Just.

7111. What means do you employ now for drawing up the skips?—We employ there a flat hempen rope.

7112. Do you find that that does not wear out so much?—Yes; it serves us much better. We had a flat hempen rope prior to the introduction of the wire, but Captain Evans, the managing agent, from the neighbourhood of Redruth, thought that he would be, I suppose, up to the age, and as the wire rope had been introduced so much in the coal districts, that he would try it here also, and we judged that we had made a good hit for a short time, but we soon found ourselves in difficulties, for shortly we had one or two extensive breakages, and I would warn others against ever attempting the thing again. At St. Just we did it under advantages that some mines do not possess.

7113. (*Mr. Kendall.*) This has been a mining district for hundreds of years, has it not?—Yes.

7114. I believe your family has been here for hundreds of years?—Yes.

7115. They have been miners or mixed up with miners?—Yes.

7116. I suppose you are as much mixed up with mining as any of your ancestors were?—I have about an eighth part of the Wheal Owles.

7117. You have not a less interest in mining than any of those who have gone before you?—No.

7118. Perhaps a large interest?—A large interest.

7119. Do you look over your own mining property?—Yes.

7120. You watch your own bounds, and you look after your own speculations?—Yes; it would be impossible for me to do otherwise, for living here I really cannot be but a miner theoretically. The inquiries which I have frequently to make after my own property lead me into all kinds of questions relating to mining.

7121. You are acquainted with all the vicissitudes of a miner's life from necessity?—Yes.

7122. Is the miner, in your opinion, a shrewd man?—I hold him to be a very much more intellectual man than the cider-drinking population of Devonshire.

7123. As far as you have seen, is he or not careless of life?—I heard the evidence of a very extensive mine agent this morning, and I should be disposed not to endorse to the full extent his views in reference to the carelessness of miners as to life. I have no doubt that there is a great degree of carelessness amongst them, especially on the part of the young and impulsive, and I dare say that there are occasional instances, such as were adverted to this morning, but I could not endorse the opinion expressed, to its fullest extent; I believe that the great bulk of our people are careful of human life.

7124. But so far as the evidence which you heard went to show that the miners would rush into ends before the powder smoke was cleared away, breathing in consequence a quantity of pernicious smoke, you do not impugn that evidence?—I did not hear that evidence.

7125. From your experience, do you think that the miners in their anxiety to ascertain the effect or success of their blasting, frequently rush too rapidly into the ends?—I believe that the boys are tempted to do so pretty frequently; but as the miners advance in life, I have reason to believe that a consideration of their own health, besides the necessity for a very proper and seasonable cessation from labour, would induce them to stand without for a time, and not hastily and recklessly thrust themselves into an end before the smoke was properly cleared away.

7126. With regard to ventilation, do you go down much into mines here now?—Not much.

7127. As far as you hear, and from looking at the plans, do you think that there is much improvement, as compared with past times, in the ventilation of the mines?—I should say that there is very considerable improvement.

7128. Are you of opinion that the mine agents think it not only economy, but the right thing to do, to have their cross-cuts more frequent, in order to provide better ventilation?—I believe that our mining altogether is carried on with greater consideration for human life both above ground and beneath the surface.

7129. You must have had considerable experience from being mixed with so many mines, and do you think that justice is done to the miner with regard to his subscription to the clubs?—I believe that the exceptions to fair play would be very rare; in fact I have only heard of one or two instances in which the mine agents have been challenged, and upon investigation I have found that there has been another side to the statement which the men had made.

7130. You mean this, as I understand you, that the balance has been against the adventurers, and not in favour of the men?—The men said they were unfairly dealt with as to the clubs.

7131. Have you ever known an instance in which

a profit has been made by the adventurers out of the miners' money?—I never have known such an instance.

7132. (*Mr. St. Aubyn.*) You have spoken of a wire rope having been tried in the Levant mine?—Yes.

7133. Are the shafts straight in that mine?—No, they have an underlie.

7134. I suppose that the rope passed over rollers?—Yes, at the angles.

7135. Would the same objection apply to the employment of wire ropes in perpendicular shafts, as in the case of underlying shafts?—I think not; they are in almost universal use in the Welsh collieries, which seems to confirm that view.

7136. In cases where there are perpendicular shafts, you think that wire ropes might be used with advantage?—Yes.

7137. Something has been said in the course of the evidence given to-day about tamping, and about sand being used to fill up the holes instead of stone; can you give the Commission any information upon that point?—At Botallack there is a rule laid down by the agent, at all events in his dealings with the men, that they shall take sand down into the mine for tamping instead of using any stones. They think that there may be inequalities of size in the stone, and, if roughly and hastily pounded up by a hammer, it seems to me that it would produce attrition and fire more generally than the fine sand will in which there are no large cubes of felspar to cut the fuze and so endanger life.

7138. Has this plan been in operation for a long time?—Yes, for years.

7139. Has it been found to answer in all respects?—I could not say definitely that no accident has taken place in a mine whilst it has been used, but I know that where persons have neglected it in the Botallack mine a hole has gone off suddenly.

7140. But you do not know of any case in which an accident has occurred through using the sand?—I have an imperfect idea of one such case occurring, although I cannot call it to mind so as to speak definitely upon it.

7141. Are you of opinion that it would be conducive to the safety of the miners generally if the sand was more generally used?—I have a strong conviction that it would be conducive to the safety of the miners generally; it amounts to positive certainty in my own mind.

7142. Speaking of the district generally with which you are well acquainted, should you say that the miners here were a healthy body of men?—They are healthy as a mining population.

7143. From what you know of them, do you consider them to be more healthy than miners in other districts in the county?—Yes, I do, especially as compared with the Redruth district where I have mining property.

7144. Upon what do you found that opinion?—Upon the knowledge which I have obtained by a pretty extensive acquaintance with them as to the numbers of really infirm persons whose health has broken down early in life, and from my intercourse with the miners who have come into our neighbourhood, and who formerly worked there.

7145. Have you found that the miners who have come from other districts were in better health, while working in the St. Just district than in other places?—I have presumed as much, because they confess that they have less water in the mines, and consequently they are not so subject to rheumatic ailments as they are in the eastward part of the county where they are almost amphibious.

7146. Have you observed that the miners' disease, or, as it is sometimes called, miners' consumption, is prevalent here, as compared with the other districts in the county or not?—I think it is less prevalent in the St. Just district than in Redruth. Our mines, with one or two exceptions, are not copper mines, and the copper mines we hold to be on the average warmer and more unhealthy than the tin mines.

7147. Whereas the mines in this district are chiefly tin mines?—Yes, they are chiefly so.

7148. Upon the whole you would say that the working in this district is more conducive to health than it is in other parts of Cornwall with which you have had an opportunity of comparing it?—Yes.

7149. Will you be kind enough to state briefly to the Commission what are the causes in your opinion of that difference?—In the first place, I would say, that as compared with other districts, in the tin mining districts the heat is not so intense underground; I have every reason to believe that our winzes are sunk here more numerously than they are in the average of the mines in the country.

7150. And by that plan the ventilation is improved?—Yes, of course it would affect the ventilation, and at the same time our mines are not so deep as the mines of the Gwennap district, including some parts of the neighbourhood of Redruth about Carnbrea. Our miners, from the little quantity of water there is, can work, generally speaking, in more comfortable circumstances with dry clothes on, whereas they would be deluged in some of the mines of Cornwall.

7151. Then it is partly from natural causes that your mines are more healthy, they being drier and cooler than other mines, and partly also from improved ventilation?—Yes.

7152. You stated just now that the copper mines were considered less healthy than the tin mines, what in your opinion is the ground for that assertion?—I cannot give you a reason why it should be so, but general experience, I think, will show that that is the case. In the Botallack and the Levant mines, which were the richest and full of copper, it was found that they were the hottest for working in, and some of our miners say that they know almost from the rise of the temperature that copper is near.

7153. Do you know whether there are many more old men working in your mines than it is usual to find in other districts, or whether the men are older who are working in the mines?—I have never had an opportunity of judging from statistical information, but the number of wind-broken people about Redruth who are unable to go underground, and are suffering from bronchial or consumptive complaints, seems to be vastly greater than in our neighbourhood.

7154. Have you never made any observations for statistical purposes yourself?—No.

7155. You cannot say perhaps whether the assertion which has been made, that the average age of all persons working in the St. Just mines is 26 years, is correct or not?—No, I cannot.

7156. (*Chairman.*) You have talked of rheumatic affections prevailing amongst the miners, to what district is that especially confined?—Wherever we find it here we find that it has been from early thoughtlessness in reference to working in sumpts and wet places.

7157. But in what district should you say that these rheumatic affections especially prevail?—In the districts of course where water principally prevails. I should say in the Gwinnear, Camborne, and Redruth districts, and in Illogan.

7158. (*Mr Holland*). Do you refer to rheumatism in the limbs or to rheumatic fever?—Rheumatism in the limbs.

7159. (*Chairman.*) Are there many men out of work now in St. Just who are suffering from miners' disease, or a complaint of that kind whom one could see?—Yes, I know of one or two.

7160. You say that the improvement in the ventilation of the mines has been very considerable of late years, in what way has that improvement been effected?—By sinking winzes within shorter distances, and in fact from a greater consideration for life than formerly was shown; but I believe that it has also been helped to a considerable extent by the employment of waggons upon railroads underground. It is well known that where waggons are employed

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the circulation of the air caused by the waggon passing half-a-dozen or a dozen times through a level is very considerable, and much more than where the air has not been circulated by any such movement.

7161. Then it is the circulation of the air in the mines that has been increased ?—Yes.

7162. Has the passage of the waggons through the levels had any effect in getting rid of the foul air from the mines by driving it out ?—Unless you move the air it would otherwise lie sluggishly underground, as a dead, damp, and poisonous atmosphere ; it would continue there for perhaps any length of time ; but the waggons by moving backwards and forwards have vastly improved the air.

7163. So that what you consider improved ventilation is a mere free circulation of the air underground ?—Yes, getting away the bad air and helping in the new. In all changes of that kind a beneficial effect is produced.

7164. Have you ever known of any experiments being made to ascertain whether air is expelled or drawn in by the movement which you have described as caused by the passage of the waggons through the levels ?—No ; but I know also that the currents are determined to some extent by whether the wind is in the direction of the deep levels of the mine going out to sea, or in the sides of the cut. I have known the circulation of the air to be greatly quickened by the direction of the wind.

7165. Therefore at times, when the wind does not set in that direction, or when there is not much wind, the ventilation would be more imperfect ?—It would be not so good. The Commissioners will have information given to them as to the Levant mine, they get the circulation on to the ends extending furthermost under the sea. They have put down upon the winzes between the shaft and the ends a sort of doors one after another, so that they have not allowed the draught to pass until it was sent on to the very extreme end, almost to the last winze in the end, and there they have made it a chimney.

7166. In the Levant mine they have used means to direct a current of air through it ?—Yes.

7167. Is that generally the case in other mines with which you are connected ?—Mr. Boyns says that in Wheal Owles, and I have no doubt that he is correct, they have done it in one or two cases ; but they have so many winzes down there.

7168. But it is not generally the case ?—No, it is not, and it is by this arrangement that the ends in the Levant mine have been driven out under the sea ; there were no means for it, excepting by ventilation in this way; we could not sink down a perpendicular shaft to the sea.

7169. If the means you have referred to answer in that mine, would it not be an advantage if they adopted the same principle in other mines ?—Yes ; if the same necessity existed ; but usually where we can command a proper surface, shafts are sunk down for a moderate distance where they have not to go, as in one or two of our mines, a quarter of a mile or a third of a mile under the sea, without the possibility of sinking a shaft

7170. In other mines which do not run under the sea, do you think that the shafts and winzes provide sufficient ventilation ?—Yes, I am satisfied that there is nothing wrong in that respect.

7171. Have you ever been in a close end yourself ?—Yes.

7172. Where a candle would not burn ?—I have been in a place where the candle has been inclined to go out, but not where it would not burn.

7173. Is there any way of improving the air when that is the case ?—The only way is by sinking winzes where it is possible, and by making a double current, which is sometimes effected by bringing a bolt into the bottom part of the level, and by throwing air in by artificial means, by fans, through tubes ; we do that in a little mine, now called Bosorn and Bollowall United mines.

7174. You bring the air in from the surface ?—It is brought in through the adit level. We are driving an adit to intersect the lodes which we believe to be before us ; we are in this way doing our very utmost to avoid being compelled to sink a shaft for the purpose of extending this level, and cutting these lodes.

7175. What is the machine that you employ to force in air ?—A fan.

7176. How is that fan worked ?—It is worked by a boy, I think, turning a wheel.

7177. Where is the fan placed ?—It is placed in the level underground, opposite the tubes that convey the air into the level.

7178. How near is any place from which the air is obtained ?—There are shafts coming down to the adit.

7179. How near is it ?—The fan is placed where another adit intersects, and where there is a considerable quantity of air coming in.

7180. (*Mr. Holland.*) By that means you send the air in from the adit to the level ?—Yes; there are two adits coming together, and through one of them a good draught comes ; sometimes we do not use these at all, but we take a piece of canvas and use it as it is used in a steamer to cast air into the boiler room.

7181. They use the canvas as a windsail ?—Yes.

7182. (*Chairman.*) The fan, you say, is worked by a boy ?—Yes.

7183. I suppose three boys work it in succession, one to each core of men ?—Only one can work there.

7184. Is there not some one to turn it for the three cores at work during the 24 hours ?—No; only one man can work in the end in the 24 hours.

7185. How long does he work there ?—For about 6 or 8 hours.

7186. Is he then relieved ?—No.

7187. It is then worked only for 6 or 8 hours in the 24 ?—Yes. This fan was ordered by the adventurers to be put in there, and the captain was ordered to increase the men to two in the ends. I am speaking now under the conviction that the captain carried out the order that was given, for I really cannot speak definitely as to the matter.

7188. Do you know when this order was given ?—The order was given several months ago.

7189. To the best of your belief, has it been carried out ?—Yes ; and if it has not been carried out I know that that is really the means by which the air is carried in.

7190. But you do not know whether it is carried on now or not ?—No.

7191. With regard to the club money, is the same system adopted as to the club money in all the mines with which you are connected ?—The clubs are differently established ; the miners have recently taken upon themselves to conduct the clubs ; they have insisted, by a sort of rise in one or two cases, upon having the control of their own moneys, and that the agents should no longer govern them, or the adventures, in that respect.

7192. In which mine has that happened ?—In Balleswidden and Boscean and Wheal Castle.

7193. What do the miners contribute to the club in those mines ?—They contribute 1*s.*; I think it is 6*d.* each to the burial club, and the other 6*d.* to the sick club or the hurt club.

7194. In those clubs do the men receive relief, either when they are sick or when they have received a hurt ?—It is given to them for a hurt, and for any ickness which can satisfactorily be traced to a hurt which they have received in the mine. Difficult cases are left to the committee.

7195. How long has this been the system at work in these mines ?—At Balleswidden they have partially returned to the old system ; they have allowed the purser to come in conjointly with Mr. Searle whom they selected there under their own control; they have partially yielded the point in that respect, but it lasted, I should say, for four or five years, and it still exists in Boscean and Boswidden.]

7196. In the other mines the clubs are still under the control of the adventurers ?—Yes, throughout the

parish. I believe there are no other exceptions than the ones I have referred to.

7197. Are you aware of cartridges being used for the purpose of blasting instead of the powder being poured in loosely ?—They are very rarely employed in St. Just.

7198. In your experience they have not been used? —Very rarely.

The witness withdrew.

Mr. John Nankervis examined.

7199. (*Chairman.*) You have charge, I believe, of the Levant mine ?—Yes.

7200. Have you charge of any other mine ?—No.

7201. The Levant mine is a tin mine ?—Yes, and copper, or both.

7202. How many men are employed underground in that mine ?—On tut-work we have 70 men and 15 boys.

7203. Have you already sent in a return to the secretary ?—Yes.

7204. Has the number of men been reduced from the time when you sent in that return ?—No ; that is about the number at present.

7205. What is the greatest depth which has been reached in the Levant mine ?—245 fathoms.

7206. Are there any hot levels in that mine ?—Yes ; we have some that are pretty warm.

7207. Have you tried the temperature of any of them ?—Not very lately ; we have had it at about 70°, I think.

7208. Was that the temperatue in the level generally, or only at one end ?—It was one of the warmest places in the mine, as we considered.

7209. Was there copper or tin there ?—We had copper.

7210. Do you consider that the copper has anything to do with the increase of heat there ?—We think so.

7211. Has any experiment ever been tried in order to ascertain that fact ?—There was some years since, but there has not been of late.

7212. What plan was adopted in order to test whether the temperature was higher where the copper was than where the tin was ?—We considered the copper ore to produce the heat more than the tin.

7213. Was that in granite or in killas ?—Killas ; but we had it in granite too in parts of it, but principally killas.

7214. Is there any difference in the heat between the parts of the mine that are in granite and the parts that are in killas ?—Yes, we generally find it most warm in the killas.

7215. (*Mr. Holland.*) At the same depth ?—Yes.

7216. (*Chairman.*) Is it colder where the granite is ?—Yes.

7217. Have you ever seen any cold damp where the granite is ?—We are not troubled with it much in our mine.

7218. Have you ever seen it any where ?—No.

7219. How do you ventilate your mine ?—We ventilate the mine by driving two levels, and sinking from one to the other.

7220. While you are driving the levels is the ventilation good before you have driven them and made winzes between to connect the two levels ?—If we want assistance we put in a machine occasionally, and at other times we put in a stool in the back to make a turn in the draught.

7221. How do you know when it becomes necessary to do that ?—By practice and being trained up to it, as the men get into work they know the heat, and they judge by the light of the candles as well ; they feel the perspiration coming on, and they understand it by practice.

7222. They judge by the candle when it will not burn well ?—Yes ; when it will not burn freely.

7223. Have you resorted to the means you have spoken of ?—Yes, when it is so warm, the men sweat so much that they cannot exert themselves as usual, and then we assist them with an air machine, which has a wooden board at the bottom, and is like a conduit pipe, and they can take the air from the winze ; at other times we take the back away, and put in stools.

7224. Which do you think is the best mode of supplying air ?—That depends upon circumstances, if the ground is such as to be able to take it away over head, it answers two purposes, putting stools to work on and to ventilate too ; otherwise we put it in the bottom, and that is a less expense.

7225. Is there any water there ?—There is very little generally speaking in our mines.

7226. If it is put on the bottom is it not more likely to be stopped up ?—It requires attention to clear it out when it is put in the bottom; it is covered over, to prevent the stuff getting into it.

7227. Is it looked to every day ?—Yes it is, generally.

7228. Does the captain of the mine examine it every day ?—He may not be there every day, but when he comes and goes he sees that everything is all right.

7229. How does he try it ?—By putting down a candle there.

7230. In order to see whether the air is coming through ?—Yes ; he can put his head down.

7231. If he found that the air was not coming, he would think that there was something wrong ?—Yes.

7232. Do you think that that plan is as good as the hand machine ?—It is cheaper, as the hand machine requires somebody to work it ; there must be manual labour connected with that, a boy.

7233. It takes three boys in the course of 24 hours ?—Yes, we work about six hours, when we set the work on piece work ; a tribute-man can work seven or eight or nine hours if he chooses.

7234. Does the man pay the boy, or do you pay him ?—If it is tribute work, the man will pay the boy ; but very likely if there is a piece of work, and we set it cheap, we provide a boy to keep the air right.

7235. If it is tribute work the man will pay for the boy ?—Yes ; he must pay all the expenses then.

7236. It depends, I suppose, upon whether he considers the air too oppressive ?—We will not let them work without the air is proper.

7237. I suppose if a man did not feel any inconvenience it would be considered unobjectionable ?—If he does not complain, we examine things when we go there ; he might complain unless we went to examine the thing for him.

7238. It would be an object to him, would it not, to save the expense of the boy ?—Yes ; but if we see that it is necessary, we must have him put there.

7239. Do you make the miner find the boy to do the work ?—Yes, and we give him a price in proportion to that.

7240. Would you set a boy to work for him, or would you say you must find a boy ?—He must keep the machine going for himself, and get a boy.

7241. Suppose you had to set to a tributor so much, on the supposition that the air was bad, and he must therefore have a boy, how would you compel him to employ a boy ?—We should tell him what we thought was necessary, and it would be at his own expense.

7242. How would you make the tributor employ the boy to turn the fan when you thought it necessary? —If we wished to compel him we could fine him, or we could stop his pitch and threaten to take it away from him if he did not obey us in what we thought was necessary ; we could take his pitch away or not let him work.

7243. Supposing he had a bad pitch ?—He would be willing then to leave himself.

7244. If there were no other means of ventilation

would you put in for him a soller ?—We do that ; we have men to do it at the adventurers' expense.

7245. For the purpose of preventing accidents in blasting with what do you supply the men ?—With a wooden instrument.

7246. Do they use it ?—Yes.

7247. Do they always use it ? — Perhaps not always.

7248. What do you do if they do not use it ?—We cut them off the club ; but any man might use the things provided for them gratis.

7249. If an accident occurred to a man from his not using the wooden instrument he would forfeit his club money ?—Yes.

7250. Has that ever happened ?—Yes, occasionally.

7251. Have you ever stopped the club money from a man ?—No ; we have never been present to know whether it was so or not ; but this is a check that is put on the people. We let them know that they are in danger of losing their monthly subsistence-money ; we have had it posted up, but we have not put it in practice. If we saw a case of the kind we should act very likely upon it.

7252. Judging from your experience, is that oaken rod quite sufficient for tamping ? — Yes ; but we allow them to use the iron bar after they have settled in two layings of tamping on the powder with the wooden sticks, should they think it necessary.

7253. Suppose there is any powder lying scattered about the hole, and the tamping is put on with a rod, might not the powder be exploded by a stroke of the rod ?—They have a swabstick, and they get water generally, and they damp the end of that stick and put it in to clear away the grains of powder ; this is done before any tamping is even put in the hole.

7254. If they do not do that there is danger ?—Yes.

7255. Would it not be better if some plan could be adopted to prevent the chance of accident ?—Yes, if it could be done.

7256. You do not know anything of that kind that could be put in practice ?—No.

7257. How often do the captains of the mine visit a level where the men are working in the ends ?—They may visit them perhaps two or three days following, or perhaps two or three times a week, it depends upon what importance they attach to the place ; it is not confined to every day, but sometimes they do it two or three days following.

7258. What happens when a captain goes down into a mine and he finds a level choked up with deads ?—Then the miners are called to account, and they are told, "You must bring your stuff out or we "shall send people to bring it out for you, and keep "the money from you to pay for it."

7259. Does that often happen to you ?—It happens occasionally ; there is not a man hardly who is not liable to do it ; they will leave it there sometimes at a sacrifice to themselves if they are not looked after.

7260. You mean, I suppose, that it will impede the ventilation ?—Yes ; and the men cannot work with the same vigour. We have to look into that, for when they are crammed up they cannot exert themselves with the same vigour.

7261. They neglect it, I suppose, in order to save the cost of removing it ?—Yes ; but if they got a boy or some parties to take it away they might do it twice a week or once a week, and we have to guard against their not doing it.

7262. Will you be good enough to furnish the Commission with a copy of the rules in the mines with which you are connected ?—Yes.

7263. What do the men pay for candles ? — 9*d.* a pound.

7264. Are they limited to a certain quantity in a given time ?—Not exactly ; but there is a certain quantity mentioned generally ; and if they are working longer or anything takes place so that they require more they have more supplied to them.

7265. What is the general quantity that you allow the men ?—About 2 lbs. a man per week.

7266. Do you use in the mines with which you are connected any particular kind of powder ?—No ; it is the common powder.

7267. Have you never tried powder that produces less smoke than the common powder ?—There was a powder that was had down here and it was something lighter, but we could not perceive any difference.

7268. I suppose that the other deductions made in the bill are for club money and doctor's money ?—The club money is the men's ; a similar amount goes to the doctor.

7269. Do you deduct so much a month from each man for club money to provide for accidents ?—Yes.

7270. How much do you deduct per month ?—6*d.* a month.

7271. Is that to provide for visible accidents ?—Yes ; that is divided between the parties who meet with visible accidents.

7272. How much is contributed for the doctor ?—6*d.*

7273. Does that contribution include attendance only upon the miner himself, or also upon his family ?—It includes attendance upon himself and his family, except in case of fever, and for the midwife.

7274. Is any deduction made for the barber ?—No.

7275. (*Mr. Holland.*) You have stated that when a level was full of deads, the men could not work with their accustomed vigour ?—Yes.

7276. Is that fact well established ?—Yes.

7277. Is not that a loss to them as well as to you ?—Yes ; but they are anxious to allow a sufficient quantity to accumulate so as to have a full day's work for the person they hire.

7278. When the miners cannot work with proper vigour, you put in a blowing machine, and that is for their benefit too ?—Certainly.

7279. Do the tributors never make any difficulty about paying the boy ?—No. They are glad to have him and to pay for him.

7280. (*Mr. Kendall.*) If you find any difficulty in getting your orders carried out, do you not always either spale or suspend the miner ?—Yes ; or we turn him away.

7281. Do you always do that ?—Generally.

7282. Are you not always obeyed by the larger number of the men ?—Yes. If they work in the mine they must do what we wish them to do.

7283. Is not spaling very common ?—Yes ; quite common ; and it was before I was born, I believe. The first spale is 2*s.* 6*d.*

7284. (*Mr. Holland.*) You are the judge of how a pitch ought to be ventilated, and you do it in the way that you think best, and the miners submit to your decision without question ?—Yes ; we have it put down in our rules. We fine a man for not obeying our orders, in the first instance 2*s.* 6*d.*, and for the next offence 5*s.*

7285. Can you equally spale both the tributors and the tut-workmen ?—Yes ; or we can do away with them. We say to them "You must attend when you "are called upon, you must submit to what the agents "think is best to be done".

7286. Is it not very good economy to furnish a good supply of air to the miners ?—Yes.

7287. Does not that save them loss of time and loss of exertion ?—Yes ; we have to look into that ; and it is for our benefit to do it ; that is one of our principles to get the places well ventilated; we then get more work for the money.

7288. Your plan is to use a fan machine worked by boys, and to put in sollers ?—Yes ; and in sinking down winzes from level to level.

7289. Until a winze is sunk, or a rise is driven, when the air is close have you any other plan besides the fan machine and the boy or an air soller ?—Yes; there is one thing that we have, we open a wide level and a high one generally where we intend to go for a great length.

7290. How wide and how high would it be?—Eight or nine feet high, and three and a half or four feet wide. Then we put down a railroad, and lay in a tram waggon, which, pushing to and fro, makes such a circulation, that it does assist us in getting the air in better.

7291. (*Chairman.*) By that means you make the air circulate to the bottom of the mine?—No; only at the level where that plan is adopted.

7292. What do you call a long end; how far distant from a shaft, or from a winze?—We go by the railroad sometimes 30 fathoms and sometimes 50 fathoms, and perhaps 60 fathoms; sometimes we work 70 fathoms, the air coming from one draught.

7293. (*Mr. Holland.*) Without a winze?—Yes; we can work so, it depends upon what draught you have at the mouth of the level, and whether the air is pure.

7294. (*Chairman.*) If the air is pure you can go 70 fathoms?—Yes.

7295. (*Mr. Holland.*) Can you keep the air cool to a distance of 60 or 70 fathoms?—Not in places to work all the time; in those places we generally calculate to work for six or twelve hours out of the 24, for the rest of the time it is left to cool. If we wanted to work longer time we should very likely have to apply the machine and to sink winzes if we could.

7296. How long does it take to sink a winze?—That depends upon the distance you are going to sink it.

7297. What is the longest time that it has taken you to sink a winze?—It depends also upon the hardness of the ground; three months sometimes, or more or less, and it depends also upon the number of hands.

7298. Until that winze is sunk, what do you do?—We abandon the end perhaps, if we do not think it will do to keep it on.

7299. When you are sinking a winze is not the air bad at the bottom of that winze?—Then we use the fan machine.

7300. How do you throw the air to the bottom of the winze?—By the air machine and pipes; we put down pipes in order to carry the air to the place where the men are working.

7301. What length of pipes do you run from the end of the air machine?—I think we have driven 100 fathoms.

7301*a*. With a boy driving the air machine at the end?—Yes.

7302. Do you know what quantity of air you drive in?—No.

The witness withdrew.

Mr. Henry Boyns examined.

7303. (*Chairman.*) You come from the Botallack mines?—Yes.

7304. Have you been underground to-day?—Yes.

7305. How long is it since you have had any means of conveying the men down your incline?—About six months.

7306. Formerly the mine used to be very hot in places, was it not?—Yes, the part of the mine which is ventilated now by our diagonal shaft was 91°; very warm.

7307. What is it reduced to now?—To about 70°.

7308. Is it a copper mine?—Yes.

7309. Is there any tin in it?—Yes, there is.

7310. In the part you have referred to?—Yes, there is both tin and copper.

7311. Does that diagonal shaft communicate with other shafts?—Yes, through the levels.

7312. That is the way in which the ventilation has been effected?—Yes; the levels being communicated in long distances from one shaft to another.

7313. When you speak of long distances, do you mean the distance from one shaft to the other?—Yes.

7314. You think that this helps the ventilation?—Yes; there is a better balance of the air.

7315. Have you any shaft that is an up-cast, and any shaft that is a down-cast in your mine?—No; we have five mines in connection with the Botallack mine on different lodes, in each we have more than one shaft, so that the ventilation is good for driving out the impure air.

7316. Is there one or more of those shafts which are especially up-cast shafts?—I do not understand the term.

7317. I mean a shaft by which the air goes out, it being drawn in by others?—Yes; sometimes it is altered by a change of wind, but there is no rule for it; excepting in the Crown's part being under the sea, the engine and other shafts are the down and the diagonal the up-cast.

7318. But the air below the sea always goes down one shaft, does it not?—Yes, and comes up the other.

7319. (*Mr. Kendall.*) How far are you able to force air in?—We can force air in to a distance of 200 fathoms, if necessary.

7320. How far have you forced it in?—To a distance of about 150 fathoms by a small machine, that is the greatest case that I have known.

7321. (*Chairman.*) How is the machine worked?—By a boy at the rate of 10*s*. a month.

7322. What is the depth of the shaft?—190 fathoms vertically and 370 diagonally.

7323. What is the length of the level?—The 180 fathom level is 400 fathoms from the vertical shaft and reaches the diagonal at 280 fathoms.

7324. What was the object of making the diagonal shaft?—There were three reasons for it: the first was to explore the productive part of the mine which took a diagonal course from the surface, the diagonal shaft being sunk on the lode; the second was to carry on the ventilation, without which we could not work the mine; and the third was to draw the men up and down through the shaft.

7325. How do you contrive to ventilate beyond the point where the diagonal shaft reaches the level?—By winzes.

7326. How far had you driven the level before you put in a winze?—About 50 fathoms in the Crown's part; in some parts we have gone as far as 100 fathoms.

7327. Was the air before you came to the 50 fathoms at all poor?—It is generally close, but much depends on the freeness of the air behind.

7328. Suppose you were driving away from a shaft or a winze 50 fathoms, should you consider that far enough?—Yes.

7329. It must be close there, must it not?—Yes, but it depends upon circumstances; if we work only one pair a day it makes it much more acceptable to work in; if we have three pairs of men a day at work it is necessary that something better should be done.

7330. Do they work 6 or 8 hours a day?—They work 7 hours a day, but there is no blasting goes on then; a man can leave and he is not affected in any degree whatever.

7331. How long is it before the smoke gets out of that sort of end?—Three hours perhaps.

7332. You can only work one pair of men a day?—In following that rule we can drive our ends further without ventilation, not doing injury to any person.

7333. When you have foul air the men do not drive so fast?—No; if a mine does not need forcing we can take a longer time about it, and do it cheaper; we can do it more effectually, and at less expense, but if we must force it we must put in superficial means of forcing the air, then we save the expense of

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sinking winzes, and the men are better off even then.

7334. They are better off then?—Yes; they are not affected by the blasting.

7335. Is there any accumulation of bad air when the men go down on the Monday, or is there any damp air?—No; the air is as free as it is in this room. If you go to the bottom of the diagonal shaft the air is as free as it is here.

7336. But it is not so at the end of the 50 fathom level?—No.

7337. Does the diagonal shaft go the bottom of the lowest level?—Yes.

7338. Have you ever worked in other mines?—Yes.

7339. Have you worked in what they call a close end?—Yes; I worked as a miner for 16 years.

7340. How did you know that the end in which you were working was close?—I felt the want of draught, and then by the burning of the candle.

7341. Which showed it to you first?—The candle. We feel that it is a little warmer, but we can generally breathe freely.

7342. You see that the candle does not burn so well?—Yes; as soon as we are in a close place, generally speaking, we have a little warmer atmosphere, and there is not that current of air to be felt, and the perspiration is more free.

7343. After leaving a close end, do you feel affected when you are climbing the ladders?—I do not think it makes much difference in that respect; if a man works hard he becomes exhausted, but the climbing, I believe, is an evil amongst us. I think that we climb rather too fast, generally speaking.

7344. What causes do you think chiefly interfere with the miners' health?—The first cause no doubt is the closeness of the air. The next is climbing the ladders; that has proved very injurious to our young men in walking up so fast, which they often do, the heart is greatly affected. I was down 200 fathoms yesterday, and I found that I could climb the ladders very comfortably, and felt very little exhausted when I got to the surface after doing my work of examining the mine. The third cause is the high state of perspiration produced, and then coming into a cold atmosphere near the Atlantic, and then, perhaps, having miles to walk to their homes.

7345. And when they come up to the surface, having far, perhaps, to go to the changing house.?—That would be bad; but our situation is considerably improved in that respect.

7346. A good changing house, I presume, is a matter of great importance?—Yes, that is clear if necessary precautions are taken.

7347. You think it is of importance to have a good changing house?—Yes.

7348. Have you got a good changing house?—We have them warm; but I do not think that our condition is altogether satisfactory on that point. We change in the boiler houses; the engines being in different parts of the mine make it very convenient for the men, being near the shafts and warm to dry their clothes. I think it is preferable in some cases, but I think we should have a little better arrangement than that as a rule. I apprehend that there must be danger, although we have had only one accident from the bursting of a boiler in the neighbourhood.

7349. Where did that happen?—At Pendeen Consols.

7350. When did it happen?—About 12 months since.

7351. Was any man killed upon that occasion?—One man was, but he was not connected with the engine; he was out in the fields and he was killed.

7352. Therefore there is always a liability to danger if the men change their clothes in the boiler house?—Yes; we think so.

7353. How often do you clean out the boilers?—Somewhere about once a year.

7354. Is there any record kept of the time when they are cleaned out?—Yes; the date is put down at once.

7355. How do you judge when it is necessary to clean them out?—From practice, knowing the quality of the water that goes into them. When we cleanse a boiler at any given time, we judge accordingly.

7356. Do you clean out the boilers regularly once a year?—That depends on the quality of the water and the quantity of steam generated in them, and whether the foulness of the water acts chemically on the iron.

7357. Are the rules of the mines stuck up when you set the work?—Yes, there are rules; and our purser at the setting day will say, "Our rules are as usual," unless anything particular is necessary.

7358. Will you be good enough to furnish the Commission with a copy of your rules?—Yes.

7359. Are the rules stuck up?—Yes; rules with reference to the order of working on entering the mine, and giving notice on leaving the mine.

7360. Have you laid down any rules as to the mode of blasting?—We have no other rule than constantly reminding the men on the setting days that we provide for them suitable material, a suitable kind of tamping for blasting, and a certain kind of bar to be used, and we caution the men that if they do not attend to these things and anything happens, and it is proved that it has not been attended to they will not have any claim upon us.

7361. I suppose that in all mines there is a supply of proper tamping?—Yes; in all well-regulated mines.

7362. What is the bar that you have just spoken of?—We have a composition bar.

7363. To serve as a tamping rod?—Yes; the composition is copper principally and lead.

7364. With that bar can you not strike fire?—It is not supposed so.

7365. Have you ever had an accident occur from blasting?—Yes, several; but when I say that, perhaps sometimes not one a year.

7366. Do you suppose that these accidents have arisen from carelessness?—Yes; in the last case there was a great deal of carelessness; there was not proper tamping used in the first place.

7367. That you supply?—Yes; but the men take up just what comes.

7368. How do they carry the tamping down the mine?—They provide bags, and it is sent down by the engines.

7369. I suppose the tamping may become mixed with the refuse?—Not of necessity; we have boxes provided to hold it in.

7370. Have the miners always the boxes with them?—They are supposed to have.

7371. But they have not always got them, I suppose?—I do not say that there are not exceptions, but when there are such a number of men at work the agent's eye cannot always be over them to carry out the rule without exception.

7372. What quantity of candles are allowed to each man?—2 lbs. a week per man.

7373. How much powder is allowed to the miners?—That is at their own judgment and choice.

7374. What is the charge made to the miners for candles?—9*d.* a pound.

7375. How much for the powder?—9*d.* a pound.

7376. What is the contract price at which you get the powder?—It costs us about 50*l.* a ton; about 6*d.* per lb., but it varies in price.

7377. What is the contract price of the candles?—It is about 6*s.* for a dozen pounds, at present about 6*d.* a pound.

7378. What sum do the miners contribute to the club?—It is 6*d.* per man per month, and 3*d.* per boy.

7379. Is that to provide for visible injuries?—It is for any person who is hurt by any means in the mine; it is called the hurt club, not the sick club.

7380. How much is paid for the doctors?—The same amount, 6*d.* per man and 3*d.* per boy a month;

but in that is included the attendance of the doctor on the whole of the family.

7381. Is there anything charged for the barber ?—Nothing.

7382. How are the doctors appointed ?—They are appointed by the adventurers.

7383. Have you any men who have been previously working with you, but who are out of employment just now ?—I do not remember one, we had one man burned but he has followed his avocation in order to get his livelihood since.

7384. (*Mr. Holland.*) Do the tamping tools to which you have referred last pretty well ?—Yes, they last fairly.

7385. Is the implement that you mentioned an iron rod with a composition end ?—Yes.

7386. Are they nearly as durable as iron ?—Yes.

7387. About how much do they cost ?—We charge 1*s.* per bar, the copper I suppose being about sixpennyworth.

7388. What is charged for the whole bar ?—1*s.*

7389. And you say that they last nearly as well as iron ?—About the same. The men are charged a certain amount for the purpose of making them take care of them.

7390. Are not all the tools weighed ?—Yes, and all deficiency they pay for.

7391. In the case of the tamping rod it is the same, I presume ?—Yes.

7392. (*Mr. Kendall.*) You do not weigh out the tamping rod ?—No ; that is charged per piece.

7393. (*Mr. Holland.*) How are the men drawn up in your mine ; in waggons ?—Yes. We have a railroad and a carriage to take the men up, but without a break ; it is drawn up by a chain ; we do not think it safe, and the men do it at their own option; we do not warrant it ; we cannot do that without having a break to the wheel.

7394. At present it is a common tram waggon ?—Yes.

7395. Drawn up by a chain ?—Yes.

7396. (*Mr. St. Aubyn.*) It is drawn up the diagonal shaft ?—Yes.

7397. (*Mr. Holland.*) Do the men like it ?—Yes ; indeed there is a great difficulty in keeping the men out.

7398. Can you get all the men up in that way ?—Yes ; from that part of the mine, which is not one-fifth part of the mine altogether.

7399. Are the men able to perform more work since they have been carried up and down in that way than they did before ?—Yes. I have an idea that the men expend their strength the other way in coming and going, and cannot put it into their work.

7400. What proportion of extra work can they do now ; do you think it is as much as a quarter more ?—From the advantages that we have derived here in the way of extra work from the position of this shaft, we can save more than one-third part ; we do that now, and for one-third less money than before we had that shaft there ; that is partly from economy of toil and partly from ventilation.

7401. Can you divide them at all, and say how much is due to each ?—I think somewhere about one half of it.

7402. Have you any very distinct data for calculating it ?—Not at all. I was never asked the question before.

7403. (*Mr. Kendall.*) According to your present idea, your save about fifteen per cent. upon the labour in consequence of being able to send the men down as you do now ?—Yes ; I should think that is something about it, judging offhand.

7404. What age are you ?—Forty-two.

7405. How long have you been an agent of a mine ?—About fourteen years.

7406. How long were you a miner ?—I was a miner for 16 years.

7407. How do you feel now in your health ; are you as strong as ever ?—I am quite strong for labour.

7408. Who is it that pays the fan boy ?—Sometimes the agents reserve it to pay it themselves, otherwise they make a contract with the parties; they arrange that very generally with the parties engaged ?

7409. Do you find that in order to save the expenses of the boy they ever neglect to use the fan ?—Not if it is insisted upon by the agent.

7410. But suppose you found out that they did so, what steps should you take ?—We should correct it immediately.

7411. How would you proceed ; first, by spaling the men ?—Yes ; but we very rarely do that. I never did it but twice in my life. It is the custom to do it occasionally ; but I do not think it is the right way to do it.

7412. As I understand from your evidence, notwithstanding your mine runs a long way under the sea, yet by winzes which are connected with your diagonal shaft, and with your right down shaft, the mine is not otherwise than fairly ventilated ?—Yes, it is ventilated equal to any mine in the county of Cornwall.

7413. (*Mr. St. Aubyn.*) You have stated that you do not consider the waggon coming up the diagonal shaft on the rails is safe ?—You must understand me to mean without a break we do not think it safe.

7414. But they use it without ?—Yes, they do, but they do it at their own risk.

7415. But how can you feel justified in allowing the men so to come up if you do not consider it safe ?—We say to the men, "If you do it, you do it at your "own risk," that is how we justify ourselves.

7416. But still the miners are under your control ?—We consider that we are no longer responsible.

7417. Have you not the management of the mine ?—We are the agents of the mine ; but, however, the matter has been attended to, and a carriage with a break to it to take eight men is now working with the greatest safety.

7418. In which do you think the miners suffer the most, in the old mines or the new mines ?—In the new mines if in any. The ventilation is not so good as the ventilation in our mines. I could put you under 200 fathoms, where the air is as good as it is here. We have very few new mines here. Our fathers began them for us.

7419. In the new mines you think there is more risk of the men suffering ?—Yes.

7420. From want of ventilation ?—Yes. The difficulty is when we sink the first shaft to get air down any considerable depth without superficial means to force it till we communicate with another shaft. I recollect working in the dark in order to get a communication.

7421. Did you suffer from that ?—The time was nothing to interfere with one ; I do not recollect suffering.

7422. How long were you so working ?—Not more than three or four weeks at the furthest, speaking of the time that it took us to get this communication through. Artificial means were used by using sails to force the draught all we could.

7423. Do you think that miners may suffer independently of the deepness of a mine by merely driving without having a thorough communication with some other shaft ?—Yes.

The witness withdrew.

Adjourned to To-morrow at 12 o'clock.

Friday, 1st August 1862.

PRESENT :

The Right Hon. Lord KINNAIRD, K.T.	RICHARD DAVEY, Esq., M.P.
NICHOLAS KENDALL, Esq., M.P.	P. H. HOLLAND, Esq.

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

Mr. STEPHEN HARVEY JAMES examined.

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7421. (*Chairman.*) What position do you occupy?—I am the purser and manager of the Botallack mine.

7422. Have you the charge of any other mines?—Not at present.

7423. Will you state about the number of men in the Botallack Mine?—I should think we must have about 320 or 330, or perhaps 340 underground. There are altogether underground and on the surface over 550 persons, including women and boys.

7424. How long have you been manager?—I bought the mine of the late adventurers in the year 1835.

7425. That was before the diagonal shaft was made?—It is only now put down; it is about three years ago that we commenced it.

7426. Before that was put in it was very hot in parts, was it not?—Yes.

7427. During your management was it in that state; and were you obliged to abandon the working of any part of it?—Not exactly so; but it got very hot, and it would have been difficult for us to have gone on to have followed the ore that was there except we had a diagonal shaft.

7428. At that time, when you were working the mine, how did you manage to ventilate it?—We carried one level after the other, and so made winzes from one to the other. We had no artificial means, except that occasionally we used fans if we were driven to push in a level. We put in a fan where there was good air, and forced it in to suit a winze at such a place.

7429. But since the diagonal shaft has been sunk you are able to work at the ends of the levels?—Yes; as much as you like.

7430. Have you no close ends now?—Not one to my knowledge.

7431. No places where a candle will not burn?—No; and we never had. We were never so bad as that.

7432. How did you judge that the ends were bad?—We found it very hot.

7433. You only judged from the heat?—More particularly from the heat.

7434. Did the men never suffer from working?—I do not think that they suffered to any extent. The only man that I know who suffered to any extent was a man named John Waters; he worked in the worst end of the mine for years, and I think that he is as good a man as we have now.

7435. How did he suffer?—I should suppose that he suffered a little from shortness of breath, but it seems to have passed away altogether now.

7436. How old is he now?—From 50 to 60.

7437. Where does he reside?—Here in Church Town. I think that we can get hold of him in the afternoon. I should like you to see him he has been working with us every day, I think, for 10 years, and I think that he is a strong sort of a man.

7438. And he is now working under ground?—Yes. I never heard a complaint from him.

7439. That is the only man who you think at all suffered from working in Botallack Mine?—I am satisfied that we have had no other working in any close place to any extent whatever. Whenever we have found it close we have always taken care to put in a fan, and iron or zinc pipes, and force in air into the end in such a way that it would blow out a candle.

7440. What is the extreme distance for which a fan has ever been employed to drive air?—I should think that we have employed it for some 70 or 80 fathoms in the latter part of it; of course in the former part it was not wanted.

7441. Is the fan driven by a boy?—By a boy or a man.

7442. Have you employed a boy or a man?—Sometimes a boy and sometimes a man; a boy generally I should think; that was found to be quite sufficient.

7443. How far was he generally from the point where the men were working?—Perhaps it would commence at 40 fathoms, and it might go on to 80 or 90; on one occasion I should think that it went on to 100.

7444. Must the boy continue constantly blowing?—Always while there is a man in the end.

7445. Is there a relief of boys the same as of men?—Yes.

7446. Three corps?—We seldom work three corps; two corps generally.

7447. What are the hours of the two corps?—I do not myself think that they work above five hours in a corps on the average. They may be seven hours from the surface, but I do not think that they are above five hours at the work.

7448. At what hour do they go down?—At half past seven; and they come up at one or possibly half past one and sometimes two.

7449. They are relieved and another corps goes down?—Yes; but in many cases we only work one pair of men; we have not had men enough to do more.

7450. Does it depend upon the state of the ore?—In a great measure it would. If there was anything very particular you would put more and pay them an extra price for pushing on; but with a single pair you can work cheaper than with two, and with two cheaper than you can with three.

7451. If you put in extra men, still that fan gives you sufficient ventilation?—We have always found it so.

7452. What security have you that the boy continues constantly blowing?—If a man in an end did not find sufficient air coming in, he would take out a rope's end.

7453. He would take the rope into his own hand?—Yes.

7454. Does he pay the boy's wages?—Very likely the adventurers would have to pay them; on some occasions they would, and on others not.

7455. According to the bargain which you make?—According to the bargain which we make.

7456. Have you ever tested the air in a close end when the fan has been at work?—I should think that it has been tested many times. I do not recollect that I have done so myself. I never have.

7457. Do you think that the fan is quite sufficient to ventilate any close end?—It will depend upon where the fan is fixed; if the fan is fixed in a place where the air is very good and perfect, I think that it will be sufficient.

7458. I suppose you have worked in and been connected with other mines?—I have been connected with other mines.

7459. Is not a soller sometimes used?—Yes, occasionally.

7460. Do you think that a good mode of ventilation?—Yes; it will carry air a very long way.

7461. Which do you prefer, a fan or a soller for ventilating a close end?—I think a fan better for a short distance; in a very long distance you may have to

resort to a soller, but I hardly think that anything of that kind is required here. We want to drive our levels through the ground. If we omit driving a level, we may leave a bunets, therefore we prefer driving 10 or 12 fathom levels and sinking winzes.

7462. Do you sink winzes for ventilation?—You may discover something by it; but if not, it is for ventilation.

7463. When you drive a lower level, and put in a winze into the upper level, does it ventilate the lower level?—Yes.

7464. Does the draught come down?—Sometimes it comes down and sometimes it goes up; but it will depend upon the wind at the surface.

7465. If it goes up it will not ventilate the end beyond the winze?—It will ventilate the end to some extent, but not to a very great extent.

7466. Do not you think it possible that parties driving an end away from a winze where the draught is up are of opinion that the air is improved when it is not?—No. I think that they can tell it pretty well; but we have another mode, we put in a door to send the air into the end.

7467. Do you think that that is generally done?—Very frequently; it is done on all occasions whenever it is thought to be necessary.

7468. In a well managed mine?—Almost in every mine; it is always done with us, perhaps there are some omissions. Some people, I fear, are not so careful about things as they ought to be.

7469. If it is not done, and if there are not means to secure the air going by doors, or otherwise, to the extreme level, it is gross neglect?—It is neglect, there is no question about that. I was never but once in my life in a place where it was such a close end that a candle would not burn.

7470. Of course you never permit any accumulation of deads in your levels?—As little as possible; there are certain times when it will happen, but we calculate that it is cleared every week, or perhaps twice a week.

7471. In letting the ground to your tributors and tut-work men, is it equally their business to carry the deads away?—Yes, to bring them to shaft.

7472. If you found them accumulating, what would you do?—There would be a noise about it; they would not be paid until they had cleared their work.

7473. Would a man be spaled for it?—No; but there would be a noise about it. I do not think you can spale any men in this place, they would be off to another place; they are just as independent as yourself. All the spaling that you can give them is to say, "If you have not completed your bargain altogether we will not pay you." We cannot spale here, the men are masters here, and they have been masters for years.

7474. When you are in want of men, do they come from other parts of Cornwall?—Yes, from many places.

7475. Then you are never in want of men here?—I believe that we have been in want of men here for many years.

7476. Have you ever taken any steps to induce them to come from another part?—Perhaps we have quietly. If you want men you dare not say so in the mine. Our men are remarkable for their independence. And there is another thing, our men all work single-handed; we have not two men in an end here at a time.

7477. Is not the work let to them in pairs?—Yes; but if there are two men in an end, one comes in the forenoon and the other in the afternoon. He holds the borer with one hand, and beats with the other, and when the hand gets tired with the hammer, the man changes it. That is a reason why the eastern men cannot work with our men here, they must all go double-handed.

7478. Which is the best mode, double-handed or single-handed?—Single-handed men get more money; two men single-handed in an end will get as much as three double-handed men. There is all that difference.

7479. Which would be the best for the adventurers?—Single-handed.

7480. (*Mr. Holland.*) Is that the case in all rock?—Yes, with us, excepting there is something extremely hard. If you are going to drive a cross-cut across a piece of ground at 20*l.* or 25*l.* a fathom, that, perhaps, is a different thing.

7481. (*Chairman.*) Then do you think that that is one reason why when in other parts of Cornwall there are men seeking work, they do not come here because they cannot work single-handed?—That is a reason and a very principal one.

7482. Another reason, I suppose, may be that living in another part they do not like to leave with their families?—No person would leave his home if he could remain at home.

7483. And therefore it would be an expense to them to give up their cottages in other parts of Cornwall to come here?—Yes.

7484. Have you plenty of house accommodation?—Yes, I think pretty well.

7485. But should you have sufficient for any extra men?—I do not know that you would find very much extra accommodation for other men; there is no excess of houses.

7486. Are they principally tut-work men or tributors?—Principally tut-work men. There are more tut-work men than tributors.

7487. Do you raise the ore by tut-work men?—Principally, more than by tribute. When we had the rich bunch of ore in Botallack, I never set one tribute pitch, it was stoped at so much a ton. We made 50,000*l.* profit there, by setting the ore by the ton, and I do not think that any man ever made more than 4*l.* a month by it, so that the adventurers had the whole of the proceeds.

7488. I suppose it is only where you have a good bunch of ore that it would answer to work by tut-work?—It is only where you have a good bunch of ore that it would answer to break by the ton; but we are now breaking all the ore that we are breaking by tut-work, at so much a fathom. Our ground is very rich, generally, and subject to what the miners call "scotches." It would go abroad, perhaps, into a wall of 8 or 9 feet long, and would turn out 10 or 15 tons of ore, worth 15*l.*, 18*l.*, and 20*l.* a ton, and we have had 25*l.* and 28*l.*

7489. What are the tribute men working at principally?—On tin.

7490. With respect to the candles, is there a limited allowance of candles to each man?—I think there is, generally.

7491–2. What do they cost you a pound?—About 5½*d.* or 6*d.*, delivered here.

7493. (*Chairman.*) What do you charge for powder?—9*d.*

7494–5. What kind of powder do you use?—Principally from Kennell Mills, near Penryn.

7496. Does that give less smoke than common powder?—It is common powder.

7497. There are two kinds of powder used in mines, are there not?—There was a sort the other day, which was sent out by Thomas Davey, which was composed of something different; we had a little of it on trial, but our people did not like it.

7498. What is the cost per pound of the powder which you get?—We are charged 6*d.* a pound by the ton. We charge it as high a price as we can in order to induce the men to be as careful as they can.

7499. Is it the same reason with the candles?—Exactly.

7500. But you only allow them, under any circumstances, 1½ lb. or 2 lbs. of candles?—Two lbs. is the most in the regular way; if there is anything extra, so that they work longer hours, they have more candles.

7501. Do you know the quantity of candles consumed in a year in the mine?—I am hardly prepared to answer that question.

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7502. Can you furnish us with it? — Yes; I should think that our supply is something like 50 dozen a week.

7503. Can you furnish us with the quantity of powder? — Yes; we will give you the quantity of powder which we use in a year; we had two tons last quarter.

7504. There is no deduction from the men in your mine for the barber, is there?—No.

7505. With respect to the club, is it an accident club or a sick club?—An accident club.

7506. How many men contribute? — All the underground men.

7507. Do the women and girls contribute?—No; many of the surface men do.

7508. (*Mr. Holland.*) Is it voluntary?—Yes; it is voluntary altogether.

7509. (*Chairman.*) Is it voluntary with the underground men?—I should say so. I do not know that there is any compulsion about it at all. We collect it; but if any person likes to refuse to contribute he is quite at liberty to do so.

7510. (*Mr. Davey.*) Did you ever know a man refuse?—Yes; we had a man who refused some years ago to pay to the club, and I think that that day fortnight he was buried.

7511. (*Chairman.*) Is there also a death club?—Yes; it applies to every person working in the mine, and if Botallack had been the last mine that a man worked in, and he continued his subscription up to pay to the death club, his widow, or mother, or sister, or whoever might be his representative would be entitled to 1*s.* from each of the men.

7512. The death club is different from the accident club?—Yes.

7513. How often is the account of the accident club balanced?—It is never balanced at all. The money is paid and the expenses are charged every month.

7514. Can you give us the amount now to the credit of the men?—There is neither debt nor credit. They are paid every month out of the club. No account is kept of it in any way. The adventurers pay them as they go along.

7515. They are paid if they meet with an accident?—They are paid if they meet with an accident; they are paid 5*s.* a week.

7516. For how long?—Until they get better.

7517. If a man is blind how long does he get the the payment?—As long as he lives, and the mine lasts.

7518. Five shillings a week?—Yes.

7519. Have you any distinct club fund? — We have no distinct club fund. I kept it for some time and I found that the club did not pay, and I thought that we had better turn it over.

7520. When you found that it did not pay I suppose you had had a number of accidents?—I think we had more at that time; that must be 15 years ago.

7521. How many accidents have you had in the last three years?—There was one man killed entirely through his own folly, and we have had two or three others who have shot themselves.

7522. Blind?—One man only.

7523. You mean, by shooting themselves, blasting?—Yes.

7524. The three men are getting that allowance from the club?—Yes.

7525. How many have you as pensioners on the club?—Very few, I am glad to say. I should think that we may have about six altogether, and one of them only worked in the mine two or three days.

7526. Those men would be receiving 5*s.* a week?—Yes.

7527. Have you ascertained how the accident happened with these men who hurt themselves by blasting?—Yes; the one that I alluded to might have been there for a month. I do not think he was there so long. I have for very many years kept the pulverized sand there for tamping, and we have always used it for tamping, and allow no person to use anything else. I have always endeavoured to impress upon the minds of the men, on the survey or before the survey, that if they attempt to use anything else and any accident happens they shall have nothing from the mine. I believe we went on for seven years, and never had an accident, after introducing this sand, and at the same time I introduced oak sticks, about two feet long, made of dry oak, and I requested that they would tamp the powder with them instead of with the bars. We went on for, I should think, seven years and never had a single accident. A man who had just come in, out of stupidity or, perhaps, laziness, I do not know which, had taken up some stuff from the bottom of the level and it exploded. He had but one eye and he lost that.

7528. You think that if they used this proper tamping sand there would be no danger of igniting the powder?—If they use that proper tamping sand and the oak stick there is not the slightest danger. I am satisfied about that.

7529. But the tamping sand alone without the oak stick would not be safe? — I should use the oak stick in preference to everything. I say it is sufficient for everything except, it may be, for a particularly hard drawing hole, and I do not know that it would not be sufficient there.

7530. Do the men in Botallack mine use the oak stick?—Always. We charge them nothing for it, and if we found them charging a hole without it they would be dismissed.

7530 *a.* Have any of the men made objection to using the oak stick?—Not one. It is only from carelessness that they will get something else.

7531. I suppose the advantage of an oak stick is that the iron may strike against the rock and a spark go through the tamping, or there may be loose powder about the hole?—Yes; I think that one reason why holes explode very frequently is from there being loose powder about the hole.

7532. If you had any tamping-rod which would not strike fire against the rock would it not be as good as the oak stick?—Yes; but if the oak stick is sufficient I do not think there is any reason to risk anything.

7533. Then it is your impression that a man can complete the tamping with an oak stick?—He can complete the bottom part of it with an oak stick; for the remaining part, perhaps, it would be better to have it driven a little tighter, but I think that an oak stick is sufficient for the hole.

7534. You think that in all mines provision should be made to prevent, if possible, accident by the use either of an oak stick or some other tamping-rod which will not strike fire?—Yes, I should recommend it by all means.

7535. Do the men ever use cartridges?—Yes, occasionally in a wet place, but not elsewhere.

7536. You have never known the use of cartridges to be general in a mine?—No; the powder which we have from Kennell is very large.

7537. (*Mr. Holland.*) Is it as large as coffee berries?—No, hardly, I should think. Some of it is very nearly as large as coffee berries, but I think that that is rather an excess; it is like peas just broken in two, and whole peas, and so on. Scarcely any of it will stick about the hole, but if you have very fine powder it will stick about the hole. We think that our powder is better for that reason.

7538. That very large grain powder, I suppose, hardly wants cartridges?—No, except it is in a very wet place. Our powder is I should say, generally larger than split peas

7539. (*Mr. Kendall.*) What are the average wages of your men at tut-work and at tribute? — I should think somewhere about 3*l.* 5*s.* a month.

7540. What are the wages for the girls?—A shilling a day for the girls in the copper floors.

7541. And the boys begin at ten years of age?—Yes, and so go on.

7542. What is the lowest sum, 3*d.* a day?—I should

think that there are none under 7*s.* or 10*s.* a month. The underground boys get more.

7543. From ten to sixteen years of age you go up to what amount, from 10*s.* ?—Up to 20*s.* or 25*s.*

7544. Do the young men marry early ?—Very many of them do, rather too early.

7545. What do you call early ?—Many of them marry before they are twenty, and I think that a little too early.

7546. When they marry, do they at once go into furnished houses or into lodgings ?—I think they go into their own houses principally ; there are no such things here as furnished lodgings.

7547. Generally speaking, are they provident or improvident in their marriages ?—There are both sides—there are some who are very provident indeed; others, I believe, are equally reckless, but I think that the latter are the fewer number.

7548. On the whole, you think that they are fairly provident ?—The greater number of them.

7549. You have spoken of men having lost their lives under ground—are they, as a class, reckless about life, from your experience. Your experience is very great amongst them, is it not ?—I have had pretty long practice among them. I think that the young men are considerably more reckless than the elder ones and you will find that all the blind cases around the parish have been occasioned by young reckless fellows. It is a very rare thing to hear of a steady elderly man meeting with a misfortune.

7550. Taking the young as a body, at present, and the young as a body when you can first recollect, are they improved as far as their care goes in their working underground, and in the use of powder or not ?—I do not think that they are very much improved, I am afraid not.

7551. You have been asked with respect to the draught the moment you hole a winze, is it not the fact that the moment you hole a winze circulation begins ?—Yes, most certainly.

7552. Within a minute ?—Yes, except you have some very small hole which would not have the effect.

7553. Although the circulation may vary according to the wind, and although the draught may on one day go up and on another day go down, still at the same time, is there not a general circulation ?—Yes, there is sure to be, if you take the means to do it ?

7554. The foul air does not remain in the mine, it gets out somehow ?—Yes, most certainly.

7555. There is an idea that as there is not a regular up-cast and down-cast, and as there is a variation, it is not only very possible but very probable, that, instead of getting your foul air out of your mine you have this foul air working round in your mine for a very long time, and that there it remains, is that your opinion ?—I do not believe anything of it ; where you have two or three shafts, 50 or 100 fathoms apart, the air goes down one and up the other, and the next day it goes down the other and goes up the first one and takes every thing with it.

7556. Although there may be a variation in the mode of circulation, yet your idea is that there is sufficient ventilation to take the foul air out in a short space of time ?—Yes, most certainly. You will sometimes find it in such a state that you can hardly see the candle.

7557. With regard to the club-money, as I understand, you at one time kept a separate account of your club-money, and you found, after a certain time, that the account went against the adventurers and you dropped the separate account ?—Yes.

7558. As there are less accidents now, do you believe, as far as you can judge, that if you kept a fair debtor and creditor account now it would be in favour of the adventurers ?—I think that there would be very little balance either side. If I had thought of it I would have brought the cost-book and you would have seen the column for the club and the column for the doctor ; they very nearly balance.

7559. (*Mr. Davey.*) A question has been put to you by Lord Kinnaird and by Mr. Kendall afterwards, which has not been answered. You say that when you hole a winze you have an immediate communication from one end to the other ?—No ; I did not say that from holeing a winze you would have immediate communication from one end to the other.

7560. From one winze to another there would be a draught ?—Yes.

7561. Supposing an end to be 10 fathoms beyond that winze, what would be the result ?—It would depend upon circumstances. You cannot always answer that question, neither is the thing always the same, I think.

7562. How would you throw the air in, 10 fathoms beyond a winze ?—You would either throw it in with a soller or put in a pipe and a fan if the air had got close ; but you can drive a level from some winzes for 50 fathoms.

7563. If you have communication every 10 fathoms the air goes down one winze and up another ?—Yes ; but if I have two or three winzes down, I shall cover over all the after ones and carry in a soller. The winze would be covered up, and the air would be sent on.

7564. You have stated that all your levels are worked single handed ?—Principally so.

7565. And that the men are not away from the surface above seven hours, and are not working above five hours ?—I do not think they are.

7566. Consequently, your levels must be 19 hours out of the 24 unoccupied ?—I should think that for 18 hours out of the 24 they are unoccupied altogether as an average.

7567. Therefore, you would not consider so much air to be consumed as if the levels were longer worked in ?—Most certainly not. We would work ours harder in some places if we could, but the men will not go. They will not go and work in the afternoon, and a good many of them are so very independent that they will not work on a Saturday.

7568. Do you think that the reason why you cannot get men from other parishes is, because they cannot work single handed ?—Yes ; and they cannot live at the same price that we pay ours. They cannot get so much money.

7569. You say that the average gettings of your men are about 3*l.* 5*s.* a month ?—Yes ; our wages were over that amount on the last pay.

7570. That is beyond what they get in the midland part of the county ?—I am sure it is, Tut work and tribute work are very much the same, sometimes they vary ; sometimes one will do better than the other either way, but taking them as a whole I think the average is what I have stated.

7571. What price ground do you get ?—In Huel Cock the ground is hard, 6*l.*, 7*l.*, 8*l.*, and 9*l.* a fathom. In the Crowns, it is not so hard ; it is perhaps 4*l.* or 5*l.* a fathom. In Chicornish I think that one man and boy broke 13 fathoms last month.

7572. What sized borers do you generally use for one man?—Seven-eighths.

7573. That would be somewhat smaller than what two men would use ?—Two men would use a 1-inch borer, I suppose ; a great many of ours are not more than three-fourths ; they are all cast-steel.

7574. You mentioned that using sand in tamping was a great safety for blasting the hole ?—Yes.

7575. How do you use sand in tamping ?—We put it in for tamping the same as anything else.

7576. What do you put with it ?—Nothing.

7577. Can you tamp with dry sand ?—It will get damp ; it is not the slime.

7578. Are you aware what is the temperature of your levels ?—No ; not of late, but we have not a complaint about a single place in the mine that I am aware of.

7579. It is not very hot ?—No, it is nothing like what it was.

7580. I have heard of people in this country who prefer working in a warm place to working in a cold

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one ?—There are some people who have been accustomed to it, who have been working in a warm place who, if they go into a cold one, suffer at once. I knew one man that we had who had been working in the 180 fathom level not less than 10 years, and when he left us, he was as fine and healthy a looking man as could be ; he went away to another mine and got cold, and has not been so well ever since.

7581. How many doors or enclosures have you to your winzes ; have you many ?—Not many ; perhaps one here and another there. It is wherever the air is wanted.

7582. Is the door taken away afterwards ?—It is thrown open when it is not wanted.

7583. Is it removed ?—No, not generally, because you want it occasionally.

7584. Would a soller be of any use leading from a winze where the draught was upwards ?—Yes, you might turn it in any way by covering over the winze.

7585. But not without covering the winze ?—No, because the air would escape to the first place—that is natural.

7586. You say that the foul air finds its way out of the mine, how long do you suppose from your lowest level the foul air would be finding its way out of the mine ?—A very short time indeed, I should say.

7587. Have you ever made any experiment ?—No, we have never been called upon. It will depend upon circumstances. In the lower part of the mine, if the wind shifts and gets over the land, and is very light, you will find that the air will be close down in the mine, whereas, if it gets out to the southward or west or north-west, it is otherwise.

7588. In that case, will it take one hour to get out ?—I should say not half the time ; but when the wind is not so favourable, the air is not so good. At least it was the case. I do not think there is anything of it now. I have heard some of our people say that they were very glad to have a great coat to get into a corner to smoke their pipe.

7589. On pay-day do you pay in notes or in gold mostly ?—We pay about one half in cash and the other in notes.

7590. Where do they get the notes changed ?—Anywhere ; any person will change them here at any shop or market, or any where, if they want to buy anything. I brought home 1,275*l.* with me last night to pay tomorrow.

7591. Do they change the notes at the public-house ?—At the public-house, or at the shop, or anywhere.

7592. How are the doctors appointed in your mine ?—By the adventurers.

7593. (*Mr. Kendall.*) From your experience, where do you think that these 5*l.* notes are mostly changed ? is it or is it not at the public-house ?—That is a question which I cannot answer.

7594. (*Mr. Holland.*) Are they obliged to go to the public-house for change ?—No ; I do not think that the notes are principally changed at the public-house. Some people will go to the public-house to change them, and if they had not a necessity for it they would make some excuse to go there.

7595. (*Mr. Kendall,*) Your idea is, that whether they had notes to change or not they would go to the public-house ?—Yes.

7596. From your experience, is it not a fact that in order to induce men to come to their public-houses, the publicans get a large quantity of small change in order to accomodate the miners, so that they may split up the larger sums of money paid to them by the purser ?—I should think that there is something of that sort still carried on. I think that the shops and public-houses are prepared to receive the 5*l.* notes, and to give them their change if they come to pay their accounts ; but I think that there is very little credit at the public-houses with us.

7597. (*Chairman.*) Is there much credit at the shops here ?—I am afraid there is too much credit at the shops.

7598. Can you account for that ?—I suppose that the hope of reward sweetens labour. I suppose that they hope to profit by it.

7599. If the men were paid oftener, would it not prevent that to some extent ?—No, I think not ; once a month is often enough to pay people.

7600. But a man coming to you from another part of the county would not receive any payment for two months ?—Yes he would, if he came to me and wanted money.

7601. But according to the rules, he would not be entitled to get any money for two months ?—No ; but then we should grant him subsist.

7602. But if you did not grant him subsist it would induce his getting into debt at a shop ?—It would.

7603. (*Mr. Holland.*) As a matter of practice, subsist is given, is it not ?—Yes ; we give subsist every pay.

7604. And before every pay ?—No ; our subsist to-morrow would be perhaps 40*l.* or 50*l.* to people who think that they want something.

7605. Tributors whose accounts are good ?—Yes ; and those whose accounts are not so very good perhaps. If they were good men we should subsist them at once. Our list of subsist is made out now, and the pay is made out. The setting will begin at two o'clock exactly, and as I begin the setting the clerk and surface agent begin the pay, and in an hour or an hour and a half the setting and pay is all over ; every man is paid and has gone about his business by about three o'clock or a little after.

The witness withdrew.

Mr. Richard Burford Searle examined.

Mr. R. B. Searle.

7606. (*Chairman.*) What mines are you connected with ?—Balleswidden, Boscean, and Huel Caw.

7607. How long have you been surgeon to these mines ?—Eight and a half years.

7608. Were you in any other district before you were surgeon to these mines ?—In no mining district.

7609. Have you at all turned your attention to what is called miners' disease ?—Yes ; a number of miners come under my care in our mines and neighbouring mines.

7610. Do miners from neighbouring mines, as well as from these mines, come under your care ?—Yes.

7611. So that you may say that you have had good experience in this disease ?—Yes.

7612. How many at the present time have you off work from diseases of the chest ?—I cannot say. There is not a large number by any means. I know that there is one man who I think is about 60 years of age ; he is laid up with an affection of the chest. I think it is nearly 20 years since he went underground ; the symptoms frequently lie dormant for a long time.

7613. Have you any men now working underground who have been to you and have gone back again ?—Yes ; numbers who are permanently short breathed are now working.

7614. Can you furnish us with the names of a few of those men who are permanently affected ?—Yes, by just recollecting ; I could tell the names on a future occasion.

7615. By what cause do you think that this is occasioned ?—By a local irritation, not constitutional disorder like phthisis, it is vastly different. The pulse of miners' decline is frequently short, frequently shorter than natural. This statement would apply solely to the first stage or period of irritation and spasm ; the heart's action not only becomes depressed in tone, but its frequency affected, frequently intermitting, either due to reflex action or deficient anterialization of the blood, probably a combination of both. In phthisis it is a quick pulse.

7616. In your opinion, by what is this occasioned ?—By irritating matter lodging in the air cells.

7617. Is that matter which is drawn into the lungs

while working in the mine?—Yes; unconsumed carbon.

7618. Anything else?—Not that I am aware of. It is very black. I have seen a man after an attack of inflammation spit up the best part of a quart of black matter in the course of 24 hours.

7619. (*Mr. Holland.*) Do you mean phlegm blackened?—Phlegm made dark with black matter.

7620. (*Chairman.*) How long after he had been up from the mine did you observe this?—I think that that man had not been working underground for 10 years; the matter had been lying there all that time until an attack of inflammation ensued, and then you got it loosened and thrown off. I was struck with the large quantity thrown up. That man is dead now.

7621. Was this matter ever examined by a microscope?—No.

7622. You could not furnish us with the name of any man with whom that is likely to be the case now?—No. I have a case now where a man has not been working underground for 20 years, and yet he spits up black matter, but not the same quantity.

7623. The man who you say is 60 years old, and has not worked underground for 20 years, still occasionally spits up black stuff?—Yes.

7624. (*Mr. Kendall.*) Does he smoke much?—I am not aware that he does. I have not seen him smoke.

7625. (*Chairman.*) Do you think that the effects upon the miners arise from the carbon and not from the air or from climbing the ladder?—Yes; I believe that they arise from the carbon. The men get contraction of the air passages, and they are in a state of chronic asthma, they are asthmatic. If you sound a man's chest, you get a clearer sound on percussion than is natural certainly in the first stages; in the last and third stage, when ulceration has taken place and the air cells become filled with purulent matter; as also in the second stage, when there is permanent contraction of the bronchi from thickening, the sounds or percussion are proportionably dull, which is quite the reverse of phthisis.

7626. Do you think that these men are at all affected by the ladders?—The ladder affects them by telling on the heart.

7627. A man affected in this way would feel the ladders more than a man in sound health?—Yes; no doubt.

7628. (*Mr. Holland.*) Do you think that miners are under-fed as a rule?—I believe that their food is not the best calculated for them; miners are a great deal subject to indigestion.

7629. Are a large proportion of them suffering from indigestion?—Yes.

7630. In what part of the country did you practice before you came here?—I am a native of Dorset. I have been in Hampshire. I only practised a few months in Hampshire before I came here.

7631. Did you serve your apprenticeship in Dorsetshire?—Yes, in Bridport.

7632. Do a larger proportion of the miners suffer from indigestion than the inhabitants of Dorsetshire?—Yes; I think they do.

7633. Decidedly larger?—Yes; I think so.

7634. Do a larger proportion suffer from rheumatism?—No.

7635. Is there any excess of disease among the children?—Yes; 50 per cent. of the deaths in this parish, I believe, are of children under three years of age.

7636. Are you well assured of that?—I was looking over my list to-day, and I came to that conclusion. It is remarkable how the children die off here.

7637. (*Chairman.*) Is that conclusion drawn from the register, or from your own observation?—From my own observation.

7638. (*Mr. Holland.*) What are your data for that conclusion?—If you take 100 deaths, you find that 50 of them are under the age of three years.

7639. Do you know the number of births in the parish?—I think that there are about 400 in the year.

7640. Do you know the number of deaths under three years of age in the year?—I do not.

7641. To what do you attribute the great mortality of young children?—The great majority of them die in what we call a state of marasmus, a gradual sinking away of the body; and a great number die of croup, which you may say is endemic to St. Just; scarcely three or six months pass over without having croup here; it is very seldom absent here, croup and typhoid fever.

7642. To what do you attribute that?—To the damp atmosphere and the deficient drainage.

7643. (*Mr. Kendall.*) Do you find croup as rife among the agriculturists as you do among the miners?—Yes; I find croup in the outlying districts.

7644. As far as the miners are concerned, the croup is not more prevalent here than among other parties?—The mining population are much in the majority here; there are very few who pay attention to agriculture.

7645. As far as your experience goes, do the children of the miners die more under three years of age than the children of the agriculturists?—Yes; most decidedly.

7646. To what do you attribute that? Why should a miner's child be more subject to die under three years of age than the child of an agriculturist?—Because the father is generally is in a more infirm state of health. The state of health of the miner tells upon the offspring decidedly.

7647. Am I to understand you that the miner is not so strong a man as the agriculturist, and that his occupation, not being so healthy an occupation, what affects him affects the child?—Yes.

7648. How long have you been practising in this neighbourhood?—Eight and a half years.

7649. Did you commence here as a practitioner?—Yes, I may say so. I was only a few months in Hampshire previously to coming here.

7650. What age are you now?—Thirty.

7651. You began practice at what age?—At 21.

7652. What is the earliest age at which you can begin, according to the laws of your profession?—Twenty-one.

7653. And you began as soon as you could begin?—Yes; I was the first man in our college of my year who took out the double qualifications; so that I did not lose any time. I came here as an assistant to a mine surgeon first. It is generally the rule here to nominate the surgeons to the mine. The mine surgeon frequently lives out of the place, and he gets some one to fill his place for him; that is done in many cases by unqualified men.

7654. (*Mr. Holland.*) You mean not legally qualified?—Not legally qualified.

7655. (*Mr. Kendall.*) Generally speaking, as I understand you, or very frequently this is done, and as the adventurers have the appointment of surgeons, some men get appointed who live at a distance?—Yes.

7656. And they supply their places by unqualified men?—Yes. I may say that I am a miners' surgeon, but not a mine surgeon.

7657. You had taken your proper degrees in London?—Yes.

7658. And you came down here with a full degree, and took the place of a party who was residing at Penzance?—It is rather a strange circumstance about my staying here. I was about leaving the place, and the men of the mine that I attended to struck, and brought me back again; and they said that they had never been so well served before, and wished me to serve them.

7659. (*Mr. Davey.*) Are you appointed directly by the adventurers, or are you a surgeon substituted for another?—The men themselves took it out of the adventurers' hands, and chose me as their surgeon.

7660. (*Mr. Holland.*) I understand you to attri-

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bute this marasmus of children to the broken health of their fathers to a great degree ?—Yes.

7661. Have you noticed that the younger children of a family have been more liable to marasmus than the elder children ?—I have not noticed that.

7662. At what age do miners generally become broken in health ?—It varies from 45 up to 55.

7663. They are but little broken in health before 40 ?—They are weazened for years before they get laid up.

7664. They do not begin to break in health until after 35 do they?—No ; it is very seldom that you find a man much affected in breath before 35.

7665. And not very materially until after 40 ?—No.

7666. These men marry early, at 20 or thereabouts, do they not ?—Yes.

7667. Are not a large proportion of their children born before their health becomes broken ?—Yes.

7668. And yet the health of those children is not materially different from the health of the children born after that ?—No.

7669. How, then, can the ill health of the children be attributed to their fathers' broken health ?—I suppose they are not in good health from their boyhood ; they are not so healthy as boys as agriculturists, even those who survive infancy. Many commence working underground at 9 or 10 years of age.

7670. (*Chairman.*) Have you anything else which you wish to state ?—As regards death, I have met with one case of death here by poisoning from arsenic.

7671. Have you met with any case of death from any infection taken internally from the mine ?—Yes, from dressing the tin ore ; either from the metal itself containing arsenic, or from the hydro-chloric acid containing arsenic.

7672. (*Mr. Holland.*) How did it affect the man ?—He was taken with convulsions.

7673. Are convulsions a common symptom of arsenical poisoning ?—I cannot say that they are, but it is only one case that I have met with.

7674. Did you ever hear of convulsions as a common symptom of poisoning by arsenic ?—Yes, accompanied with salivation and vomiting.

7675. (*Chairman.*) About how long ago is this case to which you refer ?—I think that it was between two and three years ago.

7676. Did you ascertain this by *post mortem* examination or otherwise ?—No, but I concluded that the symptoms were brought on by that, and I I thought that it was carried out by the man's occupation.

7677. You never met with any other case of the kind ?—No.

7678. (*Mr. Davey.*) What age was the man ?—I think that he was about 26.

7679. Do you know in what portion of the tin-dressing he was occupied ?—It is cleaning the ore by hydro-chloric acid ; I do not know what occupation they call it.

7680. Was it after the ores were calcined or before ?—I do not think that the ore is calcined there, it is considered pure enough to do without calcining. I think that they dress it with hydro-chloric acid and that that is sufficient.

7681. (*Chairman.*) What are the usual symptoms of poisoning by arsenic ?—Irritation of the stomach and intestines.

7682. (*Mr. Kendall.*) Was this not during calcining, but merely in dressing the pure ore ?—Yes; I do not think that they roast the ore in this mine.

7683. Do you fancy that in dressing the ore there is an escape of this arsenic ?—Yes. They dress the ore with hydro-chloric acid which is supposed to clear the ore from arsenic I believe (so I have been given to understand), and either from the ore containing arsenic or the acid itself containing arsenic I suppose the man was affected thereby.

7684. Do you think that the arsenic would escape from the simple dressing of the tin ore in the open air ?—The arsenic would be set free by the hydro-chloric acid.

7685. (*Mr. Holland.*) Would it become gaseous ?—Yes, in the form of arseniuretted hydrogen.

7686. And the man would breathe it ?—Yes. The men frequently cannot stand it above a short space of time, they have to go into the open air from the irritation produced by dressing the ore.

7687. (*Chairman.*) In what mine was that ?—Huel Owles mine. I do not belong there.

7688. Is that process carried on now ?—Yes.

7689. (*Mr. Kendall.*) In order to get rid of the arsenic ?—I believe so, to clean the ore.

7690. (*Chairman.*) Have you ever seen the men affected by the poison in any way besides that ?—No.

The witness withdrew.

Captain James Bennetts examined.

Capt. J. Bennetts.

7691. (*Chairman.*) Of what mine have you charge ?—Spearne Moor and North Levant.

7692. Are those tin or copper mines ?—Principally tin but a little copper.

7693. How many men have you employed underground in the first-mentioned mine ?—I suppose in the Spearne Moor we have about 65 or 70 men and boys underground.

7694. And in the other how many ?—About 50.

7695. What is the deepest level in each of those mines ?—The bottom of the shaft in the Spearne Moor is 135 fathoms.

7696. And in the other, what is it ?—74 fathoms.

7697. Are those below the adit ?—No, those are from the surface.

7698. How do the men ascend and descend ?—By the ladders.

7699. Are there any ends which are hot or close now working ?—No ; we put winzes through from one level to the other to ventilate the mine.

7700. At present there is no end at all close ?—No.

7701. Have you had any close ends before the winzes were put in ?—Never; I never saw a close end in the Spearne Moor in my life.

7702. Or in the other mine ?—No.

7703. Then you have never had to use any artificial means ?—We have in North Levant but never in the Spearne Moor. In the North Levant we have had to force air into one end by a fall of water, but the air was very pure in the end when it was forced there by water.

7704. But not before ?—Not before. The men could work there and keep the light very comfortably, but we thought it our duty to put as good air there as we possibly could.

7705. Did the candles always burn upright ?—Yes, as much as half a dozen at the same time.

7706. And yet you thought the air was not so good as it ought to be ?—Yes, we found it out by blasting; when the holes were blasted the smoke would remain a good while and by putting this air in the smoke would be driven out quickly.

7707. Before you put in the air how long did the smoke remain ?—I suppose that it remained for two hours before it got altogether out.

7708. But the men would get in to work before that ?—Yes.

7709. After you put in the water how long was the smoke getting away ?—The smoke would go away very quickly. I should say that it would all leave the place in half-an-hour.

7710. (*Mr. Holland.*) In one quarter of the time ?—Yes.

7711. (*Mr. Kendall.*) Did you put in the air by the water machine for the sake of the men or for the sake

of getting the smoke out ?—For the sake of the men; getting the bad air out of the place would be for the benefit of the workers.

7712. (*Chairman.*) You did it for the sake of the men, both for their health and for their being able to work more ?—Yes.

7713. Can you describe the fall of water; how it managed to give this supply of air ?—The fall of water is 18 fathoms; it falls and there is a pipe leading off from a cistern; the water falls into a cistern and it forces the air into iron pipes, and when it enters the pipes there is no other way for the air to escape until it goes to the end. The water rises to the top of the cistern and runs over, and the air is forced into the pipe, and there is no way for the air to escape but to the end of the pipe where the men are working.

7714. And you found that that gave complete relief ?—Yes; the launder is four inches square, the pipe is sometimes nearly full of water.

7715. The air is carried by a pipe to the end ?—Yes.

7716. How far have you ever carried it ?—We have worked, I suppose, about 90 fathoms.

7717. With a pipe for air 90 fathoms from the fall of water ?—Yes.

7718. Before you put that in were the men at all affected ?—No.

7719. Have you any men working in these mines whose breathing is at all affected from having worked in any other mines ?—We have one working in North Levant who worked very hard in other mines, and he is affected; he is the only one that we have in the two mines.

7720. What is his name ?—John Stevens.

7721. Where does he live ?—In Morvah.

7722. How old is he ?—I suppose about 40; but he never received any injury in North Levant by the impurity of the air.

7723. You think that the affection was before he came there ?—Ever since he has been working in North Levant he has been working where the air was very good.

7724. What amount of candles are the men allowed; how many lbs. a week ?—They are allowed about 2 lbs. each.

7725. What do they pay for them ?—They pay 8*d.* a lb.

7726. What kind of candles are they ?—They are very good candles. I do not know what name to give them.

7727. Are the candles from London ?—We have our candles from Mr. Higgs at Penzance.

7728. What is the price of them per lb. wholesale, as you get them ?—About 6*s.* 6*d.* or 6*s.* 9*d.* a dozen now, I think.

7729. Do you use any particular kind of powder ?—We use the Kennell powder—the old powder; we have introduced none of the new powder which has been lately made.

7730. Have you tried any of the new powder ?—No.

7731. What price do the men pay for the powder ?—8*d.* a lb.

7732. What is the cost price wholesale ?—50*l.* a ton.

7733. How much is the doctor's fee that the men have to pay ?—6*d.* a man per month.

7734. Is there any barber ?—No.

7735. How much is the club-money ?—6*d.* per month.

7736. Is that accident club-money ?—Yes.

7737. Only for accidents ?—For accidents, and occasionally sickness.

7738. There is no provision for the men in sickness ?—Not in the mine; some have clubs among themselves.

7739. Is there a separate account kept of the club-money ?—That is generally left in the purser's hands; the purser generally manages that with the agents.

7740. You cannot speak to the management of the club-money ?—No; I think that the account of it is kept separate from the mine account.

7741. Do others, besides the men who work underground, pay to the club-money ?—Yes; but then they are left to have their own way; they can either pay or leave it alone.

7742. But there is a regular deduction for the men working underground ?—Yes, and some men who work on the surface as well.

7743. Have there been any accidents at either of those mines since you have been there ?—One in each. A man blasted a hole in the 110 fathoms level at the Spearne Moor, about a year and a half ago; the level was straight, and he fancied that he was out of reach, and a stone struck him in the back, and he died from it. In the case of a man in the North Levant, a hole exploded about him, and he lost his eyes by means of it.

7744. What was he tamping with ?—With sand that we get from Balleswidden mine, the safest that we can get in the district; we keep a stock in the mine for the purpose, and wooden chargers for them to put the powder in with.

7745. Do you use cartridges at all ?—No; our mine is dry.

7746. How do you think that the accident happened ?—I suppose that it was through neglect in putting the powder in, and that the man used iron instead of wood. They try to make all the excuses they can when an accident does happen, but we provide everything that is necessary to prevent accidents.

7747. You provide a wooden tamping rod ?—Yes.

7748. Do you think that sufficient to complete the whole operation ?—They generally put in a part with it, and the remainder with the iron.

7749. If there was any powder about, the iron rod might strike a light, and it might ignite below the tamping ?—Yes; and it might cut the fuse.

7750. But if it cut the fuse, would it not take a longer time before it went off ?—Yes, I suppose it would; but I do not think any one can account for how the holes fire sometimes.

7751. If you had a rod which would not strike fire would it not ensure safety ?—If there was a grain of powder, and it ignited, it would not go to the bottom. A grain after the hole gets two-thirds filled would not go to the bottom; and there is no way of the hole being fired except through the fuse being cut.

7752. Is there not a good deal of powder mixed up with the tamping ?—No; but powder sometimes sticks to the side of the hole, which is generally cleaned out.

7753. If that was neglected it might cause an accident ?—Yes.

7754. How many men are receiving money from the club ?—Only one in North Levant.

7755. And none in the other mine ?—No; the man in the North Levant receives 30*s.* a month. We pay a widow woman something. A man worked in our mine, and was taken sick, and died of fever; we did not think well of giving the woman money at the same time, but we have been giving her 1*l.* a month since out of the club money. The man worked there a good deal of his time, and we thought that the man worked a little longer than he was able.

7756. Was he ill before ?—He complained some days before he returned from the mine; and we helped the widow a little from the club money.

7757. What is the name of the purser of that mine ?—Mr. Higgs, of Penzance.

7758. He could furnish us with an account of the club money ?—Yes.

7759. Do you pay your men partly in notes and partly in gold ?—Partly in each.

7760. Do you know how the men get the notes changed ?—Sometimes they go to the shop where they have their meat, and the shopkeeper gives them change.

7761. When the taker wants to divide the money between the different men of the corps, how does he get it changed ?—Sometimes they go to the shop-

St. Just.

Capt. J. Bennetts.

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keeper with whom they deal, and sometimes they come back to the mine again to the purser, and then the purser gives them all the change that he possibly can.

7762. But if he has not got it, will they go to the public-house?—I suppose that some do.

7763. What proportion of notes and gold on your pay day do you pay?—I think that we pay a quarter of our money in notes.

7564. (*Mr. Kendall.*) Not more than that?—I should not think that we did.

7765. (*Chairman.*) How many boilers have you in your mines?—One boiler at each mine.

7766. How often is it cleaned out?—It depends upon the quality of the water that we have. I suppose upon the average once in a year; but then we condense with clear water. If the water was foul, we should clean out the boiler oftener. We have a clear stream of water which runs through the adit level, and that is employed for the purpose of condensing with.

7767. For supplying the boiler?—Yes.

7768. When the boiler is cleaned out is there any accumulation?—No; nothing but the settlement of the water. Sometimes if we have been driven up for clear water we have tried a little foul water and then it leaves a little slime, and that is washed out.

7769. Have you ever heard of any boiler bursting in this neighbourbood?—In the neighbourhood I have; not in any mines with which I have been connected.

7770. Can you tell us any mine where a boiler has burst within the last three years?—I suppose it is not more than three years since there was a boiler explosion at Pendeen; it might be a little more.

7771. Have you a water gauge?—We have taps at the end of the boiler.

7772. And a gauge to show the quantity of water?—No; we have no gauge, but we have one tap over the other, and the lower tap is in the tube of the boiler, and we can tell how high the water is.

7773. Are the men who are employed at the boiler men who were formerly engineers or miners?—One of our men has been to the engines all his time, and the other, I suppose, about 10 years.

7774. (*Mr. Davey.*) Do you understand much about the dressing of tin?—Yes.

7775. Do you use any new patent for cleansing it?—No.

7776. Do you suppose that any arsenic or any other mineral would injure a man from merely washing it?—No; I cannot see how it should.

7777. Are you aware that there are some acids used for dressing tin?—In some mines there are, but not in any mine with which I am connected.

7778. Do you know for what purpose?—I suppose it is to destroy all kinds of ingredients which are mixed with the tin.

7779. Is it for destroying the arsenic or sulphur or copper?—To destroy the copper or anything that may be in it; to make the tin more pure.

7780. You have never been any such acid used yourself?—No.

7781. (*Mr. Holland.*) Do you know how much water the ventilator which you have described consumes?—Not exactly; I could tell in a short time.

7782. Do you know how much air it drives in?—It drives enough air in to blow a candle nearly out. I do not know the quantity of air.

7783. Through what sized tube does it drive it?—A four-inch round tube.

7784. Have you noticed how much it cools the end?—The air is very fresh there. I do not exactly know the quantity of air or of water.

7785. Was the end hot before you put it in?—No.

7786. (*Chairman.*) You have not noticed the difference in temperature created?—No; the air was not very impure before we put the pipes there.

7787. (*Mr. Holland.*) Did you say the draught blows out the smoke about four times as fast as before?—Yes; or the current of air.

7788. (*Mr. Kendall.*) Why do you charge your miners more for the powder which they have of you than you give for it at the merchant's; and why do you charge more also for the candles?—There is an understanding with miners generally, that if they can have candles at a lower rate at the mines than they can from the shops, they will carry candles home from the mine; and it is a check that they shall not be taken away. Generally there is a calculation made of about what the men shall get in a month, and in that respect the price which they are charged does not matter, and it will prevent their taking the candles away.

7789. If you were to let them have them at the same rate as you buy wholesale from the merchant, have you any idea that they would be enabled to sell cheaper than people could elsewhere?—Thousands of pounds of candles have been carried away from the mines and sold by miners, at the present price.

7790. And, therefore, thousands more would be sold if you put a lower price on?—Yes.

7791. (*Chairman.*) What is the price at the shop of a pound of candles?—I suppose about 7*d.*

7792. Then there is 1*d.* difference?—Yes.

7793. I thought you stated that the miners were only allowed 2 lbs.?—They are allowed 2 lbs. a week, but sometimes there are boys working with the men, and the boys may not have much to do; the boys have the same quantity as the men have; and while the under people and boys are not employed working, the candles are put out. Sometimes the men are engaged at the surface spalling their stuff, and then they can accumulate their candles, and sometimes, though rarely, they steal from each other.

7794. (*Mr. Davey.*) Do your men all work single-handed?—Principally; but sometimes when the ground is very hard they work double.

7795. How many hours do you suppose they work?—I suppose that they work eight hours on an average.

7796. Would they require 2 lbs. of candles a week to do that?—No. When there are two working in one place one candle will do for the two, and two good candles will hold nearly six hours.

7797. Therefore, if you allow them 2 lbs. of candles you give them an opportunity of going to a shop to dispose of them?—If they work single, and their lights are continually burning, it will take a great deal of that quantity, and they are continually using little candles at home; they are carrying a few home in the week to burn in their own houses.

7798. But, as you say, a great many find their way to the shops now?—I have not a doubt of it, and where the beer is sold. We never allow more than 2lbs. of candles to go with each man.

The witness withdrew.

Captain JOHN CARTHEW examined.

Capt. J. Carthew.

7799. (*Chairman.*) Of what mine have you charge?—Carnyorth is one, Spearne Consols, and St. Just United.

7800. Will you be kind enough to state what number of men you employ underground in each of those mines?—I should think there are about 70 employed in Carnyorth, in Spearne Consols about 45 underground, and in St. Just United 55.

7801. Do you mean men and boys?—Yes

7802. How many women and children are employed above ground?—In St. Just United the whole number is 156.

7803. And how many at Carnyorth?—At Cranyorth there are about 120 altogether, and in Spearne Consols I should think about 105; in St. Just United 156.

7804. In which of those mines is there the deepest level?—In Spearne Consols.

7805. What is the depth of the deepest level there?—140 fathoms under the adit, 166 fathoms from the surface.

7806. By what means do the men ascend or descend the mine?—By ladders.

7807. In which of these mines is there copper, and in which tin?—Copper and tin in St. Just United, in the other two tin only.

7808. Is it in granite or killas?—Both in St. Just United; the others granite only.

7809. Are there any hot levels in those mines?—Not at all hot. Spearne Consols is the hottest of the three mines.

7810. Do you know what the greatest heat is at any one level?—No; but I do not think the heat is more than our common heat. They are cold mines generally.

7811. Do they not require any artificial ventilation?—None of them; we have no artificial ventilation in any mine that we have got.

7812. How many shafts are there in Spearne Consols?—There are three in Spearne Consols, and in Carnyorth we have three shafts; only two in the south lode, and one in the north lode.

7813. Is the north lode not connected with the south lode?—No; but it is connected with Spearne Consols.

7814. Does the same pumping engine answer for both?—The same pumping engine from Spearne Consols draws the water from the north lode and the other.

7815. In St. Just United, how many shafts are there?—Eight.

7816. Was that an old mine?—Yes, and it is now put on.

7817. How long has it been put on again?—It began in last January.

7818. How long have the other mines been at work?—I have been in Spearne Consols for 22 years, and in Carnyorth we put her on afresh 10 years back.

7819. How long is the powder smoke in clearing away after an explosion in any one of these mines?—Our mines are very well ventilated, and there is no complaint from any man or boy as to the ventilation in either of the mines.

7820. How long is the powder smoke in clearing away?—I cannot pretend to say how long.

7821. Have you ever taken note of the time?—No; but I have never heard any complaint in either one of the mines.

7822. Has no accident occured in either of these mines during the last three months?—Not in the last three months; in the largest of the three mines we had an accident by an explosion; I mean in Spearne Consols.

7823. Was that accident caused by blasting?—Yes.

7824. Have any accidents occurred in either of the other mines?—No.

7825. Did a man lose his life in the case of the accident to which you have referred?—Yes.

7826. Did you ascertain how the accident happened?—Yes, it was in tamping a hole.

7827. Do you know what the man was tamping with?—I do not know what he was tamping with, I do not recollect now.

7828. Do you supply the miners with any particular tamping rods?—We always supply them with a regular fuse, the best fuse, a tap fuse.

7829. Do you supply them with any particular tamping rod?—We supply them always with a copper tamping rod.

7830. Has it a copper end?—Copper is put on to the iron, we always provide copper; we provide hard wood for any hole they wish to tamp with, and copper as well; we tell them particularly never to use iron.

7831. Do you suppose that the man to whom the accident happened had used an iron tamping rod?—I do not know really, I never heard that he had.

7832. Do you suppose that he had gone back to the hole too soon after the explosion?—I cannot recollect the particulars, but there was no complaint made that anything was out of the common way with him.

7833. Was any inquiry made as to the cause of his death?—Only before the coroner; there was no charge brought against any one.

7834. Was there any inquiry before the coroner as to how the accident happened?—The underground agent of the mine told me that every precaution was taken, and there was no charge against any one.

7835. Did the coroner not inquire as to how the death was caused?—I was not at the inquest.

7836. In the case of an accident of that kind occurring, does the coroner inquire into how the accident happened?—Yes, he always does, whenever I have been present.

7837. Did you ever hear of any agent of a mine being blamed by the coroner?—I do not know; I never look into these things.

7838. You do not know perhaps what was the verdict of the jury?—No, not now; only I believe it was considered on all hands that there was no blame to be attached to anyone whatever; his own brother was with him.

7839. Upon a coroner's inquest taking place, who are the parties called upon to serve as jurors?—I do not know; I was not there; I was not in the habit of going to that mine—not more than once a week.

7840. Generally speaking, who are called upon to serve as jurors?—They call upon almost any person they can find at leisure; any respectable person they can meet with.

7841. Have you ever served on a coroner's jury?—Only once.

7842. What do the miners pay for candles?—*9d.* a pound.

7843. How much do they pay for powder?—*9d.* a pound also.

7844. What quantity of candles is allowed to them?—2lbs. a man per week.

7845. Do you never allow them any more?—No.

7846. If they require more, what do they do?—I do not know; I do not hear any particulars about that; the regular supply is 2lbs. a man.

7847. Could they not get any more if they wanted them?—If they were working in cores they could get some more I dare say; if I found men that wanted more, and they were working long, I should not hesitate to give them a few more.

7848. Do you think the men sell them?—No doubt some of them do.

7849. What do the candles cost you per pound?—They cost us 6*s.* per dozen pounds, and we put an extra price upon that; we consider that the men shall be bound to use them; that they shall not sell them, or carry them home, and we make them pay 9*d.* a pound.

7850. But if they do sell them and pay you all the same, you do not lose, nor the adventurers?—Not at all; we profit by it.

7851. The more they sell them the more profit you make?—Yes; but we do not think anything about that.

7852. Could you furnish the Commission with an account of the quantity of candles consumed in your mine, and the cost of them?—I have no objection to send you anything I can; but I am now come on a sudden.

The witness withdrew.

Adjourned to St. Ives To-morrow at 12 o'clock.

REFORM CLUB PALL MALL

St. IVES.

Saturday, 2nd August, 1862.

PRESENT:

The Right Honourable Lord KINNAIRD, K.T.
NICHOLAS KENDALL, Esq., M.P.
JOHN ST. AUBYN, Esq., M.P.
RICHARD DAVEY, Esq., M.P.
P. H. HOLLAND, Esq.

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

Mr. SAMUEL HIGGS, of Penzance, examined.

ST. IVES. — *Mr. S. Higgs.* — 2 August 1862.

7853. (*Chairman.*) Will you state the mines of which you are purser and superintendent?—The Providence mines, Huel Margery, and Spearne Moor, at St. Just, and my firm, three others, Trelyon Consols, North Levant, and East Margaret.

7854. You have considerable experience in the management of mines?—I have been engaged more than 30 years as the purser and superintendent of mines.

7855. To each of these mines are there a set of rules which are printed and stuck up at the mine?—Yes.

7856. And it is according to those rules that the settings are made?—Yes.

7857. Have you a list of rules with you?—Yes (*producing the same*). These are the printed rules, they just apply to all our mines, they vary as to the amount paid for the club.

7858. It is according to those rules as stuck up that the engagement is made for the work to be done during the following month?—Yes, our settings are monthly; the rules are stuck up at the mine, and they are exposed.

7859. Though the settlings are monthly, there is always a month in hand of the pay, is there not?—Yes.

7860. Will you state why there is always a month in hand?—We cannot measure the work and make up the cost in much less than a month; we might do it on tut bargains in a fortnight, or perhaps less, but it takes a month for the tribute; we do not like to have more public days in the mine than is necessary; one day is enough for setting and paying.

7861. That is a day of cessation from work generally?—Yes.

7862. And if it is on the Saturday, is the Monday following also a day on which no work is done?—We always pay on the Friday afternoons, and every Monday is alike in our mines.

7863. But in many mines they pay on the Saturday?—Yes, and then the Monday is allowed as a broken day.

7864. Is Saturday a broken day in consequence of the payment?—We lose a half-day; Saturday afternoon is always a holiday with the miners.

7865. In all mines?—I believe in all mines.

7866. If the pay is on the Friday, do the men go to work on Monday morning?—Every man is in his place on Monday morning; every Monday is alike in all our mines.

7867. From your experience in the management of mines, do you think that that plan is a good one?—Yes.

7868. Do the men like it?—They do like it; they prefer it, but some two or three years ago there was a feeling against it in some of the St. Just mines, because they would have it that they should be all alike. I am of opinion that mines in the same district ought to be paid on different days in the week, and not all on a Saturday, or all on a Friday.

7869. You are of opinion that the settling days should vary at different mines?—Yes, I think that i would be an improvement.

7870. Will you state your reason for that?—The men would not have an opportunity of congregating together so much.

7871. What you propose might be an advantage to the men, as thus, a man seeking for work in another mine would have an opportunity of visiting it better?—Yes, I think that it would be an improvement for the men. I think that it would be an advantage both to the employer and to the employed.

7872. With respect to the list of rules, are the prices at which the materials are to be supplied to the men mentioned in the rules?—No, the price is fixed according to the circumstances, it very seldom varies.

7873. Is the quantity allowed mentioned in the rules?—No.

7874. That is an understood thing?—That is an understood thing at the mine.

7875. What quantity of candles, for instance, is allowed?—2lbs. a week generally is allowed, I think; for a pair of men 4lbs., but in most of our mines we allow 3lbs. only, we supply them with the best candles and a less quantity will do.

7876. With a better kind of candle a less quantity does?—Yes.

7877. What price are the men charged for those candles which you supply?—I think that they are charged 8*d.* a pound for them.

7878. What is the wholesale price?—The present price is 5*s.* 9*d.* dozen, but that varies; last year soon after this time they were 6*s.* 9*d.*; they average about 6*s.* a dozen, but we do not vary the price to the men, we keep it steady.

7879. What is the reason why the men are charged more than they cost?—I suppose the object is to make the men more careful of them; but the object is defeated, the men care very little about how much or how little they take out, I think.

7880. They are not allowed more than a certain quantity?—No.

7881. With regard to powder, have you any particular kind of powder with which the men are supplied?—They are supplied with the rough kennel powder.

7882. What is the price at which that is supplied?—I think that that is charged 8*d.* or 9*d.* I do not know, I do not look into those things; I have an auditor who examines all these accounts.

7883. But the prices do not vary?—The prices do nat vary unless there is a very great change in the value.

7884. Can you state the amount which is deducted for the doctor's fee?—In one of our mines we deduct fourpence in the pound for doctor and club.

7885. Which mine is that?—That is in the Providence mine.

7886. You deduct fourpence in the pound from what men earn?—Yes, from the balance which they receive.

7887. (*Mr. Holland.*) What does that amount to?—It amounts to about 1*s.* The average of each man's gettings is about 3*l.* a month, but then all who get 1*l* a month and upwards are charged with the club and doctor; that includes both, it is equally divided.

7888. (*Chairman.*) Is there a separate account kept of the two sums?—Yes.

7889. Is that taken from the surface men as well as the under-ground men?—Yes.

7890. The parties who do not earn 1*l.* are not charged?—They are not charged with the doctor or club.

7891. Is it only for visible hurts, or for sickness as

well ?—We have a rule in our mine that the purser and agents may grant relief, if in their opinion the funds of the club will admit to any man who may fall sick from long labour in the mines, or from any casualty; we have that in our printed rules.

7892. (*Mr. Holland.*) That is a discretional payment ?—Yes.

7893. (*Chairman.*) Is the balance of the club account made up every month ?—Yes.

7894. Is a statement of it submitted to the adventurers ?—The particulars of it are not submitted, but the books are always there, the cause of the payment from the club is recorded, whether it is for sickness or for hurt, and what kind of hurt it is; they sometimes take cold from exposure underground or on the surface, and if they have been long in the mine we consider them on sick pay.

7895. To whom is it considered that the club money belongs, to the adventurers or to the men ?—If the mine stops the balance of the club belongs to the adventurers.

7896. And they would be justified in dividing it ?—In adding it to the assets.

7897. Has that ever been done ?—Invariably, so far as I know in this neighbourhood.

7898. Do you know what amount it has ever been to any one set of adventurers ?—I could tell in one or two mines where I have had the closing up, but I cannot tell from memory.

7899. Will you furnish that ?—Yes.

7900. (*Mr. Holland.*) Has it been a considerable sum ?—No.

7901. (*Mr. Kendall.*) Have you ever known a considerable balance ?—There was a case, I think of Huel Prudence, in St. Agnes, which stopped a few years ago, and the men claimed a balance of club money, and I think the case was tried at Hayle.

7902. (*Chairman.*) How was it decided ?—That it belonged to the adventurers.

7903. Do you remember the amount in dispute ?—No, I could furnish it.

7904. (*Mr. St. Aubyn.*) Before whom was it tried, was it in the County Court ?—No, it was tried before the Vice Warden or the Registrar.

7905. (*Chairman.*) Can you give the date of that case ?—It was perhaps 12 or 14 years ago, that is the only disputed case which I have known.

7906. Do you suppose that that case rules the decisions ?—Yes, at least I have not heard of any dispute; you may look upon it in this way, some clubs may have 100*l.* or more in hand; and 700 or 800 hands employed on the mine being stopped, all the hands might be discharged to two or three, and the purser and manager might keep relations and charge them upon the club, and the whole would go to such individuals; a miner is always in a club, there are clubs in all mines.

7907. If a man has only just joined a mine how soon does he become a participator in any benefit from the club ?—As soon as he goes underground with his tools.

7908. In these mines with which you have been connected has the sum ever been considerable ?—At the Providence mine we have a balance in hand for the club of 268*l.* 13*s.* 5*d.*

7909. (*Mr. Kendall.*) How long has that mine been worked ?—Nearly 30 years. To show that we treat it as the adventurer's fund, 12 or 14 years ago our mine was very poor, and the hands much reduced, we then had 260*l.* in the club, and we transferred 100*l.* to the credit of the adventurers.

7910. (*Chairman.*) Do you happen to have with you the account of any other mine ?—Yes; the Huel Margery, 108*l.* 7*s.* 7*d.*

7911. Any other ?—In the St. Just Mines, Spearne Moor, 76*l.*; and North Levant, 104*l.*

7912. Can you state about the sum which has been received into the bank from either of those mines in one year ?—We pass it into the purser's account. The purser holds that in common with the other balances of the mine. We have no separate banking account.

7913. Would that account show the total amount which has been paid to the club account by the men during one year ?—Yes.

7914. Would the purser's account of a mine show the total amount which has been paid to the club account for one year ?—Yes; we make up our accounts quarterly and it is shown every quarter.

7915. Could you furnish that ?—Yes.

7916. I suppose that where a club account is very low there must have been a good many accidents ?—Yes.

7917. Will you state your reasons for adopting the plan which you have mentioned of the men paying a per-centage from their earnings instead of a fixed sum per month ?—I found that the Providence mine was very bunchy, and that the tributors would go on sometimes for three, four, or six months, and would get scarcely anything, and they then received a very small subsist; but yet their cost was always charged for the doctor and the club, and it went as a debt against the men, but it was paid by the adventurers; and when the men got a start of 20*l.* or 30*l.* a man they were only charged 1*s.* for doctor and club. Now, the average earnings of the tributers are a little over 3*l.*, and the 4*d.* comes in regularly, and it is no loss to the adventurers; we do not lose by paying the doctor or the club out of the adventurers' funds instead of the miners.

7918. But the charge would always be made against the tributor ?—When his earnings would admit of it.

7919. The debt standing against the men in the ledger for materials, club, and doctor is carried forward in the settlement of their account ?—Yes; when they can afford to pay it out of the balances.

7920. It is not remitted ?—No; it always stands against them, but we do not claim the debt unless they can afford to pay it out of their wages. We must allow miners to get a sufficiency to maintain themselves. If they are unsuccessful for months we grant them a subsist, and on that subsist we do not charge the doctor and club. When they get a start, if they get a 40*l.* start, they have 40*s.* to pay to the doctor and club.

7921. So that you consider that this is a relief to the men who are receiving only subsist, while at the same time it is an advantage to the adventurers ?—Yes; the adventurers are not charged with the doctor and club.

7922. How stands the case with regard to the doctor; how is the doctor paid ?—He is paid half of the charge of the doctor and club; that is divided equally between the doctor and the club.

7923. Then the doctor's income varies according to the men's earnings ?—Yes; but if you make up the men's cost it comes to pretty nearly the same.

7924. This plan is not generally adopted ?—No, it is not generally.

7925. How are the doctors appointed ?—They are generally appointed by the adventurers, but sometimes lords have a clause introduced in the leases giving them the power of appointment. In some mines I have known that it has been put to the vote among the men to choose the doctor.

7926. Is it in fact the agent who generally appoints the doctor, or is it at a meeting of adventurers ?—At a general meeting of the adventurers. All the agents are appointed by the adventurers.

7927. Do the doctors attend the agents' families gratis ?—No; I believe that it may be done by some, but others do not.

7928. Do the agents contribute to the doctor's fund ?—Not in our mine. Some doctors attend to most of the families of the agents, and perhaps of the men, but others do not.

7929. Do your doctors for that payment attend to the men's families as well as to the men themselves ?—No; only to the men and to those employed in the mine.

St. Ives.

Mr. S. Higgs.

2 August 1862.

7930. Are the doctors generally appointed for life ?—I suppose that it must last during good behaviour. It is very seldom that they are removed, but the appointment is during pleasure.

7931. Is there any payment to the barber in your mine ?—No ; that is rather a barbarous practice, and it is going out.

7932. In paying your men are they paid partly in notes and partly in gold ?—Partly in notes and partly in change.

7933. Have the men any difficulty in getting their notes changed ?—Sometimes they have, but not so much now as some years ago. Change is more easily obtained.

7934. What proportion of notes and of change do you pay ?—We pay a third in notes, or a quarter, just as it happens. To those who get 5*l.* we pay a 5*l.* note ; if men live together and they get 5*l.* we pay them in a 5*l.* note ; but if the pair are scattered and are in different parts of the country we pay them in change. We just ask the clerk as we go on, " Can " such a pair take a 5*l.* note or two or three," and if he is up to his work, he says, " Yes, one or two."

7935. Would there be any difficulty in paying them all in gold and silver ?—The bankers would rather that we took it in 5*l.* notes, but they are rather indifferent about it now ; formerly it was quite an object to them to pay in notes, but now they do not care much about it. We have no difficulty in Penzance at all ; we get a large quantity of change.

7936. Supposing it was found that the paying in notes induced the men to go to a public house in order to get the notes changed, there would be no difficulty at all in giving all change ?—No ; the shops and the publichouses in the neighbourhood generally provide themselves with change against the pay days in the neighbourhood.

7937. In the expectation that the men will want change ?—Yes ; they pretty well know how much change they shall require from the regular pay of the mine.

7938. Do you occasionally hear of boilers bursting ?—Yes ; and I think that mines ought to frame a very strict rule upon that head. We have now no means of punishing the men ; we cannot prove the negligence after the explosion, there is a difficulty ; we can only discharge them. But I think that they should be liable to punishment. We are about to frame a rule in our mines to meet such cases. All explosions are from neglect, and I think that that should be punished.

7939. May not an explosion take place from the boiler not being cleaned often enough ?—Yes ; the enginemen should point that out to the agents, or the agents should discover it. We generally have an engineer who attends the mines and whose duty it is to see to that with the agents, but we throw much as responsibility as we can upon the agents of the mine, so as to make them responsible.

7940. Is there any fixed period at which the boilers should be cleaned out ?—It depends upon the water which is used in condensing ; some boilers do not require to be cleaned out once in six months, and others require it every two months.

7941. Whenever a boiler is cleaned out is there a note kept in the books ?—No.

7942. There is no particular register of it ?—No ; a charge is generally made.

7943. But there is no regular register of the period when it is done ?—No ; it is within the memory of the people whose duty it is. Some boilers require cleansing every two months and others can run for six months, or even twelve.

7944. Is that left to the judgment of the agent or of the engine-man ?—The agents, and the engine-men, and the engineer : he visits the mine. They know the kind of water which is being used. There are some boilers which will be completely worn out in three or four years, and others will run for 20 or 30 years. We have been using boilers in this neighbourhood for 20 years or more. I think that we have a boiler in use which has been in use for 30 years

7945. (*Mr. Davey.*) Then you have good water ?—Yes, soft water, granite water, not mineralised in any way.

7946. (*Chairman.*) Have you heard in the last four or five years of many boilers bursting ?—The accidents have not been so numerous of late, but we had a case the other day in one of our mines where a boiler burst, and we are about to frame some rules to meet that.

7947. In which mine was that ?—At East Margaret.

7948. Did you ascertain the cause of it ?—We knew the cause, but we could not prove it, or we should have brought the man up.

7949. Was there loss of life attending it ?—No, fortunately there was not.

7950. What did you believe to be the cause of it ?—The feed was allowed to run down.

7951. Have you glass gauges to the boilers ?—No.

7952. Is trying with the gauge cock the only way which the engineman has of ascertaining the amount of water ?—Yes ; sometimes the water will spout from that ; if they are quick about it the water flows out instead of steam, and they shut it up. We have an order now that both the engineman going off duty and the man who relieves him shall see that the feed is up in the boiler when they change—that they shall each see that the boiler is properly fed.

7953. If they do not do that is there a danger of there not being sufficient water ?—Yes.

7954. (*Mr. Holland.*) What particular offences would you make punishable with respect to boilers ?—For neglect of attending to the feed of the boiler.

7955. What else ?—That is the only cause of explosion that we know of.

7956. Whose duty is it to see that the safety valves are all right and do not stick ?—The man in charge of the engine.

7957. If he neglected that, would not it be a punishable offence—ought it not to be his duty to see every day that the safety valve is right ?—Yes ; and some one of the agents should go into the boiler house constantly.

7958. (*Mr. St. Aubyn*). Did you ever know a case in which, from a multitude of accidents, or any other cause, the whole of the club money was exhausted ?—No, I never knew it in our neighbourhood.

7959. Supposing that it was to happen, the adventurers would, as a matter of course, advance any sum which might be requisite to meet the hurts of the men, would they not ?—Yes, there must be mutual confidence between the employed and the employer, or the work cannot go on well.

7960. (*Mr. Kendall*). Supposing that a man comes into your mine, say to morrow, and after being there a month pays his 1*s.* towards his club money, and supposing that he gets a hurt, and supposing that there is a large balance when he comes in of some 200*l.* or 300*l.* in the hands of the adventurers, and he has only contributed 1*s.*, and he is disabled for life, is not that man provided for as long as that mine exists ?—We allow 1*s.* a day for two years and afterwards 6*d.* a day.

7961. A man who comes in to-day, where you have a balance of 200*l.* or 300*l.* of club money in hand, if he gets hurt in two days, stands in the same relation as a man who has been for 30 years ?—Yes, I believe that this is always understood—we consider that a miner is in a club—if he goes from mine to mine he contributes to the club, and you may have 500 men contributing in a mine, and in a few years they may be reduced to 20.

7962. How long has the Providence mine been established ?—About 30 years.

7963. The club began at once ?—Yes.

7964. And the club has never been altered from that time to this ?—Never.

7965. After a few years you had a balance in hand ?—Yes.

7966. And I suppose that there is hardly a man who is now working in your mines who, when he came in did not find a balance in the hands of the adventurers as far as club money went?—We have always had a balance in hand.

7967. You have been working for 30 years, and you have scarcely a man working who, when he came in, did not find a balance of club money in hand?—We have always had a balance.

7968. You have said that you give a man so much money for the first two years, after that how do you get on?—We continue to pay miners 30*s.* a month if the club will afford it, and the man has a family, and we see that it is necessary. We never allow any of our men or their families to go to the union or apply to the union for relief; we find that the club is quite sufficient.

7969. If a man has once received a hurt in your mine, you never allow him after that to go to the union?—Never.

7970. You take care of him out of the funds?—Yes, if we find that the funds are sufficient to do it.

7971. You have been the purser of a great many mines, have you not?—Yes.

7972. (*Chairman.*) How many?—We have six in our office now.

7973. (*Mr. Kendall.*) Did you ever know a single refusal of the usual allowance to any man hurt in any mine?—No; it will vary. If a man is not an honest character, of course he has merely the strict allowance according to the rules, but it is very seldom that anything of that sort turns out.

7974. But if you find that a case is a very bad case, you would exceed the payment even according to the rule?—Yes, we should. If it is necessary to send a man to Truro or to Plymouth, we make an allowance from the club to pay his expenses up and down, and allow his family 30*s.* a month.

7975. What I gather from you is this, that you consider that, generally speaking, one shilling a month for the doctor and club out of the earnings of the men would keep the balance on the right side?—Yes; I have always found it so.

7976. Whether it did so or not, you would feel yourselves bound to pay the men one shilling a day?—Yes. We have no instance where the club money has failed. On the contrary, we find that we have sufficient sometimes to pay to a widow and her children.

7977. If you find that you are getting rich, do you go beyond the hurt money and go to illness, where you fancy that a man has become ill in the service of the mine?—Yes, we allow one pound a month. At this time at Providence mine, I think that we have only one person upon the club fund this last month, next month, perhaps, we may have two or three. I have found in all our mines that the club money is sufficient to provide for hurts and for sickness.

7978. You have spoken of start, and of men getting large wages; though you do not go under ground much, I suppose you know as much of the underground operations as if you did?—Yes, from the plans; I have never been under ground except from curiosity.

7979. Do you know anything of the mode of working there?—Yes, I understand it pretty well.

7980. Suppose that a man working by tribute, gets a start, if there are two men or four men in a pair do you allow them to vary the numbers?—No, not from the taking, if four men take they are expected to work out the month as four men.

7981. (*Mr Holland.*) Supposing that a man is receiving hurt pay from a mine that stops, what becomes of him then?—He is entitled to it for two years.

7982. But suppose that the mine stops?—Then if there are sufficient funds you pay him for two years.

7983. After the mine stops?—Yes.

7984. The adventurers are bound to do that, are they?—Yes.

7985. Can you make a call upon the adventurers to pay that?—No.

7986. Then in that case a man would become a pauper, would he?—We do not know any such instance; it is just a possible case, but I do not know of any instance of the kind.

7987. (*Mr. Davey*). Did you ever know an instance where after a mine has stopped the balance of the club money has been divided pro rata among the men?—I knew an instance where a man received 30*s.* a month for 18 months, sufficient was kept from the balance to pay him that.

7988. Would the whole of the balance or the money in the hands of the purser belonging to the club be divided pro ratâ to those sick people having a claim upon it?— No, I have never known but one instance where a man has been chargeable to the club where the mine has stopped.

7989. Do you subscribe to the infirmary in any of your mines?—Yes.

7990. Do you charge that to the adventurers or to the club?—It is paid out of the club.

7991. (*Chairman*). Which infirmary is it?—The Truro infirmary.

7992. (*Mr. Davey*). You have known St. Just for a great many years, what do you consider to be the state of the miners generally? are they in as good a condition now as they were when you first knew them?—Yes, they are better decidedly.

7993. Supposing that the Providence mines cease to work to-morrow, and that you had two or three claimants upon the club, and you paid them off, what would you do with the balance?—We should divide it among the adventurers, we should use it as an asset.

7994. (*Chairman.*) Have you some statements which you would like to put in?—I have the average earnings of the tut and tribute men in separate mines, they come very near.

7995. Can you furnish the commissioners with the average earnings of the tut work and tribute men in the Providence mine?—Yes, you have it here for a quarter, and you can have it for six months, or any longer period. I have it for Providence mines, Huel Margery, Trelyon Consols, East Margaret, Spearne Moor mine, North Levant mine, and Huel Reeth.

The witness delivered in the same, which is as follows:

AVERAGE WAGES THREE MONTHS.

	£	*s.*	*d.*	£	*s.*	*d.*
Providence Mines:						
April - Tutwork -	2	18	0			
May - Do. -	3	0	9			
June - Do. -	2	19	0			
				2	19	3
April - Tribute -	3	7	3			
May - Do. -	3	13	4			
June - Do. -	3	13	3			
				3	11	3
Huel Margery:						
April - Tutwork -	2	16	1			
May - Do. -	2	16	3			
June - Do. -	2	7	7			
				2	13	4
April - Tribute -	3	4	1			
May - Do. -	3	10	0			
June - Do. -	3	10	0			
				3	8	0
Trelyon Consols						
April - - -	2	14	9			
May - - -	2	15	4			
June - - -	2	8	0			
				2	12	9
East Margaret:						
March - - -	2	13	6			
April - - -	2	13	9			
May - - -	2	17	6			
				2	15	0
Spearne Moor Mine:						
March - - -	2	15	9			
April - - -	2	16	7			
May - - -	2	19	6			
				2	17	4

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North Levant Mine:

			£	s.	d.	£	s.	d.
March	- Tutwork	-	3	4	1			
April	- Do.	-	2	16	5			
May	- Do.	-	3	1	10			
						3	0	9
March	- Tribute	-	2	16	9			
April	- Do.	-	4	0	3			
May	- Do.	-	3	12	4			
						3	9	9
	Average	-	-	-	-	£3	0	10

Huel Reeth:

1862.	Tutwork.			Tribute.		
	£	s.	d.	£	s.	d.
January -	3	8	2	3	7	10
February -	2	15	9	2	4	7
March -	2	17	8	2	16	6
	3)9	1	7	3)8	8	11
	3	0	6	2	16	3

Huel Reeth—*continued.*

1862.	Tutwork.			Tribute.		
April -	3	11	3	3	12	1
May -	3	6	0	4	4	0
June -	2	2	5	3	4	5
	3)8	19	8	3)11	0	6
	2	19	10	3	6	10

7996. (*Mr. Holland.*) Would it be desirable to raise the subscription of the club to provide for sickness as well as hurt?—We find in our mines that it is sufficient.

7997. For all the cases of sickness?—Yes.

The witness withdrew.

Captain William Hollow examined.

Capt. W. Hollow.

7998. (*Chairman.*) You are captain of the Providence mines?—Yes.

7999. Have you charge of any other mines?—No.

8000. Are the Providence mines copper and tin?—Yes; principally tin.

8001. What is the greatest depth?—The greatest depth of the shaft from the surface is 170 fathoms.

8002. Is there a level at that depth?—Yes; but we are not doing anything down at that depth.

8003. What is the greatest depth of any level at which you are working?—The greatest depth at which we are working is about 130 fathoms from the surface.

8004. What is the greatest heat at any of your levels?—I do not know.

8005. You have never tested it?—No.

8006. Are there any what are termed close ends?—No. The greatest distance which we have from the shaft is about 110 fathoms perhaps.

8007. In that distance how many winzes are there?—There are several winzes and places worked on tribute. I should think that the nearest winze might be about eight or ten fathoms. I cannot say exactly.

8008. How far from a winze would you consider it safe to hole?—About ten or twelve fathoms. If we can cut a good bunch of tin or copper, we sink a winze a little closer than we should with a very poor piece, but from ten to twelve or fifteen fathoms would be about the distance.

8009. Do you sink a winze only for the purpose of ventilation?—Not in the Providence mine; our mines are very singular, we are not like many other mines on the course of the lode. The greater portion of our operations are off the lode. If the lode is east or west the greater part of our operations will be going north and south, or north-east and south-west, so that we can hardly give an estimate.

8010. Sufficient ventilation in your opinion is provided by merely working the tin?—Yes, quite so. In the eastern part of the mine it appears to me that we get out of the range which I have stated, and there the lode is pretty productive; there we sink winzes pretty regularly.

8011. For the purpose of ventilation alone?—Yes.

8012. Have you ever had to apply any additional means for ventilation?—Yes, at times.

8013. What mode have you adopted?—We have a cylinder, what we call a piston, and we pump air through pipes.

8014. From the engine?—From the engine. Our engine is always going from eight to ten strokes a minute; that is only just for the present moment when we have to ventilate any particular winze or shaft.

8015. From that it is carried by what kind of pipe?—By an iron pipe through the levels.

8016. To the point where the men are working?—Yes.

8017. Do not the iron pipes corrode very much?—No.

8018. What is the size of the pipes along the levels?—About five inches.

8019. How near can you carry one of those pipes to the point where the men are working?—Within about two fathoms, just out of the way of the blasting; in fact we have had them in the mine for the last two years and they have not been used; they are only used on very particular occasions.

8020. But you have the means of forcing in air when it is required?—Yes.

8021. In those ends, how long generally is the powder smoke in clearing away after an explosion?—Not long; I cannot tell you to perhaps half an hour; when the men come back they can go in to work again, but in our mine, where it is not on the lode, we only blast once a day, just when the men leave work.

8022. How many corps work there?—We work generally in a single corps. We find that men will do better in a single corps than by working four in a pair.

8023. At what time do they go down?—They go down at six and come up at two; that is our usual time.

8024. Is not there another corps which then goes down?—Only a small portion compared with those that go down at six.

8025. By a single corps do you mean single-handed?—No; there are two men. By a single corps I mean eight hours out of twenty-four.

8026. What is your reason for having only one corps?—Our reason is simply because we have so many parts in our mine which we should like to try, and we fancy that by putting on 8, 12, 15, or 20 tutwork bargains we should find a chance, and if we should ever cut anything, which we do sometimes, we increase our men; we put from two to four; the mine is so bunchy that we are constantly trying.

8027. What proportion of tribute men have you to tutwork men?—Our tribute men are 94, and our tutwork men are 80?

8028. Do you take any precautions to prevent accidents from blasting?—No, not particularly. I have been on the mine now seven years, and we have not had a single accident of any sort or kind from blasting.

8029. Are the men supplied with any particular tamping rods?—They are supplied with a piece of hard wood to settle down the powder before putting

in the iron, they have that from the carpenter's shop. It is our rule that if any accident should occur, and they do not happen to have one of these hard wooden rods, they do not come upon any pay from the club.

8030. Is that in the rules ?—I do not know whether it is one of the printed rules, but that has been read out at the time of setting, several times.

8031. But they use for finishing off the hole an iron tamping rod ?—Yes. Our ground is all dry ground, perhaps that may be in favour of our not having such accidents as there might be in wet ground.

8032. I suppose that you have no poor air ?—No, we have not any in the mine.

8033. To your knowledge, are there any men working with you who have been affected from working in other mines ?—No, not that I know of. I do not hear any complaints whatever. We have some in the mine about sixty years of age ; we have none in our mine above sixty-two underground, but we have several from fifty to sixty.

8034. How many boilers are there in the Providence mine ?—We have two at the engine.

8035. Have you only one engine ?—Only one pumping engine.

8036. Have you any other engine ?—We have a steam wym and a stamp ; we have two boilers to the pumping engine, and one to each of the other engines, that is four altogether for the three machines.

8037. Have you any water gauge ?—No, we have what we call gauge cocks.

8038. So that it must rest with the engine-man to try the gauge cock occasionally ?—Yes.

8039. How often is he bound to try it ?—I do not know that he is particularly bound, he must use his own judgment. I do not know that we have any specified time that he shall try it.

8040. When another man takes his place, is he bound to try it ?—It is the rule that when a man turns in he is to try the gauge cocks the moment he comes in.

8041. But there is no way of ascertaining whether that is done ?—No. Sometimes we agents are on the spot, and we see that it is done.

8042. How often are your boilers cleaned out ?—Once in two or three months, just when it suits. The water with which we condense is good water, in fact pretty nearly good enough to drink ; so that once in three months is just about as often as we require it.

8043. Do you test the boiler in any way in order to see whether it is necessary to clean it out ?—No ; we make a rule just when it suits from two months to ten weeks.

8044. (*Mr. Holland.*) Do you look at the blow-out water ?—Yes, we use our own judgment as to that.

8045. (*Chairman.*) Do you keep any record of the times when you clean the boilers ?—No other than our rough cost book, when the charge is made for cleansing, and we charge the money, so much for cleansing; but we find that it is about once in three months.

8046. But it is left to your discretion when the boiler shall be cleaned out ?—Yes ; I may state that our men are very well satisfied.

8047. How do the men ascend and descend ?—In the ordinary way, by the ladder ; but ours is a very easy ladder ; our ladders are not more than about 20 feet. Sometimes they will run to 22 or 23 feet, but about 20 feet is the rule.

8048. (*Mr. Holland.*) You mean 20 feet from soller to soller ?—Yes.

8049. (*Chairman.*) How are the tools sent up ?—They are sent up and down by the steam wym. We do not allow the men to carry any tools.

8050. What distance is there between each tread ?—About ten inches. Our men are not allowed to change in the boiler houses. We have a good dry.

8051. Do the women work under cover ?—Yes.

8052. Have you any separate place for the women to get their meals in ?—There is a house appropriated for that purpose. We take all the care we can.

8053. (*Mr. Holland.*) Are the boilers under your charge ?—I am the agent, but I am not the engineer; we have a paid engineer. Of course I give orders when I think that they ought to be cleansed; and after letting them stand for three months, we find that they are quite safe.

8054 When the boilers are cleansed, are the plates carefully examined ?—Yes.

8055. To see that there is no bulging ?—Yes ; one agent or the other goes in, not every time that the boilers are cleansed, but occasionally.

8056. Is the state of the boilers tested at any regular intervals ?—No, not by any particular pressure.

8057. Then they might weaken without your finding it out ?—They might.

8058. Do not boiler plates constantly weaken ?—Yes, certainly they do.

8059. Then you have no security that they are not getting dangerously weak, except what you observe when you go in ?—We have not ; we work at very low pressure.

8060. At what pressure do you work ?—We do not work more than about 30 lbs. to the inch.

8061. I suppose that you have a float to govern the feed pipe ?—Yes.

8062. Whose business is it to see that that is all right ?—It belongs to me as the agent.

8063. Is it carefully looked after ?—Yes.

8064. Regularly ?—Yes.

8065. Are the safety valves regularly looked after to see that they do not stick ?—Yes, I generally test them every day or every other day.

8066. Have you one or two safety valves to each boiler ?—We have only one to each.

8067. Are the boilers connected ?—Yes.

8068. There is the same steam pipe for both boilers ?—Yes.

8069. Do you think that that is safe ; is that common in Cornwall ?—Yes ; it depends upon the pressure principally, I should say. It depends on the state of the mine. Where you have four or five boilers, I think that it would be necessary that they should be kept separate at times. We are so easy, compared with the eastern mines, at least our water charges and our mines are so easy that we think everything is safe.

8070. (*Chairman.*) There is plenty of boiler power? —Yes.

8071. (*Mr. Holland.*) You have spoken of a ventilating engine, is that at the surface ?—No, that is fixed down in the shaft at one of the airiest places that we have.

8072. What is the size of the cylinder ?—Twenty inches.

8073. What stroke ?—Six feet. It is just like any other cylinder of a steam whim. We find that it will pump air 150 fathoms, and will blow a candle out at some distance from the mouth.

8074. Is that only at one end ?—Yes.

8075. (*Chairman.*) Could you divide it ?—Yes, and for this reason,—it will pump two strokes of air to one stroke of the engine, and we might put one stroke east and the other west if we were driven up, but we generally find that only one end wants ventilating at once.

8076. (*Mr. St. Aubyn.*) Is yours a right-down shaft ?—Yes.

8077. Have you any experience of the man-engine ?—No, but I have seen it.

8078. Have you any experience of the skip to carry the men up and down ?—No.

8079. (*Mr. Davey.*) In what parish is your mine ? —In Lelant.

8080. Is that this side or the other side of Penzance ?—It is this side ; it is about a mile and a half up.

8081. Have you any scarcity of men here ?—No, not so all ; in fact, we are so swarmed with them that we hardly know what to do with them, and particularly within the last three or four months.

St. Ives.

Capt. W. Hollow.

2 August 1862.

8082. What priced ground have you generally ?—On the lode from 4*l.* 10*s.* to 6*l.*

8083. Do you think that you could break that ground better single handed than by having two men ?—I do not think we could.

8084. I ask the question because in some neighbourhoods it is said they can do better single-handed than with two men ?—We do not find it so ; we have only four or five ends driving on the lode, and we do not think that it is worth while to make any alteration in those particular parts.

8085. Do you consider it necessary to have two men in a corps for ground of 3*l.* or 4*l.* a fathom ?—Yes, I do. The men in our district do not like single work at all, in fact, they could not do it.

8086. You have been asked whether your boilers have ever been tested ; supposing that the boiler was properly attended to, and the water was of a proper gauge and that there should be a bare place in that boiler, how would that show itself, would there be an explosion, or merely a break out of a little steam ?—We have had some of those cases, and they have merely broken through.

8087. There has been no explosion ?—No, not at all ; first of all it will drop, and when we find it drop or leak we stop it at once.

8088. Do not you attribute nearly all the explosions to the neglect of the gauge ?—I do as far as I am a judge ; I do not profess to be an engineer.

8089. And not to the weakness of the boiler ?—Yes. I think that they are all to be attributed to neglect.

8090. Would it in your opinion be necessary or desirable to have the gauges which you say you have seen in other mines ?—I do not think that they would be at all amiss.

8091. Would they add considerably to the security of yourself and the enginemen ?—They are like every other thing, they require looking after, but I think that they would not be amiss.

8092. Do you not think that they would add to the security of the mine ?—Yes. I have seen them in steamers, and so on, and I think that they would add to the safety of the enginemen, and of ourselves, because very often they would see the gauge when they might be too lazy to try the cock. Those gauges are not at all costly ; I think that the great mistake very often is that parties are put to work the engines who are not competent.

8093. (*Chairman.*) And therefore every indicator of danger would be of advantage to an inexperienced man ?—Yes.

8094. (*Mr. Davey.*) What class of people do you employ as engine men ?—We have them on the mine who were there before I was there ; they very seldom change. They have been there for the last seven years, and how long they were there before I came there, I do not know.

8095. Is it usual to employ a man in that capacity who has received an injury in some other part of the mine ?—That has been done in some places, but we are always very cautious not to take in what I call a greenhorn if we want a man I would rather have somebody else to be troubled with him than that I hould.

The witness withdrew.

Captain William Stevens examined.

Capt. W. Stevens.

8096. (*Chairman.*) I believe that you are captain and manager of Huel Reeth ?—Yes.

8097. Have you charge of any other mines ?—No. at present.

8098. What kind of ore does your mine produce ?—It is a tin mine.

8099. Entirely ?—Yes.

8100. How many are there employed underground ?—About 150.

8101. Men and boys?—Yes.

8102. How many above ground ?—About 50.

8103. Are there many children amongst those above ground ?—Yes ; some of them not more than eight years of age.

8104. Boys of eight years of age ?—Boys and girls.

8105. What is the depth of your deepest shaft ?—250 fathoms from the surface.

8106. What is the deepest level in which you are working at present ?—250 from the surface.

8107. In what manner do the men ascend in your mine ?—We have a man-engine.

8108. Is it a single or a double man-engine ?—Single.

8109. How long have you had it ?—About two years.

8110. Have you ever had an accident ?—No.

8111. Do all the men use it ?—Yes.

8112. They come from the distant parts of the mine below ground to come up by the man-engine ?—Yes.

8113. Are you able by having the man-engine to employ older men than you would otherwise ?—Yes ; very much indeed.

8114. More experienced men ?—Yes.

8115. Do you think that an advantage ?—Yes ; very much so.

8116. You would sooner have an experienced miner than a young hand ?—Yes ; we would rather have one older man than we would have three of the young ones.

8117. What would you call a young man ?—Before we had the man engine there, we could not get men above 20 years of age to go down to the bottom of our mine.

8118. And now of what age are the oldest men ?—Sixty.

8119. Therefore you think that providing this means of ascending and descending has been a great advantage to the adventurers ?—Very great.

8120. Can you state any other way in which it has been an advantage to the adventurers ; do you get more work from the men ?—Very much. Before we had a man engine perhaps we were obliged to give 12*l.* a fathom for ground, and we have got it now worked for 9*l.*

8121. (*Mr. Holland.*) Is that difference solely due to the man-engine ?—Yes.

8122. There is no other difference than the man-engine ?—No.

8123. And three men now do the work of four ?—Yes.

8124. (*Chairman.*) Are you working in killas, or in granite ?—In granite.

8125. Have you any hot levels ?—Yes, we have them pretty hot. Ours is the deepest mine in the district, and we have some places distant from ventilation where it is hot.

8126. Have you ever tested the heat at all ?—Yes.

8127. What is the greatest heat ?—From 85 to 90 degrees.

8128. That is when working at a close end away from ventilation ?—Yes.

8129. Do you provide any artificial means of ventilation ?—Yes.

8130. Will you describe what those means are ?—If we have 15 or 20 fathoms from one ventilation to another, we put down a winze from one level to the other, so that the men shall have proper ventilation.

8131. Have you any artificial way of blowing air n ?—No ; we have three working shafts in our mine, and in the western shaft the air goes down, and it goes through the mine and comes up the eastern shaft.

8132. Is that always the case ?—Always ; it never varies. We are obliged to put a door, what we term a trap-hatch, and if we take up that trap-hatch the men working in the level below cannot carry a candle in their hands. We can give as much draught as we like.

8133. By means of your shafts and winzes you can

provide all the air that is required in the lowest and the hottest level ?—Yes.

8134. When you come to 14 fathoms from a winze how do you get air into that point where the men are working ?—We can always get ventilation at 14 or 15 or 20 fathoms from one winze to another.

8135. What is the greatest distance at which you have ever holed from a winze or a shaft ?—We have gone as much as 30 fathoms.

8136. When you have got, say to 29 fathoms, have you found it hot ?—Yes.

8137. Had you any means of cooling that end while the men were completing the other fathom ?—Yes ; we have put in an air machine.

8138. What description of air machine ?—A fan machine we term it, and with boys to work it to blow in air.

8139. That I suppose is put near the winze ?—Yes; it is put where we can take up good air from.

8140. And 20 or 30 fathoms from where the men are working ?—Yes.

8141. What security have you that the boy continues to drive it, that he does not go to sleep ?—The men will watch that.

8142. If the men felt it get warm they would communicate with the boy ?—They would very soon give the boy a lesson.

8143. You think that the fan completely supplies them with good air at the end where they are working ?—Yes.

8144. Have you ever tried how much it reduces the temperature is reduced at the time when the fan is applied compared with what it was before the fan was worked ?—No ; I cannot answer that question.

8145. (*Mr. Holland.*) Does it make it decidedly cooler ?—Yes.

8146. (*Chairman.*) Do you ever put in air sollers ?—Yes

8147. Which do you prefer, an air soller or a machine worked by hand ?—I prefer an air soller, but there is not every place convenient to put in an air soller.

8148. Do you put your air soller at the top of a level or below ?—At the bottom.

8149. How long is the smoke in clearing away in your closest ends ?—Perhaps an hour and a half.

8150. Do the men go in before that ?—The men, if they do blast their holes, do it when their core is up.

8151. How long would the smoke be clearing away if the fan was at work ?—Not more than a quarter of an hour.

8152. (*Mr. Holland.*) That reduces the time from an hour and a half to a quarter of an hour ?—Yes; the men may go in in a quarter of an hour.

8153. (*Chairman.*) How long have you been manager at this mine ?—18 years.

8154. I suppose that during that time accidents have occurred from blasting ?—Yes ; we have had two or three accidents, but we have been very lucky ; we have escaped very well.

8155. Have any accidents occurred in the last two or three years ?—Yes ; one accident.

8156. Did you ascertain what the accident was occasioned by ?—It was rather by the neglect of the men.

8157. In what way ?—They were not careful enough in putting the powder into the holes.

8158. What kind of tamping rod do the miners use ?—We have a safety fuze which we use and very good tamping, but the man did not take care enough ; he used iron, whereas he ought to have used wood.

8159. Did you supply him with a wooden instrument ?—Yes; and the man ought to have used the wooden rod.

8160. Did he admit that he had not done so ?—Yes, he allowed that he had used the other.

8161. Do you use cartridges in your mine ?—Occasionally ; if we have a piece of ground where it will do.

8162. Have you never known an accident occur after the powder has been put into a hole from the edges of it not being swabbed round ?—No, I cannot say that I have.

8163. But might not an accident happen in that way ?—Yes. If there is powder lying round the hole and they put in the iron instead of the wood first, which causes the fire to strike.

8164. Might not an accident also occur in picking out the hole when the powder has not gone off ?—Yes; I have known an accident of that kind to occur, and it will happen if the men are not very careful.

8165. If the powder was made into a cartridge there would then be no danger of the powder lying loosely round the hole ?—I do not think that.

8166. Would there be any powder still lying about the hole if it were contained in a cartridge ?—No ; but I would as soon trust to putting the powder into a hole without a cartridge as with one.

8167. But there would be no powder lying about the sides of the hole if you used cartridges ?—No.

8168. How many boilers are there at your mine ?—We have four machines to the draught-engine ; we have two boilers, and to the other three we have one boiler to each.

8169. Making five boilers altogether ?—Yes.

8170. Are they under your own special charge ?—Yes.

8171. How often do you examine the boilers ?—We examine them every day.

8172. How often do you clean them out ?—Once in about three months.

8173. Is each boiler cleaned out once in every three months ?—Yes.

8174. Is there any record kept of the time when they have been cleaned out ?—Yes, our books will tell. We pay the men for doing so.

8175. Does the water used cause corrosion, or is it in any way injurious ?—The water that we use is very good water.

8176. Has an accident never occurred from the explosion of a boiler ?—No.

8177. Have you printed rules for the management of your mines ?—Yes.

8178. What quantity of candles do you allow to the miners per week ?—2 lbs. to every man and to every boy.

8179. Do you ever allow them more than that ?—No ; that is their quantity, unless they break open the chest and steal the candles.

8180. Without good reason you would not supply them with any more than the quantity you have stated ?—No.

8181. What do you charge the miners for the candles ?—8*d.* a pound.

8182. Where do you obtain your wholesale supplies from ?—Mr. Higgs is the adventurer, and very good candles they are.

8183. What is the charge that you make for the powder ?—8*d.* a pound.

8184. Do you use any particular patent powder ?—No.

8185. What is the sum that you deduct for the club, and is it to provide for visible accidents or for sickness ?—The rules of our mines say for visible accidents, but Mr. Higgs and our masters are all very kind.

8186. (*Mr. Holland.*) What do you estimate to be the average saving of labour by the use of the man-engine ?—About one quarter.

8187. In the shallower levels it would not be so much, I presume ?—Yes, they will not climb the ladders at all.

8188. But those men who only go down to the shallower levels are not saved so much as those who descend to the deeper levels ?—Yes ; they go to the man-engine, they will not climb up the ladders.

8189. What is your estimate of the average saving, taking into account the whole of the men, those who go to the deepest levels, and to whom most is saved, and those who go to the shallower ones, and to whom less is saved, is it as much as a quarter ?—Yes.

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8190. About how much does a man-engine cost ?—About 2,000*l.*

8191. Is it a very profitable investment ?—Yes.

8192. You have spoken about ventilation, and you stated that there was a door which, if left open, left the men at the bottom almost without air, but which when shut supplied them with a good draught?—Yes.

8193. (*Mr. St. Aubyn.*) How long has the man-engine been in operation ?—About two years.

8194. Has it effected a considerable saving ?—Yes.

8195. How long do you think it will take to repay the cost of it?—We get a quarter part more work done ; I cannot say.

8196. What is your monthly expense ? — About 80*l.*

8197. Then in about two years you will have repaid yourselves ?—In from two to three years.

8198. Have you had any experience in carrying men up and down the shafts by a skip ?—Yes, when we first began, the men used to get into the skip and ride up and down.

8199. Was that with your permission ?—No; we were against it.

8200. Have you been connected with any mine in which it has been allowed ?—No.

8201. Do you consider the skip dangerous ?—Yes, with a chain.

8202. How do you think it can be made safe ?—If you had a rope you could see where the danger was, but with a link you cannot tell it.

8203. You think that with a hempen rope properly looked after there would be no danger?—Yes; you can see then where there is a failure, but you cannot see it with a chain.

8204. (*Mr. Kendall.*) Do the lords in any way contribute to the expense of the man-engine ?—No.

8205. Did you ever ask them ?—No.

The witness withdrew.

Mr. GEORGE WILLIAM BEVAN examined.

Mr. G. W. Bevan.

8206. (*Chairman.*) Will you be kind enough to state the mines to which you are surgeon ?—The Providence mines, Wheal Reeth, Lelant, Worvas Downs, Trelyon Consols, and Wheal Margery mines.

8207. How long have you acted as medical attendant at any one of these mines ?—I have been connected with the Providence mines, I think 28 years.

8208. And how long have you been connected with Wheal Reeth ?—About 17 or 18 years, I think, since she has been working the last time.

8209. You were acquainted with the Wheal Reeth mine, I presume before the man-engine was introduced ?—Yes.

8210. Do you think that that has made any difference in the number of cases of miners that have come before you ?—It has been so shortly put up that there has not been much trial of it ; I think there is no doubt that it will be a great benefit to the men.

8211. Have you had any opportunity of judging whether it is accompanied with any advantage to the health of the men ?—Not at present, but there is no doubt that it will be, it will save them a great deal of labour.

8212. Have you observed whether there are now older men working in the mine than there were before? —I have not had any opportunity of observing, for at present the men are so healthy.

8213. Are there any men now who are out of work from ill health ?—Not one; I have had to attend but one man for the last fortnight, and he is a man who has been working at grass, but he has been a diseased man for the last 20 years.

8214. Are there any men working now who have been during the last two or three years on your sick list ?—Yes.

8215. Were any of those suffering from what is called miners' disease ?—Not particularly so ; they are cases generally of colds and derangements of the stomach, and feverish cases.

8216. Were any of those ailments, in your opinion, caused by working underground ?—Not particularly so, no more than an epidemic that has been prevailing occasionally, a slight case of influenza, or a slight attack of bronchitis.

8217. Are none of them affected in their breathing? —Very little ; no more than what you find from any ordinary cause.

8218. Are you able to say that the men under your charge here do not suffer from miner's disease ?—Not so much as in many places.

8219. Do they suffer at all from that disease ?—Occasionally.

8220. Do you keep any record of the cases that come before you ?—No, not all.

8221. Have you ever made any post mortem examinations ?—No ; I have endeavoured to do so several times, but I have not been allowed.

8222. Do you go at all underground ?—No.

8223. Have you ever been underground ?—Not for many years.

8224. Then are the Commissioners to understand that there are no cases of men working in the mines in this district who are effected in their breathing ?—There is only one man that I am aware of in the mines that I have attended, and he is a man who has been subject to attacks of bronchitis for several years, he continued working underground rather too long, but still he is capable of following his labour.

8225. Is he working underground now ?—No.

8226. How old is he ?—About 56.

8227. How is he employed at the present time ?—He is working on the surface.

8228. What is the number of men employed in the different mines of which you have charge ?—I cannot say.

8229. Can you state the number approximately ?—I think that in the Providence mine there are about from 200 to 300. In the last statement of account, I think that the agent told me, that of labourers there were about 300 underground and on the surface.

8230. Have you kept no record whatever of the number of cases which have come under your notice in the course of years ?—No ; the time does not admit of it.

8231. You have kept no record at all of the number ?—Not at all ; it would be interfering with the other business.

8232. Have you other practice which is rather extensive ?—Yes ; I have an extensive practice in the neighbourhood.

8233. Among the agriculturists ?—Yes.

8234. Do you perceive any difference in the health of the agriculturists as compared with the miners ?—There is not that difference now that there was some years since, in consequence of the improved ventilation of the mines, and also in consequence of the miners paying more attention to themselves than they did formerly ; the miners generally speaking have become more moral men in all their habits and conduct.

8235. More temperate ?—Yes ; and they pay more attention to themselves, and the mines are better ventilated than they were formerly.

8236. In what way are they better ventilated than they were formerly ?—By extending the levels and sinking pits, so as to communicate air from one part of the mine to another.

8237. As a mine becomes worked more extensively, you think that the ventilation is improved by it ?—Yes ; if they did not do that, the men could not work properly, and it would be a disadvantage to the adventurers.

8238. As a mine becomes more extensively worked, it must of necessity, must it not, become better ventilated ?—Yes, if they value their own interest ; but in some instances it is not the case.

8239. Are there any such instances within your knowledge?—There is one mine that is not now working—the Gew mine.

8240. How long has the working in that mine been stopped?—For two or three years.

8241. Was that mine not well ventilated?—No, it had only one shaft.

8242. Had you charge of the mine at that time?—Yes, partly, several years since, and a great number of persons suffered.

8243. (*Mr. Holland.*) What did they suffer from?—From miners' disease—pulmonary disease.

8244. (*Chairman.*) Will you be good enough to describe what you mean by miners' disease?—A cough and expectoration—disease of the bronchus, extending to the lungs, and in the last stage the lungs give way; it is caused by imperfect ventilation.

8245. At the time to which you refer did many cases come under your notice?—Yes, a great many.

8246. Are there no other mines in which the miners have so suffered?—Not where they have suffered so much.

8247. But where they have suffered at all?—Not to the extent of those working in the mine referred to.

8248. Are you able to state whether any miners are alive now who had suffered from working in that or any other mine?—I cannot recall their names.

8249. Could you furnish the Commission with a list of any miners now alive who suffered from working in that or any other mine?—I cannot now recollect their names.

8250. Is it not your habit to enquire for the name of the mine at which the miners are working?—No; they know that there is a medical attendant belonging to the mine, and then they come to him.

8251. Do they ever come to you in preference to going to the medical attendant who has been appointed to a mine?—Yes, very frequently; and sometimes I attend for a friend.

8252. Do miners ever come to you from other mines?—Yes, very frequently.

8253. Is that in consequence of their not being satisfied with the medical treatment they have received?—Not at all; it is perhaps from my being nearer—perhaps they might not be near to reach their medical attendant—they might work in a mine from which he might be four or five miles off.

8254. In a case where the medical attendant resides four or five miles away, how often does he visit a mine?—Not at all, unless he is called upon.

8255. Then have the men to go that distance to him?—Yes, sometimes they have; and if they are not capable of going the medical attendant attends them at their own house; in case of fever or accident they are particularly attended to.

8256. How are the medical men appointed?—By the adventurers.

8257. Is there often a competition between the different medical men to obtain the appointment?—Very seldom; as in other cases the medical men have their friends, and they get appointed.

8258. Do they apply through their friends, and through the adventurers?—Yes, sometimes, and by becoming an adventurer in a mine is appointed surgeon. I have been an adventurer in the Providence mines ever since they first commenced.

8259. You were appointed surgeon?—Yes.

8260. And you were an adventurer at the same time?—Yes.

8261. Do medical men often become adventurers in mines for that purpose?—Not always; some men are fond of speculating in the mines.

8262. And they may speculate for the purpose of obtaining employment?—Yes, that is one advantage.

8263. (*Mr. Holland.*) Do you consider that the miners are a long-lived race of men?—Not generally speaking.

8264. Are they a short-lived race?—I think that within the last few years they have become longer-lived than they were formerly—in the early part of my time the average age of a miner was considered about 35 or 40.

8265. What is it now?—A great many of them have died in this district at the age of 80.

8266. But what should you consider was the average age of a miner?—From 50 to 55. I see a great number, and we had an old man working in the Providence mines some time since of the age of 75; there is a vast difference in the health of the miners in the copper and tin mines.

8267. Are you prepared to state to the Commission as the result of your experience, that the miners are nearly as long lived a race of men as other labourers?—In this district I think they are.

8268. Do they suffer in a very marked manner from lung disease, as compared with other labourers?—That depends entirely upon the mines in which they work.

8269. I am speaking now of those to whom you attend?—Yes; it is certainly more marked in the miners than it is in the agricultural labourers.

8270. Is there or not a larger proportion of lung disease among the miners than among other persons?—A greater proportion among miners.

8271. What is the form of lung disease from which they suffer?—Generally speaking, and very often, it assumes the form of tubercular disease.

8272. Is it generally so?—Yes.

8273. Do you feel well assured of that?—Yes, in the latter stage it becomes tubercular disease; you see great expectoration of sputa.

8274. Is that from tubercular disease?—Yes; there is generally ulceration of the lungs.

8275. But there may be ulceration without tubercular disease?—Certainly, which is to be distinguished by the appearance of the expectoration.

8276. Are you familiar with the use of the stethescope?—I use it sometimes.

8277. Do you find among miners physical signs of disease in the upper parts of their chests?—Generally speaking it is in the upper part or about the bronchus—in the latter stage the lungs give way.

8278. Do you find that hæmoptysis is common among the miners?—Very often.

8279. Do you think it is so in a large majority of cases?—Yes.

8280. Do they throw up liquid blood?—Yes, immense quantities.

8281. Is that common?—Not so common as it was some years ago in this neighbourhood, and not so frequent as it is in the neighbourhood of Redruth; because they find more arsenic in the copper there than we do here.

8282. Do you think that you can distinguish tubercular consumption from chronic bronchitis by the character of the sputa alone?—Yes, I think I could; but in many cases the sputa is similar.

8283. Not by the character of the sputa alone?—Sometimes.

8284. By auscultation do you frequently find the upper part of the lungs consolidated, and in an early stage of the disease?—I have never remarked that.

8285. Do you frequently find indications of cavity in the upper part of the lungs early in the disease?—So far as I could judge by the sound I think so; when you place your ear to the chest, you often hear a sound as if the part was completely empty.

8286. Is not the sound rather that of mucus in the bronchus than in a cavity?—Not in the lower part of the chest.

8287. I understood you to say that it was in the upper part of the chest?—In the early stage of the disease it is more in the upper part of the chest of the miner; you find it about the bronchus before.

8288. Do the miners suffer early from hectic?—No, they do not.

8289. That does not come on until later?—No.

8290. In phthisis it comes on earlier?—Yes, but it will be found that miners will go on for two or three

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years, the lungs will not give way; they live, and are able to do a little work.

8291. Have you observed that miners who have been suffering from the disease got pretty well again if they come to work at grass?—Yes, there is one man that I attended several times for bronchitis while he was working underground. I told him that if he did not discontinue it, he would shorten his existence, and at last he was obliged to give it up; his name was Noy.

8292. Would such a man if he were to come to work at grass have a fair chance of prolonging his life?—Yes, perhaps for many years.

8293. If a man was suffering from common phthisis that was far advanced, do you think he would have a fair chance of living many years by any change whatever? —I think not.

8294. Have you seen that frequently in miners?—

8295–8. I am drawing a distinction between miners and men not miners who have all the symptoms of ordinary consumption far advanced; can that disease, in men, not miners, be commonly suspended for many years?—Not for many years.

8299. Are they not very rare exceptions?—Yes.

8300. Whereas they are the common examples in miners' disease?—Yes.

8301. Does not that seem to point out a great difference between the two diseases, that one disease can be suspended for many years commonly, and that the other can be suspended for years only very uncommonly?—There are cases, but with the miners they have not got that support to sustain life in the same way that another person might have under the same circumstances.

8302. You allude to their food?—Yes.

8303. Are the miners, speaking of them as a class, a poorer class of men than the ordinary labourers?—Yes, generally speaking they are, they marry early, and involve themselves.

8304. Is not common consumption among men who are not miners most usual between the ages of 20 and 30?—Yes.

8305. Are you well advised as to that?—Yes.

8306–7. But if the death register proves that a larger proportion of men who are not miners, and who die of consumption, die between the ages of 20 and 30, should you say that that registration was incorrect?—No.

8308. There are but few I suppose who are not miners?— There are a great many; they are generally fishermen here.

8309. Is not disease of the lungs which is fatal among men who are not miners most commonly so among young men?—Yes.

8310. If the death register shows that that is so, are we to infer that that is incorrect?—You meet with more consumption in females than in males, and very frequently between those ages.

8311. (*Mr. St. Aubyn.*) You have stated that the miner is less able to bear up against these complaints than other classes, because he is not so strong?—Yes, the miners generally work longer than they ought to do, and by that means they undermine their constitutions, and in consequence of that they give way much earlier than others do.

8312. Referring to their means of subsistence, do you think that they live worse or better than other classes?—They live, when they are capable of getting employment, pretty fairly.

8313. As a general rule, does the miner live as well as the common agricultural labourer, or better or worse?—I think he does. I think it is much the same.

8314. Does not the miner liver rather better?—No, not from what I have seen among the agriculturists and among the miners; I think that they live nearly the same.

8315. How many men do you attend to now in the mines?—To about 400 or 500, but I do not know exactly the number of men.

8316. How many sick persons are you looking after now who are connected with mines?— Not one.

8317. When you attended to the Gew Mines did you find that the men there suffered from miners' complaint more than they do now?—Yes.

8318. You said, I think, that it was chiefly owing to bad ventilation?—Yes.

8319. Were those mines deep mines?—It was rather a deep one.

8320. Do you think that that complaint was at all aggravated by the miners climbing up the ladders, or that it was caused entirely by bad ventilation?—I think by bad ventilation.

8321. Do you think that the climbing had nothing to do with it?—Not so much as the want of ventilation.

8322. Had the climbing, in your opinion, anything to do with it?—Certainly it had in one sense; from the want of ventilation the power of the men was weakened, and being weaker, climbing in that condition depressed their powers very much.

8323. Do you think that the climbing up ladders has any effect on the heart?—It naturally tends to increase the action of the heart by depressing the power, and they are obliged to use more effort.

8324. Do you think that the men whom you attended, and whom you stated suffered from miners' complaint at the Gew Mines, would have been in a better condition than they were if a man-engine had been used instead of ladders?—Certainly.

8325. In your opinion the lives of the miners are much longer now than they were 20 years ago?—Yes.

8326. Is that opinion based on statistical observations that you have yourself made?—No; but I may remark that in the early part of my life I found that miners suffered a great deal from indigestion. I stated my reasons for thinking so, and I have often done so. They, perhaps, had four miles to walk to their mine; they took their breakfast very early in the morning, and they went down underground to labour. Then not taking anything to support them or to give them strength to come up from deep mines, and having afterwards to walk home, the tone of the stomach had lost its power, and in consequence they suffered. But I saw that, and I recommended them very strongly always to take something with them underground, and after they had done their labour to eat it before they attempted to ascend, and to rest themselves for half an hour; and in consequence of that getting into general use it improved their powers very much indeed, and strengthened them. They became much more capable of ascending, and when they returned to their homes they could take their meals with much more power to digest the food; the stomach had not been kept so long unoccupied.

8327. Can you give, founded on your own personal observation, any definite opinion as to the length of the miners' lives at this time compared with the lives of the miners 20 years ago?—No, I cannot.

8328. Do you find that the miners under your charge at the present time suffer from stomach complaints?— Occasionally; but not so much as they did.

8329. Do the miners in this district eat pasties or bread and butter when they are working underground?—Generally speaking, bread and butter; sometimes they take down a pasty with them and sometimes bread and meat; but generally speaking, I observe when I go into the different places that they take bread and butter with them, and I find that they only suffer when a place is close. They drink a good deal of cold water, and very often paralyze the powers of the stomach in consequence.

8330. (*Chairman.*) You have observed when they are working in a close place that they drink cold water?—Yes; and very often they come to me complaining of pain in their stomachs.

8331. In what mine has that occurred?—In dif-

ferent mines. They generally take water, and some miners drink more than others.

8332. Are there close places in the mines to which you refer?—Not so much about here as in other mines.

8333. Are there close places in the mines about here?—I do not know that there are. I meant to say that when they get heated they very often drink cold water underground.

8334. Do you think that that is injurious to them?—Very injurious when a man is in a state of heat. It paralyses the powers of his stomach.

8335. Does the miner take the water down with him?—Sometimes; but they sometimes have as pure water underground as on the surface, especially in the tin mines.

8336. (*Mr. Kendall.*) Can you tell whether that heat to which you have referred arises from hard work or from the close ends?—It is from hard work generally.

8337. (*Chairman.*) You have stated that in your opinion the copper mines are more unhealthy than the tin mines on account of the greater quantity of arsenic?—Yes, there is more heat.

8338. But there is arsenic also in the tin mines, is there not?—Yes; but it is more in the stone. It is not so much in the tin mines as in the copper mines.

8339. Are the copper mines more unhealthy than the tin mines on account of the heat or the arsenic?—There is the dust in breaking in close places, it being so hot; the dust rises, and the arsenic will rise from it.

8340. Have you analysed the expectoration of any miners to see whether there was arsenic in it?—No.

8341. (*Mr. Holland.*) What effect do you suppose the arsenic produces?—It produces sore gums and dreadful blotches all over the body when a man has worked in copper mines.

8342. Have you observed among them sore eyes?—No.

8343. Any irritation of the nostrils?—Yes, very much so, very often.

8344. Is any skin disease produced?—Yes; and gatherings and blotches.

The witness withdrew.

Captain Richard James examined.

8345. (*Chairman.*) Of what mines have you charge?—I manage three mines more especially. The names of the three are Wheal Margery, Trelyon Consols, and East Wheal Margaret.

8346. Which is the largest and deepest mine of the three?—Wheal Margery.

8347. How many men are there employed underground at Wheal Margery?—At present there are about 90.

8348. Will you be kind enough to state the number that is employed at each of the other mines?—There are about 60 employed in Trelyon Consols, and 74 at East Wheal Margaret.

8349. Do those numbers include both men and boys?—Yes; employed underground.

8350. What is the depth of Wheal Margery from the surface?—120 fathoms.

8351. How do the men ascend and descend at that mine?—By ladders.

8352. What is the pitch of the ladders?—The first is 20 fathoms perpendicular, and the remainder about two feet and a half in a fathom.

8353. Are the bars of the ladders 10 or 12 inches apart?—They are 11 inches apart with us, but they vary very much. We do not see many ladders now 12 inches apart; those are the old style.

8354. Do you think there is any advantage in having the bars less than 12 inches apart?—I think so. It seems a little contrary to begin with, but after they get used to it they can climb easily.

8355. Have you worked underground yourself?—Yes. I worked in 20 different mines when I was a working miner and among every sort of mining.

8356. I suppose while you were a working miner you occasionally worked in close ends?—Yes.

8357. Did you ever suffer from working in those close ends?—Only just temporary; just for a month. I got choked or puffed up, but I never felt anything afterwards.

8358. At the time you felt puffed up or chok e d up?—Yes.

8359. Was your head at all affected?—Not at all.

8360. Did the breathing of the air in the close ends affect your climbing?—Yes, we breathed more short at the time.

8361. How do you discover that an e. d gets close?—By the candles as soon as by anything.

8362. Do you discover it by the candles as soon as by your own feelings?—Sooner. The candle will decline before we can feel it, except we work very hard, and then we can discover it; we begin to breathe very short when working in a close place more than when working in a place where there is plenty of air.

8363. Did any of the men who were working in the same pair with you suffer in the same way?—No; we were only two. We worked in one particular close place, we really did in those days; but we do not see anything like it nowadays. We worked when we kept our candle some 12 to 18 feet behind us.

8364. How far was that place from any shaft or winze?—It was not very far from the surface; it was called the 20 fathom level. I do not remember any accident there. We were in about 100 fathoms with no winze; it was what we call in these days a trial end; there was nothing done in that part of the mine. They intended to drive an end through a virgin piece of ground.

8365. You think you may have a close end in a shallow level as well as in a deep level?—Yes.

8366. How far was this end driven from the shaft?—100 fathoms.

8367. Was it following the lode?—Yes.

8368. How long were you able to work in that place, how many months or weeks?—I worked there for some two years.

8369. During all that time did you burn a candle?—During the whole of it, little or much. As it got further off it was so bad that we could not see it for days together. It depended upon the wind at the surface. With a north wind it was keener air, and we could work then better than with a south or south-west wind. For days together we could not then carry a candle within 20 fathoms of it.

8370. I suppose you were paid highly for working in that place?—No, it was very poor time then amongst the miners. It was in the neighbourhood of Helston in a lead mine called Wheal Rose near the Looe Pool.

8371. Is that mine being worked now?—No; it was very poor times with the miners, and we were driven to great shifts in those days. I am speaking now of about 15 years ago.

8372. How long have you been captain or manager of mines?—Now I have been a captain between 11 and 12 years

8373. Before that had you been working in any other mines where there was poor air?—Not so bad as what I have described; but in some very close places.

8374. Have you ever managed any other mines than those you have enumerated?—Yes; I managed one in St Just and one called the Durlo in Towednack a little while, and I managed one other in Towednack called the Georgia Consols.

8375. Are those mines being worked now?—Not the Georgia Consols, but the Durlo is. There is another called South Speed in Lelant.

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8376. Were there any poor ends in those mines?—No.

8377. In St. Just were there poor ends in those mines?—No, there were not.

8378. How long does the smoke take to clear away from any end in the mines with which you are now connected?—There are two ends in which we have driven more extensively than in the others, and the smoke would lie there before we stopped them a good part of one hour before the men could get in.

8379. At the present time are you not driving in those ends?—No.

8380. How long will the smoke take to clear away in any one end now?—In the closest end that we have we can go in to work in 20 minutes.

8381. How far is that from a winze?—About 10 fathoms from a winze; about 40 fathoms from a shaft.

8382. Is there plenty of air there?—Yes.

8383. (*Mr. Holland.*) Is that the worst end that you have?—Yes.

8384. (*Chairman.*) The worst in any one of the three mines you have mentioned?—Yes; the one that I am now speaking of I think would be a fair sample for either of the others. The others are better in many things than this one is,—this is Wheal Margery.

8385. What do the men pay for candles?—9*d.* per pound.

8386. What quantity of candles are allowed to each man?—2 lbs. a week.

8387. And no more?—No.

8388. What do they pay for the powder?—They pay 9*d.* a pound for the powder.

8389. Since you have been managing the mines you have mentioned, have any accidents occurred from blasting the ore within the last five years?—Yes; in Trelyon Consols we have had one accident only.

8390. Were you able to ascertain how that occurred?—Yes. I do not know how it missed, but the hole missed fire, and the man went to bore it out with a borer, and he actually beat away with the borer as if he was boring, and in doing that the powder exploded, and it carried off his arm.

8391. How do they fill in the powder, with a tamping rod, or do you require them to use any particular tamping rod?—We profess to have to do so. We lay down this rule in the mine, that any man known to be injured by an explosion who has not used a wooden rod is entitled to no pay,—that is our rule,—that is, when putting in the powder and packing it.

8392. If after that notice a miner uses an iron bar he is not entitled to any relief?—No.

8393. Have you ever seen any other bar used?—Yes; I have seen the copper bar; they are put up to the iron bar. They have a piece of the end of it that is copper, and I have seen fire come from that; a kind of blue fire, something like brimstone.

8394. (*Mr. Davey.*) Was that from the copper or from the alloy?—No; it was had for copper. We understood it to be copper.

8395. (*Mr. Holland.*) You do not think it was the shank of the tool that caused it?—No; we tried it outside the hole to see if it would strike fire, and it was a kind of dead blue fire.

8396. (*Chairman.*) Do you use cartridges in the mines with which you are connected?—No; but we have done.

8397. Does an accident ever happen in consequence of the powder lying round the edges of the hole not being properly swabbed out?—Not generally; that was in days gone by more than now. We always take care to clean it out with this wooden rod; we dip it in water and wipe out the hole with the en of it.

8398. If that precaution was neglected there might be danger?—I believe that was the cause formerly of many of these accidents. I do not know of one that has happened really in a fair way of tamping up in any of the mines that I am connected with.

8399. What do the men contribute to the club?—With us the girls pay 3*d.* for the doctor only; they are not entitled to the club. A boy earning below 20*s.* pays nothing; but if he is earning 20*s.* he pays 6*d.*, and the men pay 1*s.* to the doctor and the club.

8400. Do you keep any account of the club money?—Yes.

8401. Do you balance the account every year?—I really do not know; that is the purser's business. All we do if any man is injured or sick is this, if that man is injured or is ill so many days, for every day he gets 1*s.*, and the purser keeps an account of it.

8402. If a man were sick would he receive anything?—Yes; we have a clause in our rules that a man, unless he should show a visible hurt, has no real claim; but it is left to the discretion of the purser and the agent. And if a man is taken ill we allow him as much as the circumstances may enable us to allow. If he dies we bury him, and support his widow, or contribute to the support of his children afterwards.

8403-4. (*Mr. Davey.*) For howlong do you do that?—While the mine continues the club will support that. I know one case of a man who worked in the Providence Mines for many years, and he was worn out. He was out to lodgings and his wife died, and the woman with whom he lodged could not support him for the 30*s.* a month, or 1*s.* a day, and he went to the Union; he died there, and all expenses, including funeral, were repaid the Union, amounting to 2*l.* 5*s.* 8*d.*

8405. (*Chairman.*) Under Mr. Higgs's management, do you think that they are a better conducted class of men?—Yes, I am sure that they are.

8406. (*Mr. Holland.*) Is such an act of liberality and kindness on the part of Mr. Higgs as you have just mentioned of common occurrence?—I do not think it is so general as it is with him.

8407. I presume that it was thought a very liberal act?—Yes it was.

8408. (*Chairman.*) That is the way in which the mines under Mr. Higgs's charge are conducted?—Yes it is; it was thought by others very liberal to pay the Union expenses.

8409. How many boilers have you under your charge in the different mines you have named?—There are three in Wheal Margery, and one in each of the other two mines, they are small engines except in Wheal Margery, and there we have two for the pumping engine, and one for the steam whim.

8410. How often do you clean the boilers out?—We clean the boilers out really once a month, but we cleanse them throughout once in two months, once a month we take out the tap in the bottom of the boiler, and then all that is in it rushes out, and then at the end of two months we cleanse them altogether and get into the boilers and clean out the flues by the side of the boilers.

8411. Do you test the boilers by any means?—No, we have no means of testing them.

8412. Cannot you test a boiler with cold water?—Yes, but we never did; we examine a boiler to see if everything is right.

8413. Have the men any means of ascertaining whether there is an insufficient quantity of water in the boiler?—No other means except the two gauge cocks, the bottom one is four inches above the fire take, and the top one is about four inches over that again, so that if we have water at the bottom cock, it is then four inches over the tube; in one boiler in Wheal Margery we have really eight inches there, which is rather unusual.

8414. (*Mr. Holland*) How long would that be evaporating?—About two hours We have got a rule by which we never allow a man, whether he is by night or by day, supposing another man's core is up this morning, to go in unless he tries the cocks and finds that the feed is up flush to the cocks, and if it is not he has to come then and give us the result, and say why he does not take charge of his work: we do not let him take charge unless he finds that the feed is up to the proper place.

8415. Is that the rule strictly observed in the mine?—Yes.

8416. How do you enforce it?—We see for ourselves that it is so.

8417. You are able to enforce that rule effectually? We do it pretty well. I do not mean to say that we do see it every morning, but we go when they do not think that we are coming, and we take care to lay that rule down carefully.

8418. (*Chairman.*) Do you think that the miners are satisfied with the medical attendance that they have?—Yes.

8419. Who is the medical attendant that is employed?—The last witness is one and Dr. Rosewall is another; we have two in the same mine, so that if one is out or away from home, we lay claim to the other, and if it is an important case we send for both of them.

8420. I suppose they only attend to the miners and not to their families?—No.

8421. (*Mr. Holland.*) Have you worked in a mine where there has been only one doctor?—Yes.

8422. Does it give more satisfaction to the men when there are two medical attendants?—Yes.

8423. (*Chairman.*) The doctor is required to attend in the case of any illness that a miner may have, whatever it may be?—Yes, that is, to the man himself, and not to his family.

8424. (*Mr. Holland.*) You were speaking a short time back of working 100 fathoms in advance where there was very hot air; was not the cost of such work much increased by the want of good air?—Yes, it was; but they could not very well bring air to it without expense.

8425. About how much per fathom was the cost of working increased by want of good air?—I do not know, perhaps it would really turn out to be one quarter part; I got 40*s.* for driving that close end, and I could very well have done it for 30*s.* if I had had good air; but that is the only very bad case that I know of.

8426. In a case where the powder smoke hangs about for an hour, and in another where it is cleared away in a quarter of an hour, there must be a great difference must there not in the profit obtained from the working?—Not so much, as the men bore the number of holes for one core and fire them on leaving work.

8427. (*Mr. St Aubyn.*) In answer to a question put to you by the chairman with respect so some mines in Towednack, which are not now working, you said there were no close ends in those mines?—Yes.

8428. You also stated that you had seen a tamping rod with copper at the end of it strike blue fire?—Yes, I said that from my own experience.

8429. Is it not possible that that might have occurred from that part of the rod which was made of iron striking against the sides of the hole?—It was not tried in a hole, but it was tried outside in order to see whether it would strike fire; it was the understanding that it would not strike fire, but we tried it against some of the most fiery stones, to see whether the copper would strike fire, and we saw little dull sparks.

8430. Do you think that they would have ignited gunpowder?—Yes, I think there was fire enough for that.

8431. You believe that those sparks were produced by the contact of the copper with the stone?—Yes, it was at the bottom that we tried purposely.

8432. (*Mr. Kendall.*) The sparks were not of the same colour as those which are produced by iron?—No, they were little blue sparks.

8433. (*Mr. Holland.*) Did it look at all like the sort of blueish flash that is produced by the rubbing of two fire stones together?—Yes.

8434. (*Mr. Davey.*) You have stated that you drove a level for 100 fathoms without any artificial ventilation?—Yes.

8435. And that it was only 20 fathoms from the surface?—About 20 fathoms; we called it the 20 fathom level.

8436. How long generally could you work, about two thirds of the time, or scarcely so much?—We were for two days sometimes when we could not go near the place.

8437. Who was the agent at that time?—Captain Michael Morgan.

8438. He was considered an able man, was he not?—Yes.

8439. If you did the same thing now, what should you consider the system of working the mine to be?—I should not consider it very good.

8440. Do not you know that in sinking that 20 fathoms, as you would do in copper mines would be to ventilate the whole of that piece of ground, and then drive another 20 fathoms?—Yes.

8441. Is it very unusual to drive a level to the extent you have described without sinking a shaft if you had no winzes?—Yes, it is quite unusual. I said that it was a singular case, and the most extraordinary one that I ever saw in my experience. I do not mean to say that that is the general rule.

8442. Was it not a thing that would never be done now under the improved system of mining?—I have not seen such a thing done for many years.

8443. (*Mr. Kendall.*) How far was the level driven in before you found the air getting very bad?—We found it bad for the last 20 fathoms.

8444. It was not very comfortable after the first 50?—No, it was getting close.

8445. If you had gone to the expense of sinking a shaft at the end of the 50 fathoms, you would have saved a great deal of money by it, would you not?—Yes.

8446. How long were you driving the last 50 fathoms?—We drove about four or five fathoms a month.

8447. At what price was the work done?—The highest price was two guineas.

8448. You were working in a loose friable rock, were you not?—Yes.

8449. And therefore it would have been much easier to sink, as the cost of a shaft would have been very moderate?—Yes; they could have sunk five fathoms a month I suppose, and could have got down there in about four months.

8450. How may men were employed there?—Only two.

8451. Did only one of them suffer?—Neither of them suffered.

8452. You stated that you felt choked up?—Yes, just at the time, but not afterwards.

8453. How long were you working there, nearly two years?—Nearly about that time; it is many years ago now.

8454. What age are you now?—43.

8455. How long did you work as a miner?—I worked from the age of 7 up to 31.

8456. Ever since that have you been an agent?—Yes.

8457. Have you worked in 20 different mines?—Yes.

8458. How is your health now?—Very good.

8459. Do you generally meet anywhere with stronger men or men in better health than yourself?—I do not see many; besides that end, I have not worked six months in bad air.

8460. Did you ever get any start at all in any of the mines?—Not very heavy ones; sometimes 20*l.* or 30*l.*

8461. Have you known many men who have got starts?—Yes.

8462. When they get a start, is permission given to them to work as many hours as they like?—Yes.

8463. And I suppose they do work very hard at those times?—Yes.

8464. How many hours do they work upon those occasions?—Very often 12 hours, not often less than 12 hours.

8465. When they get a start, do they not over exert themselves?—Some men do; most men do, I suppose; but they take in a great deal of eating and drinking to keep it up.

8466. Have you ever known a case in which their

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food and drink have been taken down to them, and the miners have stayed underground ?—Yes.

8467. (*Mr. Holland.*) Have they stayed underground for a whole week ?—No, only for 12 hours, and some refreshment has been taken down to them in the shape of beer and spirits.

8468. (*Mr. Kendall.*) From your experience, when should you say that the miners worked the hardest ; when they are earning plenty of money, and in order to make more, or when they have got a very moderate take, and it requires pretty hard work to make up fair wages ; in other words, are they not generally lazy when they have got a poorish take ?—Yes ; we allow the miners to get about 3*l.* If we give them a bargain to get 4*l.* they have actually got 5*l.* or 6*l.* by working extra ; but if we give them a bargain to get 2*l.* instead of 3*l.*, they will not get more than 30*s.*

The witness withdrew.

Mr. John Nancarrow examined.

Mr. J. Nancarrow.

8469. (*Chairman.*) What mine have you the management of at the present time ?—St. Ives Consols.

8470. Do you manage any other mine ? — East Treskerby in the Chacewater district.

8471. What does the St. Ives Consols produce ?—Tin and a little copper, very little of it now.

8472. What is the depth of the lowest level from the surface ?—197 fathoms from the surface ; we call it 200.

8473. By what means do the men at that mine ascend and descend ?—By ladders.

8474. How many men have you working under ground ?—182 men and boys.

8475. How many men are employed above ground ?—Our men, boys, and girls altogether will amount to 360.

8476. At what levels are you working now ?—We are working at the bottom at the 167 and the 177, and in every level up to 97. We are working at the 87, and up to the 67 and 47.

8477. Are there any close ends in which the men are working ?—There are none in which a candle will not burn very well, and it will burn very well. We have seven shafts.

8478. Have you any other means of testing the state of the air besides the burning of the candle ?—No.

8479. Have you no artificial means of ventilation ?—No, we do not require any ; we only just put a soller into the bottom of a level.

8480. You do that ?—Yes.

8481. Have you any levels in which a soller has been placed ?—Yes, one.

8482. Is the air not quite so good in that level ?—It is warm.

8483. Which level is that ?—The 170.

8484. Do you know at all what the heat is in that level ?—No, we never tested it,

8485. How long does the smoke hang about in the level in which the soller has been placed ?—It might stay for an hour or two. We only work it by two cores out of four. We have one idle between, so that it is completely cleared out before the other comes.

8486. What is your object in doing that ?—In order that the men may be able to work it better.

8487. You think that if a fresh core went down to relieve the other, the state of the air in the level would not be so good as if it were dealt with as you have described ?—Certainly not.

8488. Therefore in order that the air may become improved by the men being out of the level you leave it for a short time to be ventilated ?—Yes ; in fact it is completely cleared out.

8489. Have any of your miners ever suffered from working below ?—I do not know that they have ; they do not complain.

8490. Do you know of any men who have suffered from miners' disease ? — No ; not one. The men work six hours in the end I have referred to.

8491. Two cores ?—Yes ; but they leave six hours between ; but that is the only place of that kind.

8492. What quantity of candles do you allow to a man ?—2 lbs. a week.

8493. Although they only work for a shorter time, do you allow them the full quantity ?—Yes ; they work six days one week and five the other generally, but that is the only case in which they work in that way ; eight hours is the regular core.

8494 What do the miners pay for the candles ?—10*d.* a pound.

8495. How much do they pay for the powder ?—9*d.* a pound.

8496. What is the cost price of the candles ? — About 6*s.* for one dozen pounds.

8497. What is the object of charging the miners 10*d.* a pound ?—As to the object I am not prepared to say. It was the custom established in the mine before I came there ; I have only had the management of it for two years and a half, or barely that. I saw no reason to alter it.

8498. What is the cost of the powder ?—It varies in price ; sometimes it is 7*d.* sometimes it is more and sometimes it is less ; now it is 6*d.* a pound exactly.

8499. What do the miners contribute to the club ?—They pay 6*d.* a man per month.

8500. Do the surface men also pay ?—Yes. The surface men pay to the club and to the doctor too ; every man does.

8501. Do the women contribute anything ?—No ; —they pay nothing.

8502 What do the men pay to the doctor ?—6*d*

8503. Do they pay anything to the barber ?—No. There is no barber.

8504. How are the doctors appointed ?—It is generally done at a general meeting of the adventurers.

8505. How many doctors are there generally ?—There is only one here, but there are sometimes two, and sometimes three.

8506. What is the name of the doctor you have referred to ?—Dr. Young. He lives in the town, and has been doctor of the mine for many years.

8507. Are the men all satisfied with one doctor ?—There is no dissatisfaction expressed.

8508. Do you know whether they go to any other doctor ?—I do not know ; they may have gone to another doctor. We have very little sickness. I have not heard any particular remark made about it.

8509. Do you subscribe to the club ?—No.

8510. Do the agents not subscribe ?—No. In some mines they pay to the doctor, and in other places they provide themselves.

8511. Then the doctor does not attend you, or your family ?—No ; it has been so in some cases where we did pay for the doctor, but not here.

8512. Do you pay the miners, or does the purser pay them ? — The purser pays the men working under ground for two or four or six ; the pairs are paid together ; but generally in a mine every single man or boy is paid separately.

8513. (*Mr. Holland.*) Are the pairs paid in such money that they can easily divide it amongst them ?—They are paid in bank notes generally, and sometimes in sovereigns.

8514. Would it not be a great advantage and convenience to pay them in small money, so that they could divide it amongst themselves without having to go to a public house for change ?—It might be ; but the greater part of them do not go near any public house at all.

8515. Where do they obtain change ?—I do not know where they get it.

8516. (*Chairman.*) How many boilers have you working ?—We have six boilers working.

8517. How often do you clean them out?—Every two or three months.

8518. Is there no fixed time for cleaning them out?—No; that is at the option of the agents, but we do not allow it to go beyond three months, except that we have occasionally at one engine gone as far as four months; but our water there is pure spring water, and in fact the men drink it under ground; they carry it down with them; they actually take the water that is brought into the dry for them to wash with down with them into the mine. There is no corrosive quality in it.

8519. When you clean a boiler out do you examine it to see whether it is in a sound state?—Yes, we examine it.

8520. Are the rivets carefully looked after?—Yes, we look at them occasionally; but our boilers I suppose have been worked for 30 years, and they do not seem to corrode at all.

8521. There is no regular time fixed for examining them?—No; I do not know that there is.

8522. Do the men change in the boiler house?—No; all the men in the mine are collected in the dry.

8523. Do the women work under cover?—Yes.

8524. Have they a place to which they can go to take their meals?—Yes; there are places in connexion with each of the dressing floors.

8525. (*Mr. Holland.*) Is the strength of the boiler tested at any regular interval?—No; it has not been tested since I have been there.

8526. Are the boilers provided with one or two safety valves?—With one.

8527. Is that considered safe in this part of the world?—Yes.

8528. (*Chairman.*) Has no accident ever occurred from the bursting of a boiler in your mines?—No; there has not been one accident of the kind during 45 years that I know of. The water is easy in this neighbourhood, and our engines are not forced; I mean that we have a small quantity to pump.

8529. Have you ever heard of any boiler accident having taken place in this neighbourhood?—I have heard of none since I have been here.

8530. Have you had the management of mines in any other parts of Cornwall?—Yes; I have at Great Wheal Busy for a time.

8531. Were you at that mine when an accident happened there?—No; there was no bursting of a boiler while I was there. I never had a boiler burst in any mine that I have been in.

8532. You have always taken care to examine them well?—Yes; and another thing that I always pay particular attention to is to see that the water is got into the boilers as pure as possible, except in one case where we had to mix soft clay with the water, it was so uncommonly keen.

8533. In what mine was that?—That was at Wheal Busy for a little time.

8534. The water at Wheal Busy is very bad, is it, for the boilers?—Yes.

8535. While at Wheal Busy no bursting of boilers took place?—No; nor at any other mine that I was ever at.

8536. (*Mr. Holland.*) Is the water used at Wheal Busy an acid water?—Yes.

8537. Where did you get the clay from that you spoke of?—In the mine. It was a questionable matter what was best to be done with the water,—my predecessor filtered the water, and extracted all the sediment from it, and thereby it had a greater power to act upon the iron.

8538. You are the manager of another mine in the east, are you not?—Yes; East Treskerby, near North Wheal Busy about a mile away from North Wheal Busy.

8539. What number of men are employed there?—Only 14.

8540. Is there more than one shaft there?—There are two shafts.

8541. What kind of work are they now doing?—We are sinking one of the shafts and driving the two levels.

8542. How often to you visit that mine?—Once a week; there is a captain of the mine there every day and all days.

8543. In driving the levels is there any poor air there, do you think, or any close end?—No; it will get close as we get further off. We are now in about 30 fathoms and the air is not bad.

8544. How far are you driving now from a shaft?—We are 30 fathoms from a shaft.

8545 How far do you think you will be able to drive?—I cannot tell; we may drive 10 fathoms further; and if we find that the air is failing we shall out down a winze or have a waterfall, or else attach a machine to the engine.

8546. Have you got machinery ready for it?—No; we have not.

8547. How will you ascertain when that becomes necessary?—We are driving towards the lode; we cannot tell the exact distance it has not been seen over this place at all; this is 40 fathoms from the surface, and we cannot tell what our future plan of operation will be.

8548. How will you know when it becomes necessary to introduce your waterfall?—When the smoke will lie badly in the level, and when the candle will not burn properly.

8549. Until then you consider that the air is good?—Yes, generally; there have been cases in which there is a sort of damp settles; but I have never seen anything of the kind in this mine, nor in the other mine.

The witness withdrew.

Captain Matthew Curnow examined.

8550. (*Chairman.*) Of what mine have the management at the present time?—Wheal Mary in Lelant.

8551. Is that the only mine of which you have charge now?—Yes.

8552. How many men are working there underground?—Somewhere about 110 I think.

8553. How do the men come up and go down the mine?—By ladders.

8554. What is the deepest level in that mine?—The deepest level in 160 fathoms under the adit.

8555. What is the heat of that level?—I do not know, as it is quite cold there; there is a breeze of wind there, and the men are glad to stand in it sometimes.

8556. How many shafts are there?—We have got three shafts; but we have got but two working ones; where the men ascend and descend.

8557. Are you driving any level where the air is at all close?—Not one in the mine; not to say close.

8558. What do you understand by the word "close"?—Short of air, or not ventilation enough; that is what I call closeness.

8559. What do you understand by the term "poor air"?—That is where the candle will not burn without leaning it to its side. I have worked in that many times, scores of times, for years.

8560. Did you suffer from that at all?—Very little; it was cast out again; I felt a little from it once, but it passed off again.

8561. Have you worked several times in places where the candle would not burn?—I have worked in as bad air as any man in the country.

8562. How did you feel under such circumstances?—I felt a shortness of breath.

8563. Did you suffer from any affection of the stomach?—No.

8564. Was your appetite impaired?—Yes; but we took a little medicine to get all right again.

8565. When you were working in poor air, did you

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feel the effects of it afterwards in climbing the ladders ?—Yes ; I felt a little stupefied.

8566. Was your head at all affected ?—Yes ; I was not lively.

8567. Did any of the other men working in the same core with you suffer from the same cause ?—Yes ; some of them died of it.

8568. Are there none living now who worked with you at that time ?—No ; not one of the pair. I am the only man that is living ; but they were much elder men than I was at that time ; I was young, about 19 or 20.

8569. At what age did they die ?—Every one of them lived, I should say, until they were between 60 and 70.

8570. Did they work underground all that time ?—Some of them worked on to the last.

8571. Were they not affected by it ?—Not a bit ; it depends upon the constitution ; some men are stronger than others.

8572. You have, I presume, heard of what is called miners' disease ?—Yes.

8573. Have you ever seen any case of that ?—Yes.

8574. Do you know any men who are at the present time suffering from miners' disease ?—No ; it is very rare now ; there are better means used in ventilating mines than there used to be.

8575. What are the means that are now used for ventilation ?—Cutting open more ground.

8576. Do you mean that the more the mines are extended the better the ventilation is ?—Yes ; the more it is cut up and opened.

8577. A new mine is therefore likely to be not so well ventilated as an old one ?—Yes ; because they have but one shaft generally ; and there is one thing that there is better ventilation in the copper mines where they work shallow than what there is in the deep mines in granite, as they can sink some four fathoms for one in killas ; in sinking one fathom in granite they can open four or five in the killas.

8578. Are there any mines in which we could see a place where the air is poor ?—Not to my knowledge in our locality.

8579. I suppose there are such places in other deep mines ?—Yes ; I have heard a deal of it, but I have not seen it.

8580 In what district were you employed when you were working in poor air ?—I was working at about 70 from the surface and 50 fathoms from the shaft.

8581. What district was that in ?—It was about three mile from here ; on the south, in the parish of Towednack.

8582. With regard to the rules to be observed n mines, are they printed rules ?—What do the men pay for candles ?—They pay 9*d.* a pound.

8583. Do you limit them to a certain quantity ?—Yes, they are limited to 2 lbs. a week per man.

8584. How is the mine worked—how many men in a pair ?—There are two in some places, and sometimes they work more—where it is set to them in breaking ground, they almost always make it two.

8585. A core consists of six men, does it not ?—A pair consists of six men ; sometimes the pairs are not more than two, sometimes four, and sometimes six.

8586. How many hours a day do they work ?—From six to seven hours.

8587. Then there would be three pairs employed in the course of 24 hours ?—Yes, where there are six in a pair.

8588. Do you think that the plan in St. Just of one man working is better than two men ?—Not for the borers ; a man must use more strength to beat the work by himself as compared with two men.

8589. Do you know what the cost price of the candles is ?—I think we pay 6*s.* 6*d.* or 6*s.* for a dozen pounds, but I am not clear upon that.

8590. What do you charge the miners for powder ?—We charge them 8*d.* a pound.

8591. Do you use any kind of patent powder, or the common powder ?—We use the common powder that is made here in the county.

8592. What do the men contribute to the club ?—6*d.* for club, and 6*d.* for doctor.

8593. The club money is to provide only for visible accidents, is it not ?—Yes ; if we know that a man falls and injures himself.

8594. It is not a club to provide for sickness ?—No, unless a man is sick, and is laid up at any time, it is thought a kind of charity to support him from the club rather than that he should come to any place of charity else.

8595. Is any account kept of the club money ?—Yes, but our purser keeps it ; we have not got it opened in our books.

8596. Does the purser lay it open in his accounts to the shareholders ?—Yes, it is kept as a stock for the club. I do not know, but I should think it was the men's property ; I should say so.

8597. Is an account kept of it for the men, or do they know anything about the state of the accounts ?—No ; no other than that if any man is injured or sick, and they think proper to relieve him.

8598. Do you subscribe to that club ?—Yes, I have been working in this mine for 28 years.

8599. You are now the manager of it ?—I am agent.

8600. Have you been agent for 28 years ?—I have been agent for some 16 or 17 years.

8601. Do you always pay to the club ?—I should say that I do not think the agents do.

8602. But you do, do you not ?—I have for many years, when I was working.

8603. But not now as manager ?—I am not manager, our manager is not able to come, and I am here to represent him.

8604. Then what are you now ?—I am here underground agent.

8605. You do not yourself contribute to the club now ?—No, I reckon that that is a privilege given to the agents by the adventurers.

8606. If any accident happened to you you would be entitled to something from the adventurers ?—Yes, I suppose so.

8607. Have you one doctor or two at your mine ?—We have two doctors.

8608. By whom are they appointed ?—By the men, that has been so for some years gone by, and that still stands.

8609. In your opinion is that a good plan ?—Yes, it is more pleasing to the men.

8610. Is that the general practice ?—No, there is a little more interest taken in that in our county in places.

8611. I suppose the doctors are generally chosen by a canvass ?—Yes ; I have attended meetings where, in putting on mines we have taken up shares to carry on a mine, and that has been canvassed before the adventurers and carried there, and then the labouring men must take whoever is fixed on to attend them ; but ours was carried by a majority of the men.

8612. I suppose the same principle could be pursued in case there was a change of doctors ?—Yes.

8613. Do you think that that is a better system than that the doctors should be appointed by the adventurers ?—Yes, a great deal better.

8614. You consider the club money to belong to the miners ?—Yes, if the men were to turn out, and were to say, what is to become of our club money, we should say we have the money as support money.

8615. But who looks after it ?—The books would get overhauled.

8616. Does the purser present any account to the men ?—No, I never heard that broached to the purser at all.

8617. Then you would not know how the account stood ?—I heard a little while ago a fellow agent say to a purser, "I suppose our fund is pretty stocky," and he said "It is right enough yet." I suppose we must have the money, but it would be better to have

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an account rendered to the men, although it is not the general rule in the mine.

8618. Generally speaking there is no account kept of the club money?—I do not think there is anywhere; I believe it is more supposed to be so than anything else.

8619. If no accidents happen in a mine, the sums which the men contribute to the club must amount to something considerable?—Yes they must.

8620. Suppose that a mine were to be abandoned what would become of that money?—That is a question that I cannot answer, because I never worked in a mine that came to that, nor ever heard tell of the thing being brought in.

8621–2. Why is the charge made to the miners for candles, not only higher than the cost price, but higher than the market price?—It is the rule, and another thing is in order to keep the men so that they shall not run themselves to too much expense; it is different to pay for a thing at a dear price to what it is in coming and taking it away at a cheap price; if I take up a thing that I pay for heavily, I must take care of it.

8623. But suppose you only allowed a certain quantity?—What is allowed them is considered enough.

8624. Therefore you would not allow them more if they only paid 7*d.* a pound for the candles instead of 9*d.*?—No more than we should if they paid no more than 6*d.*

8625. Beyond the cost price there is a profit made upon the candles?—Yes

8626. And the same on the powder?—Yes, and that is to make the miners take care of all those things.

8627. But still the men would always have to pay for them as long as they were not supplied to them below cost price?—Yes, but if a man could get them for 4*d.* a pound he would not be so nice about it.

8628. How long did you work under ground as a miner?—For more than 30 years.

8629. How old are you now?—I am in my 50th year.

8630. Have you never suffered in your health from working under ground?—No.

8631. But have others to your knowledge?—Yes, the men I have worked with; I have worked along with men who could not work so long as I could. I could work 24 hours where they worked 12.

8632–3. Do you know any men who are alive who have suffered from working in the mines?—It is a very rare thing with us anywhere in the neighbourhood; during the last 10 or 15 years the mines have been getting better ventilated, and the health of the men is more studied now than it was 30 years ago; they study the health of the men, and one man thinks more of another.

8634. The comfort of the men is attended to in your mine?—Yes, there is a stream of beautiful water that is caried down into the mine for the men to drink.

8635. Could not that stream if necessary be made use of for the purpose of ventilating the mine?—From the ventilation our men do feel great benefit.

8636. But do you not use this water for ventilating the mine at all?—No, it is for drink for the benefit of the men; it is good for their health when eating their morsel.

The witness withdrew.

Adjourned to Camborne on Tuesday next at half-past 10 o'clock.

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Tuesday, 5th August, 1862.

PRESENT:

The Right Honourable Lord KINNAIRD, K.T.
RICHARD DAVEY, Esq., M.P.
NICHOLAS KENDALL, Esq., M.P.
JOHN ST. AUBYN, Esq., M.P.
P. H. HOLLAND, Esq.

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

Captain CHARLES THOMAS examined.

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8637. (*Chairman.*) Will you be good enough to state what mines you manage?—Dolcoath mine, Cook's Kitchen, Stray Park, West Wheal Seton, West Wheal Frances, and Calvadnack.

8638. What is the produce of the Dolcoath mine chiefly?—Tin principally, and a little copper.

8639. What is the produce of Cook's Kitchen?—Tin also.

8640. What does Stray Park produce?—Copper and tin.

8641. And West Seton?—Mainly copper; a little tin.

8642. What does West Frances produce?—Tin.

8643. And Calvadnack?—Tin.

8644. How many men are employed underground in Dolcoath mine?—I have sent in a list of the men employed at all the mines.

8645. What is the whole number of men, women, and children that are employed at all the mines you have mentioned?—The whole number of persons would be about 3,500 in the mines of which I have the superintendence.

8646. What amount of property do you think is represented by the mines of which you have charge?—The present market value I should think is about 400,000*l.*

8647. Does the return which you have sent in give the ages of the boys who are employed underground?—Yes.

8648. On the dressing floors, what is the age of the youngest children who are employed there?—There are a few at 9 years of age, but very few indeed; at the age of 10 and 11 there are a great number; there may be one or so between the age of 8 and 9, but it is a rare occurrence for any one of them to be younger than that.

8649. Is there any limit to the age at which you receive them at the dressing floors?—No; a father or mother will come and say perhaps, "I have this little child, and I do not know what to do with it; I can scarcely get bread for it, will you take it?" and we sometimes yield to that, and take the child in to do such work as it can do, but it is very light work.

8650. What are the lowest wages that they receive?—6*s.* a month is the lowest wage.

8651. Are there any evening schools established to which these children can go of an evening to receive instruction?—There are schools to which they can go in the evening; some schools, but not enough to take one tenth of them, I should think.

8652. So that many of these children have not an opportunity of obtaining any education if they go so early to work?—Not in the evening, except in the Sunday schools, and they are open to all that will come; we have sufficient room there for all the children, and a large proportion does attend the Sunday schools connected with the Church of England, the Wesleyans, and other sections of the Church; a very large proportion of them do attend.

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8653. The attendance at the day schools, I suppose, is but small?—I think that a large proportion of the children attend day schools of some kind or other until they are 9 or 10 years old; I should think seven eighths, but I am not sure about the exact number.

8654. I suppose as soon as children are capable of earning money their parents send them to work instead of sending them to school?—Yes, with but few exceptions; there are a few tributors who get on very well, and some few tut-workmen, men of power of mind and of body, who can get a little more money than the ordinary run of miners, and then they can support their families better; such as those send their children to the British School, or to the National School, until they are 12 or 13 years old—a few of them; at the age of 10 or 11 they generally leave the school.

8655. At the Dolcoath mine, what is the depth of the lowest shaft that you are working at?—From the surface it is just exactly 300 fathoms.

8656. What means are employed at that mine to enable the miners to ascend and descend?—We have a man-engine to send down the men by and pull them up again, down to 220 fathoms out of the 300.

8657. Is it a single or a double man-engine?—Single.

8658. Have you ever seen a double man-engine at work?—Yes; I have gone down into a mine, the Tresanvean mine, when it was working, (it is shut up now) with a double engine.

8659. Which of the two do you prefer?—I much prefer the single one as being safer.

8660. By the double man-engine can more men be sent down?—Yes; but not in proportion, not double as many in the same time.

8661. Is that the only mine of which you have charge in which a man-engine is employed?—No; there is a man-engine at work at Cook's Kitchen.

8662. How deep does that man-engine go down?—The man-engine there goes 190 fathoms down from the surface.

8663. What is the greatest depth of the mine?—It is 260 fathoms down to the deepest point there; but a few men only are working there now. At Dolcoath only a few are working down at the deepest point; a large number have to climb ladders for 30 or 40 or 50 fathoms, but not many for 80 fathoms; for 60 fathoms a considerable number.

8664. That is before they reach the level to which the man-engine descends?—Yes, that is true as to Cook's Kitchen as well as Dolcoath.

8665. Is the man-engine employed at Cook's Kitchen also a single one?—Yes.

8666. Will you be good enough to state to the Commissioners the depths of the other four mines?—I think that Stray Park was the next that I mentioned, and that is 250 fathoms from the surface.

8667. What is the greatest depth at West Wheal Seton?—160 fathoms from the surface.

8668. And at West Wheal Frances?—85 fathoms from the surface.

8669. And at Calvadnack?—80 fathoms from the surface.

8670. In the last-mentioned mines do the men ascend and descend by ladders?—Yes.

8671. Would it not be an advantage to have the same means of ascent and descent in these mines as in the others?—A very great advantage for Stray Park mines; not so great for West Wheal Seton, for the ladders are laid in on an angle of about 50 degrees from the horizontal, and it is not hard work to get up the ladders there.

8672. Do they follow the course of the lode?—Yes, nearly all the way—perpendicular shaft 20 or 30 fathoms from the surface—on the line of the lode, from thence to the bottom; it is not hard work there, but at Stray Park a man-engine would be very desirable.

8673. Did you ever recommend to the adventurers that a man-engine should be employed at Stray Park?—We have not got convenience for it; we are looking forward to making a communication from Stray Park mine to Dolcoath mine; both mines belong to Mr. Basset, who is lord, but the same adventurers in the one mine are not the adventurers in the other; I having the management of the two, we have our eye upon making a communication, and then to come to an arrangement, if we can, to pay from Stray Park to Dolcoath for sending the men up and down.

8674. What would be the extreme distance from the farthest level at Stray Park to the man-engine at Dolcoath?—250 fathoms.

8675. Would the men rather walk that distance than go up the ladders?—Yes; some of our men in Dolcoath walk as far as that.

8676. But would they all prefer that to climbing up by the ladders?—Very much.

8677. How long does it take to come up from the lowest level at Dolcoath?—Half-an-hour in the man-engine, that is the limit of the time; sometimes they draw them up in 25 minutes; but I have given an order that they should never drive the engine so fast as to get the men up from the 220 fathoms in less than half-an-hour.

8678. How many men do you suppose go down into the mine at one change of cores?—We can take in 110 men to go down, and 110 men to come up; that can be done in one hour; there are not so many always at hand; that is the largest number we can take. 50 or 60 an hour can be taken down and brought up very easy; that is done often.

8679. Do you use a skip or a kibble in the mines?—At West Seton and Stray Park a skip is used; at all the other mines a kibble.

8680. Do the men ever try to come up in the skip at West Seton?—We never allow it to be done, and they do not aim at it, for the ladders there are so easy to get up.

8681. Is there any reason for using a kibble and not a skip in the other mines?—It is principally because of the time that would be required to remove things in a mine 300 fathoms in depth, and to change the mode of drawing would be attended with considerable interruption to our workings, for a mine of that depth. I know the prevailing opinion of the mine agents generally throughout the country; but I think we can show now from our books that we draw in Dolcoath mine, with common kibbles, birch plank, and taper chains, beginning with three quarters of an inch, and coming down to half an inch, as cheap, if not cheaper than in any mine in the county at the same depth.

8682. Would it affect the returns to the adventurers and therefore affect the value of the shares?—Yes.

8683. If you found it advantageous to substitute a skip for kibble, how would that at all put out or derange the work in the mine?—I do not think we could do it in one of our shafts in Dolcoath at all, in less than six months, to make it large enough to take two skips; and to attempt to draw with one would be fatal nearly. The cost would be so great in drawing with a single skip, without any balance against it in going down; it would be much more costly than drawing with kibbles.

8684. You are of opinion that in order to use skips with advantage, it would be necessary to have a double apparatus?—Yes, for all deep mines.

8685. Therefore the shaft would have to be enlarged for that purpose?—Yes, it would be so with us with our old shafts that were sunk a long time ago.

8686. Therefore, although it might be an advantage ultimately to the mine, yet, as it would stop the returns from the mine for six months, the value of the shares would be depreciated?—Yes; and the adventurers could not have their usual dividends. For myself, I do not hesitate to say that if the adventurers were to say to me in the Dolcoath mine "Throw out the kibbles and put in skips if you like," I should say, "No; I will keep on the kibbles still." We have our shafts now in such excellent order, with birch plank, that the kibble will run over it like over a bottle, with scarcely any friction at all; and the kibbles never touch one another. That was one object in having the skips, that they should not come in con-

tact one with another, and our kibbles do not come in contact one with another. We draw now in Dolcoath mine 12 cwt. in a kibble, and that is the weight which they draw in other mines with a skip. We have a chain such as I have described before.

8687. Suppose you had a shaft of sufficient dimensions to enable you at once, without any expense as to the shaft, to use a double skip, would you then adopt it?—For a deep mine I would not. I would have a kibble for a deep mine.

8688. If you were sinking a new shaft in a deep mine, would you sink it so that you could apply a skip to it?—That would depend upon the underlie of it; with a quick underlie I would certainly. At West Wheal Seton, we had a skip road put in there under my directions, and that I would do again where the shaft is going out, with an underlie of three feet or three feet and a half in a fathom; but with an underlie of only two feet in a fathom, or a perpendicular shaft, my mind would hang nearly in the balance, and I would as soon have a kibble as a skip with a perpendicular shaft, or with a shaft with an underlie of not more than two feet in a fathom.

8689. With an underlying shaft you would prefer a skip to a kibble?—Yes.

8690. Do you keep any account of the cost of keeping the shaft in repair where you use the kibbles?—Yes; it is all put down; it is booked every day that a man is engaged in the shaft, separate from every other cost, and then at the end of the year I had frequently taken out all the cost of the chain and the kibbles, the oil and the enginemen's labour for the year, and then we had, in Dolcoath especially, the means of ascertaining the quantity drawn to the surface quite as full and distinctly as in any other mine in the county, because we have all the tin stoped by the ton, and we pay nearly all the tut workmen in driving ends and sinking winzes, partly by the ton. Then, from that we can ascertain very nearly the actual quantity drawn, and the last account that was made out for the year 1861 showed that the whole of the cost, except filling and landing, which must be done under all circumstances was 1*s.* 2*d.* a ton for drawing from an average depth of 280 fathoms; that included the consumption of coal, oil, enginemen's labour, chain, kibbles, and repairs of shafts. I doubt whether there is any stuff drawn in the county so cheap under any circumstances.

8691. In Stray Park I think you said you use a skip?—Yes.

8692. Do you keep a similar account there?—No, not so correctly. I cannot speak to the cost there. I have taken the cost in West Wheal Seton as nearly as it could be got, and I find there for the depth that it costs rather more to draw by a skip than it does in Dolcoath by the kibble.

8693. Which of those mines should you say was the hottest?—Dolcoath is the hottest.

8694. Do you employ any artificial means otherwise than by winzes and shafts to ventilate Dolcoath?—At present we do not; we have occasionally done so. We had six months ago a fall of water of 10 fathoms deep, which was forced in through air pipes for a short period until there was a communication made. Now we have no artificial means.

8695. Do you think that the winzes and cross cuts and shafts are sufficient to ensure sufficient ventilation?—Fair ventilation of that kind, so that there is no difficulty in burning a candle at all; every candle in every part of the mine will burn perfectly upright without any difficulty. If we found it required that the candle should be turned aside to burn freely, we should at once devise some artificial means to convey air for the men to work in.

8696. The candle is the only means that you have of judging of the state of the air?—Yes.

8697. Do the men never complain of the state of the air before the candle will not burn freely?—I never heard of it in a single instance that I remember.

8698. In any of the other mines have you had to employ artificial means to supply air?—Yes; in West Wheal Seton now means of that kind are occasionally used We have had a fan to force in air, and a kind of plunger to force air in with. When we have a long way to drive it; it is occasionally worked by the steam-engine; it is a simple apparatus—a box swimming with water, where there is no friction at all, and that is a very efficient mode of sending in the air; it is a box turned upside down in another, or a cistern turned upside down.

8699. (*Mr. Holland.*) Are you speaking of a duck-engine?—Yes.

8700. (*Chairman.*) At this moment have you any of these cisterns at work at West Seton, or at any other mine?—At West Seton now we have nothing but a fall of water for two rather long levels, and that is most efficient when we can have it; there is nothing equal to that.

8701. That is in two levels that are at work now?—Yes.

8702. Which are those levels?—The 82 and the 90.

8703. Can you inform the Commission what quantity of water is sent down or what quantity of air is supplied?—Perhaps 20 gallons a minute; I think so.

8704. Have you ever tested the quantity of air that is supplied?—Only by putting a candle to it. I do not know the quantity.

8705. When they have felt an end to be close you have introduced a waterfall, and then they found the closeness to be completely remedied?—Yes.

8706. Have you ever tried a soller in any of your mines?—Yes; formerly we did that more than we do now. We do not drive in any mines that I am connected with very long levels without making a communication. We never do that now.

8707. What is the furthest distance from any winze or shaft to which you now drive?—Seldom more than 30 fathoms, or from that to 40 fathoms.

8708. In your opinion is a soller a sufficient mode of ventilating a level?—It is very useful when you have a strong draught coming through the level, putting in a soller there, and then throwing all the air under the soller.

8709. May not a soller be in a level without supplying sufficient air to the end?—Yes; it depends upon the quantity of air that you have passing through the level. You can, of course, only take up the quantity that is coming through the level; if there is but a slight draught coming along it would not be very efficient to force it into a long level; sometimes we have a very strong current, and then to take hold of that, the air then that will go in under the soller is very effective.

8710. Would you recommend that the soller should be on the bottom or at the top of the level?—Generally they are in the bottom. Sometimes I have seen them on the top, but if it is to force in a strong draught, I would have it under rather than over. When it is getting into a warm end then the air will be very much rarefied, and then it will pass over the soller going back again.

8711. It is possible that a captain, when a soller has been put in, may believe that the end is sufficiently ventilated when it is really not so?—It could not convey any more than is passing; there is always a check upon that; you never can convey the full quantity of air passing through a level; and before we think of putting up an air-door, we may by the candle or by our own sensations ascertain the strength of the air coming along, and if there is not much we never think of putting in a door.

8712. Have you tried the current of air by the anemometer?—No.

8713. Do you think the fan is an efficient mode of ventilating a level?—It will do for short distances. I should prefer a plunger or one of those simple little machines that I have described for forcing the air through a very long level.

8714. You think that the machine you have described for supplying air is preferable to the fan

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machine?—Yes, for long levels especially; it requires less labour to work it, I think.

8715. And it can be worked by any machinery you like to attach to it?—Yes.

8716. (*Mr. Holland.*) Is it cheaper for the same quantity of air?—I think it is.

8717. Is it cheaper to make?—It would cost about as much as a fan would.

8718. For the same quantity of air?—Yes, I suppose so; but this one to which I have referred has been in use for the last 30 or 40 years in different parts of the county. I prefer it to any other mechanical contrivance next to a fall of water.

8719. Is that the machine called Taylor's duck-engine?—No.

8720. (*Chairman.*) In any of these mines with which you are connected, what is the longest time that the smoke takes to clear away from a close end after blasting?—It is a considerable time before the whole of it would be driven off or moved off; but, generally speaking, with very few exceptions, in the mines I am connected with, the smoke would move off, or would be so far passed away as to enable the men to work with a little inconvenience, perhaps, in ten minutes; sometimes they may have to wait for a quarter of an hour before they could go to work again comfortably, not longer than five minutes in some places, and in some other places not more than two minutes; we do not let the men go into an end, if we can avoid it, until the smoke is partly passed away, but they will rush in, and we always think there is some risk connected with their going in soon after the blasting of the gunpowder.

8721. Have you in any of these mines any end in which the air is poor?—Not now in any one of the ends in any one of the mines of which I have the management; there is not one end but where the candle will burn perpendicularly and freely.

8722. I suppose if it is reported to you that the candle will not burn, you take means to remedy the bad state of the air?—Yes; whenever we find that by going there ourselves, if the men do not complain, we always order something to be applied.

8723. Have you any men who are specially employed to look after all the machinery in a mine, the ladders and so forth?—Yes, we have one who is specially employed to take care of the man-engine; he is paid 1*l.* a month for that in addition to his other duties.

8724. Is it his duty to see that all the ladder-ways and all the openings over the winzes leading from the levels are properly covered up?—The timbermen have always that to do as part of their work.

8725. Is there a bargain made with those timbermen?—No, they are all paid alike.

8726. Is it not the business of anyone in particular to report upon those matters specially?—It is the business of the timber-men to go at once and repair anything that is faulty without asking for liberty; that is part of their duty. When they find a stave gone out of a ladder or a board gone out of a platform it is their duty at once to go and mend it without naming it all.

8727. Is there no one to report to you that all that is properly done?—No; we see it ourselves, as we go through the mine. It ought to be, perhaps, in connection with this matter, stated that the captains go through every part of the mine, and if they see anything out of order they would call upon the man in charge, and order him at once to put in a stave, or put in a board that was wanting.

8728. How many sub-agents or captains underground have you at Dolcoath?—There are two who are called underground agents; my son is assistant to me as manager.

8729. At Cook's Kitchen how many sub-agents or captains are there underground?—There are two underground captains. I am the manager alone there.

8730. How many underground captains are there at the other mines?—At West Seton there are two underground captains; I am the manager. At Stray Park there are two, at West Frances there is one, and at Calvadnack there are two. My son assists in the management of the three last-named mines.

8731. With the agency that you have employed in these mines how frequently are the underground workings inspected?—Some of the scattered pitches perhaps only once a week; all the principal parts of the mine are inspected twice a week, but a couple of men may take a pitch in some distant part of the mine, and if that is seen once a fortnight that is as much as we think necessary.

8732. How often are the tutwork bargains looked to?—Three times a week we consider sufficient for our hard-ground mines. In soft ground we should see them oftener, but in hard ground the change that would be effected by a pair of men working for two days is just nothing.

8733. Do your underground captains go underground at night?—Very seldom indeed; not in deep mines, excepting in cases of an extraordinary nature.

8734. So that you trust to the men who are at work—the tutwork men, the tributors, and the timber men—to comply with the rules laid down for their observance?—Yes.

8735. Is all the work let on contract?—Yes, all in Dolcoath mine for one month, or for two months. I should say that we never set a single bargain in the course of a month we set out all the stopes in the mine at so much per ton for what is fit to stamp when it is brought to the surface; they are a kind of tributors, and they depend quite upon their own resources; if they break down deads instead of tin they get nothing for it; they are confined to breaking tin stuff, that will pay for stamping when it is brought to the surface.

8736. I suppose you drive your levels six or seven feet high?—They are eight feet by six; all at Dolcoath.

8737. Do they take care that there is no accumulation of refuse or deads allowed to remain in the levels?—Yes; in all the working levels we take care of that; after they are gone out of working for a time there may be accumulation.

8738. Are the tributors and the tutwork men bound to see that those levels are cleared out, or how is that done?—They are under an obligation to do so; sometimes we are obliged to say to a pair of tributors, "Here is this stuff lying about here, and you must remove it before we come again."

8739. They are bound to do so themselves, are they?—Yes, they are bound to do so by their contract.

8740. Have any accidents occurred within the last three years at Dolcoath?—Yes.

8741. Of what description have they been; accidents by blasting?—I do not remember for the last two years an accident by blasting in Dolcoath of any serious character. In Cook's Kitchen we have had no accident the past four years by blasting.

8742. Will you be kind enough to furnish the Commission with a report of the accidents that have occurred in the last three years in those mines?—Yes.

8743. Have any accidents occurred from the men falling away from the ladders?—That is a very rare occurrence. I do not remember one for a long time in any of the mines.

8744. Do you take any special precautions against accidents arising from blasting by employing any particular kind of tamping rod or cartridge?—We do not use cartridges much; never, excepting when we have wet ground and water to deal with.

8745. Is the tamping rod that you allow to be used of a particular kind?—We use a safety fuze and an iron rod.

8746. You do not use any wooden rod?—Yes, to pack in the powder, always.

8747. Is each man supplied with an oaken rod to put in the powder with?—He may have it by going to the carpenter's shop for it; they do not have them prepared for them, but every man may have it, and

every man has what is called a swabbing stick; the lower end of that is roughed up a little to clean out the hole before they put in the powder; the upper end ought always to be kept in condition to pack down the powder with.

8748. Is any penalty imposed upon the miners for not using it?—No; but we charge them, because at Calvadnack mine, six months ago only, some of the men persisted in packing in the powder with an iron bar instead of using a wooden rod; they were warned of it, but they still persisted in it, until at last two of them were very seriously wounded in the very act of packing in the powder; before they had tamped it at all the powder exploded and burned them very severely.

8749. Is it not desirable to use a tamping rod which would not produce sparks by striking against the rock?—I do not remember a single instance in which the premature blasting of a hole since we have had the safety fuze has been occasioned by striking fire against the side of the hole.

8750. How have the accidents occurred?—Either by putting in the powder first of all with an iron rod, or the first or second tamping perhaps, when they have not packed down the powder sufficiently with the wooden rod; when they first come to put in the first tamping, and that first tamping is forced in upon the powder it may explode sometimes by undue pressure, that is what we have thought sometimes.

8751. Your impression is, that explosions sometimes take place by the mere compression of the air?—Yes, that might have been lodged in with the powder before; that opinion prevails rather extensively amongst miners.

8752. Is that your own opinion?—I am inclined to it, although I have not a decided opinion about it. It would be equally dangerous whatever might be the material of the tamping rod. Then there is another thing, the cutting of the fuze, which occasionally takes place; the kind of tamping that is used is a matter of great importance for safety. If very hard tamping is used then that hard tamping may cut the fuze, and then of course the powder in the fuze would be reached, and then an explosion might take place.

8753. What would ignite the fuze in that case?—If there was hard tamping, hard fiery stone, that in being driven with an iron bar, if at the same time it would cut the fuze, would scratch the side of the hole too; it might be done in that way.

8754. But would the hard tamping coming against the side of a hole create a spark?—If the hole is very hard, and the tamping was of a similar character, it might possibly do so.

8755. Even although it were driven in with a wooden rod?—It would not then depend upon the nature of the rod at all, if that were so.

8756. Do you give out any particular kind of candles for the use of the men in the mine?—We have two sorts. Some come from London, Palmer's candles, which are stiffer for working in a warm atmosphere—they stand stiffer, and they do not run as the common tallow candles do.

8757. Palmer's candles are better in a warm place?—Yes.

8758. What is the difference between the wholesale price of the common candles and Palmer's candles?—Just nothing; one price.

8759. Do the men pay the same price for both?—Yes; they are at liberty to choose which they will have; we keep both sorts in the mines, and they may take either Palmer's or the others. All the men working in open places will take the others, but a few of the men who are working in rather warm places prefer occasionally to take some of Palmer's.

8760. Does the heat of the weather affect Palmer's candles so that they stick together?—We find them so occasionally, but we think that there has been an imperfection in the manufacture then; we rather think that they may have been put together before they were properly cooled.

8760*a*. Is the light given by both the same?—Yes, the same; there is very little difference.

8761. What price do the ordinary mines pay per pound for candles?—8*d*. per pound now generally.

8762. Are they limited to a certain allowance of candles?—In some mines they are; but unless we find in any of them that they are taken out in an extravagant quantity we do not limit them. We think that the price ought to be sufficient for all reasonable men. We only pay 5*s*. 6*d*. a dozen, and they pay 8*d*. a pound, so that they pay 2½*d*. a pound more than we pay, and that we consider ought to be an effectual check to taking out more than they really require. There are a few men who will break through propriety in that respect, and then we mark them down and say, "You shall only have a certain number of pounds."

8763. Do you mean that even at that high price they would sell them?—Yes, they would sell them, perhaps, to buy tobacco—some reckless men.

8764. The high price is not a complete check?—No; but it is a very effective thing for all the thinking steady men; for one in ten it is not a complete check.

8765. I suppose that the well-conducted thinking men would not dispose of the candles even if they obtained them at a smaller price?—No.

8766. It is only in the case of the ill-conducted men that this check is necessary?—Yes.

8767. Is it always effectual in their case?—Not always.

8768. The Commissioners have heard of a mine having been lighted with gas; in your opinion would it answer and be economical to use gas in a mine?—I do not think it would. I saw that mine that was so lighted—Balleswidden.

8769. Can you furnish the Commissioners with an account of the quantity of candles consumed or supplied to the men in one year in any one of your mines?—In Dolcoath mine the consumption is about 3,300 dozen a year, or rather more; I would say 3,600 dozen.

8770. And what in the other mines is the consumption?—In proportion to the number of men, about 2 lbs. for each man per week.

8771. Do you use any special kind of powder in your mines?—We use the Kennal Vale powder, and occasionally the Dartmoor powder, and some which comes from near Liskeard in some of the mines.

8772. Is there any difference in the powder that is used?—There is not much in all the powder mills I have named, but there is another kind of powder that has been brought into use recently by Mr. Davey; there is some difference in the composition, but I do not know what it is exactly.

8773. It does not produce so much smoke as the other, does it?—No.

8774. That is an advantage?—Yes.

8775. What does that powder cost?—50*s*. per cwt., 6*d*. per pound, the same price as the others.

8776. What do you charge for the powder?—8*d*. a pound generally.

8777. What do the men pay for club money?—In some mines they pay 6*d*. and in others 9*d*. a month.

8778. In Dolcoath how much do they pay?—9*d*. now; it was 6*d*. for seven years, until about a year ago, 6*d*. was not found quite sufficient to pay all the demands upon the club, and then we charged the men with 9*d*. for a time; and as soon as we have got a little accumulation, so as to be able to carry on the working of the club, we shall fall back to 6*d*. again.

8779. Did the deficiency arise in consequence of the occurrence of accidents?—Partly from that, and some widows who had been on the club for some time, some of them for 10 years.

8780. Is the club money used only for visible accidents?—They have no legal claim according to rule, except there is a visible wound.

8781. In the case of the widows to whom you have just referred, did they become widows in consequence of their husbands losing their lives by accidents?—Some of them only. Others had died after a very long

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service in the mine, worn out, they had been working in the mine for perhaps 20 or 30 years, and in those cases the widow receives some allowance for a year or two; we have had one for seven or eight years receiving three shillings a month.

8782. Is there a correct account kept of every club fund?—Yes, always.

8783. Do you consider the club money to belong to the adventurers or to the men?—There is a difference of opinion about that. I believe that the adventurers generally claim it as their own if a mine is shut up.

8784. Do you know of any case in which, where a mine has been shut up, the club money bas been applied as part of the assets of the mine?—There was a little mine, and at the close of it there was about 30*l.* in hand. I had the management of it; there were two or three persons on the club, and we made a present to them of something considerable; I do not remember what, but we thought it just sufficient to meet their case if they had continued to work in the mine. After that there was still a balance left of, perhaps, 25*l.*, and I said to the adventurers, "I do not consider "that you have a positive claim upon this, and the "way in which I intend to appropriate it is this:—I "will not charge any wages for myself, nor for the "agents on the mine, for closing up and selling the "materials, and winding up all the accounts, and un- "less you say that I shall not do it, I shall take this "money and pay myself, and pay my agents out of "club money instead of handing it over to you. I do "not consider that you have a positive right to it." That is now 10 years ago, and since that time the sentiment has turned round in favour of the adventurers, and they say that it is their money now; but that did not exist then, and if I were in the same circumstances now it is not likely that they would let me take that course.

8785. Has any case occurred lately that has been referred to arbitration in which there was a considerable amount of club money?—There was something about the Camborne Vean mine. I do not recollect the circumstances, but I think that that was referred to arbitration.

8786. Is it understood that this money belongs to the adventurers, and that they can apply it for the purpose of affording relief to widows, departing from any strict rule as to its being applicable only to accidents?—They let us do so in the mines that I am connected with; they do not interfere about it; they never interfere. They do not ask what you do with the club money in any mine that I am connected with. We always show the account; that is thrown as much open to the auditors as any of the accounts in the mine. We show an account of every penny received, and every penny paid, where it is gone to. Every name is down in every mine that I am connected with.

8787. In the Dolcoath mine, where you had to raise the contribution of the men from 6*d.* to 9*d.*, had the men no account shown to them to explain why you were obliged to do so?—No.

8788. Do you charge the men so much for the barber?—Yes; 3*d.* a man, and I would strike that off if I could. I tried to do it seven years ago, but I did not succeed.

8789. How much do the men contribute to the doctor?—6*d.*

8790. How are the doctors appointed?—They are appointed by the adventurers always. The men have no voice in that.

8791. Is it your opinion that it would be advantageous if the men had a voice in that matter?—No, I do not think so. There would be such a variety of opinions if the matter were put to the majority. The doctors would be running about to the men, and asking them to vote for them and so on.

8792. They do that with regard to the adventurers; they canvass them, do they not?—Yes; but they are not likely to influence the adventurers so much as some of the men.

8793. Do not the medical men take shares in a mine in order to get elected doctor?—Yes, very often.

8794. Are they ever nominated by the lord now?—I have not heard of any instance of that kind in any mine that I am connected with.

8795. Have you any rules as to the time when the boilers should be cleaned out?—It is left with the engineers generally. If they say that a boiler ought to be cleaned out, it is always attended to. There is an engineer in charge of all the machinery in every mine.

8796. How does he ascertain when it becomes necessary to clean out the boilers?—The flues are outside the boilers, where all the fire is passing along, and it can be ascertained from the draught. If it is choked, then it is time to clean it out; but in the mines here there is but very little sediment in the boilers.

8797. Have they any means of testing a boiler, whether it is quite safe, or whether the plates have become weaker from any corrosion having taken place?—No; unless by stopping it.

8798. Have you heard of boiler explosions in the county?—Yes; and those we believe to have occurred universally, or with scarcely an exception, on account of the boilers not being kept full enough of water. When the tube has been covered with water we have never heard of an explosion.

8799. How can it be ascertained that it is so?—They have cocks at the level of the tube.

8800. Is it to be ascertained only by that means?—There is no other test than that here. We formerly had a buoy with an iron spill working through a collar, so as to show the depth of water in the boiler.

8801. Have you ever seen a glass tube used for testing the boilers?—We have not got them in any of our mines.

8802. Then everything seems to depend upon the man who is in charge of the boilers, and whether he tests properly the quantity of water in them?—Yes, that is all.

8803. Are the men who have charge of the boilers experienced engineers, or are they sometimes men whom you have been obliged to put to work at grass?—They have scarcely any of them been trained to become engineers. They are men who have been employed in other departments of the mine who have been chosen—men in perfect health and strength, to go to work at the engines. Sometimes their health will fail a little. We have some cases of that kind in Dolcoath mine in working small engines. They are not very strong, but they are perfectly able to work those small machines.

8804. Are there two safety valves to your boilers?—There is one generally speaking to each boiler.

8805. Do you not as manager receive any report as to the time when the boilers are cleaned out?—No; there is no regular order.

8806. In paying the miners what proportion do you pay to them in notes, and what in gold?—In Dolcoath mine, which may be taken as a guide for all the other mines, the money paid away is about 3,000*l.* a month for labour, and we pay 1,000*l.* in notes and the other 2,000*l.* in gold and silver; about 200*l.* in silver, and the other 1,800*l.* in gold.

8807. Do you think that that affords a man an excuse for going to a public-house to get a note changed?—He may make it an excuse, but there is no necessity for it. There may be 5*l.* paid in a bill, and one might have to receive 15*s.*, another 18*s.*, another 17*s.*, and another 16*s.*, or one will have to take a sovereign and another half a sovereign perhaps.

8808. Then must he not go to a public-house, or to some shop to get it changed?—Yes, to a shop they go on taking up a month's meat before they have money to pay for it. They get into debt for a month, and then they go to a shop to pay for it; a large portion do this.

8809. They are always a month in arrear, are they not, in receiving their pay from the mine?—Yes, always in all the Cornish mines.

8810. For example, a miner who goes to work at first in a mine, having left another mine, receives no

pay for two months?—He has no claim to any; but at the end of the first month he always, without exception, asks for what is called subsist, and we always grant him perhaps one-third of a month's wages, but that has to be carried over the next three months before he clears it all up, for tribute or tut work either. If a man comes to work, at first he would have to wait, according to the rule, two months; but at the end of the first month universally he is treated as I have described in every mine that I am connected with, or that I have a sufficient knowledge of to give an opinion about.

8811. Do you usually give subsist to all the men?—Not to those miners who take on for one month; but if they take for two months then we give them subsist at the end of the first month, closing up the account at the end of the second month.

8812. What amount of subsist do you generally give them?—If a tutwork man takes a bargain for two months, at the end of the first month he would receive 3*l.* for subsist, as we hope that he will get 3*l.* or more; we give him half the money, or 3*l.* at the end of the first month, and at the end of the second month he has to close up his accounts and receive the balance, whether it be 2*l.* 3*l.* or 4*l.*

8813. How much do you give to the tributors?—2*l.*

8814. Is it the general rule throughout Cornwall to grant them that amount of subsist?—I think it is very generally given, the 2*l.*; very few tutwork men will take for two months; except in West Seton, and in Dolcoath and Cook's Kitchen I do not know any. We set the stopes, instead of by the fathom by the ton; at West Seton too, in copper ore, as well as in Dolcoath; we think that that is the simplest way.

8815. In other mines it is set to the tutwork men by the fathom?—Yes, and for one month only generally.

8816. Then they would not receive pay for two months; they would always be two months in arrear?—One month in arrear.

8817. I mean that they would have to wait for two months before they got anything?—Yes, except as a favour.

8818. In those cases, is it your belief that they give for subsist more than 1*l.* a month to the tutwork men?—I do not know; we give 2*l.* to the tributors, and 3*l.* to the tutwork men, but no subsist at all for a month except a man asks for it as a favour, and then we do.

8819. Suppose a man does not receive any pay for two months, he must necessarily begin by getting into debt?—Yes.

8820. What provision do you make for the women who are working on the surface, to enable them to get their dinners?—We have at the Dolcoath mine four establishments with a large oven in each of them, large enough to contain 200 pasties or hoggins. Then we have benches around a long room where they can sit down, and hot water is always prepared by the dinner time. As soon as the bell rings they rush in to get their dinners; and so many of them as like to do so join together, half a dozen perhaps purchase a tin kettle, and every one brings a cup, or as many as like to do so, and if they join together they get a little tea with the water.

8821. It is very desirable, is it not, that the women and children should work under cover, and have a separate place to take their meals in?—Yes; it is an advantage to the mine as well as to the people.

8822. And that the men should also have a place near the footway to change their clothes in?—Yes, it is a great advantage. At Cook's Kitchen it is exactly the same, and at West Seton. We have 800 persons working at the surface at Dolcoath Mine, and 300 at Cook's Kitchen, and 300 at West Seton; and one advantage is, after the dinner hour is closed, upon the ringing of the bell, the captain is there to see that every one is out to their work again in a minute, and but for such an establishment as that they would be scattered all over the mine in a great variety of places, and it would take a quarter of an hour to get them to their work again.

8823. (*Mr. Holland.*) You stated just now that you thought it better that the doctors should be appointed by the adventurers rather than by the miners?—Yes, I said that I preferred it.

8824. If there is more than one doctor appointed to a mine, the men have a choice, have they not?—Not always, sometimes they have. They would have a power in this case; suppose there were two doctors, if the men preferred having the one to the other, they would be at liberty to go to that one; but there is a private arrangement between the doctors themselves in Dolcoath, one would have one week and another another week; they say between themselves, "You attend to the men this week, and I will attend to them next week;" but if there is one man for one week and they prefer to have the attendance of the other, he would at once go.

8825. If the adventurers appointed two doctors would not the men in that case have an opportunity of making a choice?—Yes.

8826. You stated just now that you were anxious that the men should not go into the ends before the powder smoke was cleared away, do you think that that is injurious to them?—Yes, very injurious; when it is very hot after a place has been blasted, there may be some carbonic acid then let loose, and that would settle down in a few minutes in the bottom of the level from being heavier than the common air; that is our notion about it.

8827. You consider that it is very injurious to go into an end shortly after a shot has been fired?—Yes, I find that it brings on cough; if I have gone in I have found that it disturbs my regular breathing.

8828. You think that that is a well established fact?—Yes, very well established; Mr. Davey especially told me, "I wish you would give the men "warning not to go into any of the ends very soon "after blasting."

8829. Is the heat from the powder smoke after an explosion so great as, in your opinion, to injure the lungs?—It is never so hot as that, I think.

8830. I believe it is your opinion that the miners as a body are more healthy than they were 20 years ago?—Yes.

8831. Why do you believe so?—I do not see so many of them going about in consumption as I used to do; we do not find them on our club books; they decline, but not with consumption.

8832. What becomes of the old men?—A great many of them are now engaged in this parish as small shopkeepers and small farmers. I do not know exactly the number, but I think there are 70 or 80 in this parish who are so engaged. When they reach the age of 40, if they have accumulated a little capital, a few score pounds, they will sometimes go and keep a little grocer's shop, and then perhaps advance to something a little higher; there are here now, I think, 30 owners of houses who were once miners.

8833. If they died now they would be registered as shopkeepers, would they not?—Yes.

8834. You are sure that that is the fact?—Yes, I am sure as to a great number; I cannot speak to the exact number.

8835. I find that out of 481 men, tributors, tutworkmen, and pitmen, there are only 40 above 45 years of age now at work?—I do not remember the exact number; but we have a larger number of young people in Dolcoath mine now than in any other mine that I am acquainted with. The number has doubled during the last ten years. We have taken them from our dressing floors, and brought them up for miners; for three or four years we could not get men to work in all the places, and we got them in as boys to work with two men, and trained them in that way. We have a larger number of young men in Dolcoath mine on that account than in any other that I am acquainted with; the old men, or those who were comparatively old, emigrated; as they had not moved away from the other mines to come to our mines, they had remained where they were, but these young men are very steady and there have been a great number brought

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in from the dressing floors, lads of 15 or 16 years of age, and they fill up the mine.

8836. At what age do the men emigrate, chiefly?—From the age of 25 to 35, I should think, more especially.

8837. Are there not many more at the age of 25 than at the age of 35, or more before 35 than afterwards?—Some young men go away.

8838. Is it not much more easy for a man to emigrate who has a small family than for one who has a large family?—Yes, I think it is. Men with large families do not generally like to leave, but a man with a wife and one child goes away very often, and that would be from the age of 25, but, generally speaking, it is from the age of 35 to 45; men of energy and mind and physical power, they will move off to wherever they think they can do better.

8839. If the healthier men go away the less healthy stay behind?—Then the result would be shown at once; then we should have a larger number of deaths than we should have had if they had all remained at home; a greater number would die yearly, and on the whole the average length of life would then be less than if those strong ones had remained at home.

8840. Do not you consider that the fact of so small a proportion as eight and a half per cent. being at work above the age of 40 is an indication that the occupation is very unhealthy?—It is not so healthy as farm labour, but it is as healthy as labour in the manufacturing districts is, generally, as far as I know; it is unhealthy to a certain extent, and tends to shorten life.

8841. Why do you think it tends to shorten life?—I attribute it partly to the air being not so pure as it is at the surface; it cannot be so in all departments of the mine. I do not know of any mines that get it so. I should rather be inclined to think that the climbing of the ladders by the young men so very quickly as they do may tend to bring on chest complaints; sometimes they will run to the ladders, and endeavour to outvie one another, and very often we check them as much as we can, but I was like that myself when I was a boy.

8842. Is not the great heat of the mines very injurious to those who work in them?—I can show you what the temperature is in Dolcoath and in West Seton.

8843. Do not the men come up from below very hot?—They do not come up from below very hot now, ascending as they do by the man-engine; when they come to the surface they are not hot at all, when they come up to the surface they can breathe freely, without being heated at all. This is a section of the principal workings in Dolcoath mines (*handing in and explaining the same*).

8844. Is that (*pointing to the section*) an upcast or a downcast shaft?—The air generally comes down the eastern part of the mine, and goes up in all the western shafts.

8845. How is it in the engine shaft, is it up or down?—I do not think there is any regular order, it is generally up here (*pointing to the section*).

8846. Do you not think that it would be a great protection against catching cold if the men could bathe themselves, instead of simply washing when they come up; for example, suppose there was a tank in which they could bathe?—I do not know I am sure whether they would like it when there was 100 of them together; perhaps they would not like to strip naked, they take off their shirts; they bathe in warm water down as far as this (*pointing to the middle of the body*), which Dr. Peacock said was an excellent practice in warm weather, and they rub themselves with towels. The men do not come up very hot as I have stated before.

8847. (*Mr. St. Aubyn.*) You stated just now that you think the miners, as a class, live longer than they did in former times?—Yes.

8848. To what do you ascribe their improved health and longevity?—Better ventilation generally, and from better provision being made for the men to change their clothes before going underground, and after they come up. There are warm places provided for them in which they can dry their clothes.

8849. In the different mines of which you have the management have you observed that the men enjoy better health in some mines than in others?—I do not know of any marked difference in the mines of which I have the management.

8850. Is a man-engine employed in any of the mines that you manage?—Yes, in two of the mines.

8851. Have you observed no difference on that account in the health of the men?—In the deepest mines; but the others are comparatively shallow.

8852. Therefore the benefit would be neutralized?—Yes.

8853. You have stated that the cause of the miners living longer is that the ventilation is better; is it, in your opinion, as good now as it could possibly be made?—I do not say that; it can be improved no doubt.

8854. What, in a few words, should you say was the best means of improving the ventilation, so as to make it as good as it could possibly be under present circumstances?—Where they have got a sufficient number of shafts, the best thing I think is a fall of water, when you can have it, and the next best thing is that instrument which I have partially described for forcing air in.

8855. To which there is a cistern?—Yes, but it must be always fixed in good air; great care must be taken about that, or else bad air will be blown into the men after all.

8856. In fact it must be properly managed?—Yes.

8857. Are you of opinion where it can be introduced and properly managed that a man-engine would always be one means of improving the health of the miners?—No doubt of it. When a mine gets deeper than 100 fathoms I should recommend, where it was at all possible or convenient, the setting up of a man-engine; there are some mines, where the inconvenience would be very great, for they would have to sink a new shaft. I should not advise the adventurers under such circumstances to go to the expense; it would depend upon the stability of the mine, as far as that could be judged of, and a great number of circumstances must be taken into account. To lay down a universal rule that in every mine there should be a man-engine at a certain depth would be an injury to the well being of Cornish mining.

8858. You would say shortly that where it was possible to improve the ventilation in the way you have suggested, and where it was proper and convenient to introduce a man-engine, if those two things were done, as much as possible would have been done to improve the health of the miners?—That is my judgment.

8859. You have stated that you do not think that gas would be an improvement in a mine?—The difficulty of using it is very great. I saw the working of it at the Balleswidden mine; and in order to see whether it could be introduced into our mines here, some company from London applied to me for an opinion, and I had a long conversation with them upon the subject; but after I had seen it working at Balleswidden, I thought that the difficulties altogether would surmount the advantages to be derived from it; you want a constant light with you, and when a light is stuck up in one particular spot, perhaps a man would want to have it removed six feet away, and in a very short time he could not do that, whereas he can pitch up his candle from one place to another in a moment; and then when they blast their holes I found that they have to remove the pipes before they could be prepared to blast their holes at all; with a candle the men can run out in a moment. I consider that the convenience of a candle far outbalances the use or advantage of gas underground.

8860. Are you aware that it has been stated in evidence by the captain from the Balleswidden mine that he superintended that mine during six months

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while the gas was in operation, and the result of his experience is that if it were properly managed it would give a better light, would be more economical, and improve the health of the miners?—I do not know what his opinion is, I can only form an opinion from one day's visit.

8861. Have you never had a mine under your charge in which gas was used?—No.

8862. (*Mr. Kendall.*) Is the return which I have before me an accurate return of all the men and boys employed underground in the Dolcoath mine?—Yes, if that is the list I have sent in.

8863. Notwithstanding that this is an accurate return, is it not the fact that you cannot draw a correct inference with regard to the shortness of the miner's life as compared with that of the agriculturist, for these two reasons; first, that miners when they have made a little money very frequently become shopkeepers or small farmers?—Yes.

8864. And next that the miners emigrate a good deal?—Yes.

8865. So that it is impossible from these tables to compare fairly the average length of their lives with that of the agriculturists?—That is my opinion decidedly, after having examined the matter very carefully.

8866. Referring to all the mines of which you have the management, I understand from you that generally speaking the ventilation is good in them?—Yes.

8867. And where it is not good, by various contrivances, such as waterfalls, and the particular machine to which you have referred, and occasionally the fan machine, you are able, before you can have natural ventilation, to throw in a fair supply of air to the working miners?—We have the means of doing it, but it is not carried out so perfectly on all occasions as it ought to be; I acknowledge that fully; we have not perfected the means that we have now within our reach.

8868. As I understand your evidence, although much greater care is now taken of the miners, still a love of economy does sometimes so far prevail that in order to save a little money you do not set the fan machine to work so soon as you otherwise might?—It is partly that; the men say "We can work here very well;" and when we find that the candle burns very well we do not act so soon as we ought to do.

8869. If you were generally more attentive you think that you could with the appliances at your command send in quite air enough to the men, and make the mine healthy for the men to work in?—Yes.

8870. (*Mr. Davey.*) In the Dolcoath mine at what price is the ground in your ends worked out?—In the lower levels it is 25*l.* per fathom on the average.

8871. How many men have you at work in the deep ends?—Six or nine form a pare or company always we never allow one man to work alone.

8872. Supposing that the ground at Dolcoath was as easy to work as it is in the Gwennap mines, two captains would not be able to superintend the work of the mine?—No, unless they set as we do, and I think it would not be prudent to set as we do in very changeable ground; but our ground changes but very little indeed. We set out for one month or two months without any stint; the whole is set out for an end to drive or a winze to sink for a month, and in stoping as much as they can do in two months; they must drive the ends eight feet high.

8873. But a captain in easier ground would be required to visit the workings much oftener?—Yes.

8874. Have you ever known an instance in which the adventurers have paid money on account of the club when all the funds of the club had been used up?—I have heard of that, but it has not come under my own immediate observation.

8875. When your club got into debt you increased the contributions of the men?—Yes; we advanced the money from the general funds of the Company for that time; but we raised the pay from the men from 6*d.* to 9*d.*

8876. You say that you set the tin that is raised by the ton; is it by the ton of stuff or the ton of tin?—The ton of stuff.

8877. How do you ascertain the value of it?—We always, before putting it to the stamps, take samples of it.

8878. Do you ascertain the quantity of tin in a ton of stuff before you pay for it?—Yes; we simply try it in the usual way, and if it does not make one and a quarter produce, or one cwt. and a quarter of tin to 100 sacks, they have nothing for it. But then they must be on their guard that they do not blast down this poor stuff, for, if they do, they have no claim for any pay; it is a kind of tribute work—a mixture of tribute and tutwork.

8879. (*Mr. Holland.*) You have said that you thought the loss of life among the Cornish miners had been very much exaggerated, because a large number of the older miners had left their employment?—Yes.

8880. I find from tables before me that rather more than ten times as many Cornish miners die of consumption between 55 and 65 than other men of the same age?—But are they really cases of consumption?

8881. Of the disease registered as consumption, it appears that ten times as many Cornish miners die between the ages of 55 and 65 as of other men who die from the disease called consumption between the same ages. If that is true, does it not contradict your supposition?—I have no means of knowing.

8882. (*Mr. Kendall.*) How old are you?—68.

8883. Did you ever work as a miner?—Yes, for nine years. I went underground when I was 13 years old, and worked until I was 21 or 22. Then I became agent, and I have been agent ever since.

8884. Taking the average, how many fathoms do you go up and down in a week?—Not now so many as I used to do. I used to go underground four days a week to a depth of 200 fathoms upon the average, I think, for thirty years.

8885. Do you ever go under ground now?—Yes, twice a week upon the average.

8886. Do you enjoy good health?—As good as any man in England, I believe, for my age. I do not believe that there is a stronger man in England for my age.

The witness then withdrew.

Captain THOMAS RICHARDS examined.

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8887. (*Chairman.*) Of what mine or mines have you charge?—I have charge of various mines—Prosper United is the largest mine, Treloweth, Wheal Kitty, Trencrom, and several others.

8888. Are the mines of which you have charge principally copper or tin?—Some of them are purely tin, and some copper and tin.

8889. Will you be kind enough to state which is the deepest of those mines, and where the levels are deepest?—Wheal Kitty is the deepest, that is, 160 fathoms below the 30 fathom adit.

8890. Have you in any of those mines any other means for the men to go up and down than by ladders?—No; they are all ladders.

8891. Is it, in your opinion, better for the men to have ladders than to have some other means to enable them to go up and down the mines?—There is no question but what a man-engine is better for the men than climbing ladders.

8892. Would it be for the advantage of the adventurers or not to have a man-engine?—That is a matter that hinges a good deal upon the state of the mine. I think that if there is a sufficient prospect of any time, that is to say, if you could say they would go on for five or six or seven years, all deep mines would be benefited, and the adventurers too, by using a man engine.

8893. Although the time should be shorter, would

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it or not be an advantage for the adventurers, on account of the greater amount of work the men could get through from ascending and descending by a man engine?—There are so many causes that are injurious; for instance, from climbing; men are so differently constituted that some men will climb well until they become old men, and yet some of those men are done up in a week; that climbing is very objectionable there is no question.

8894. Do you think that where a man-engine is used men of greater age can go down to work in a mine than where ladders are employed?—Yes; and then you have the advantage of their experience.

8895. Is it not an advantage to have experienced men employed in mines?—Quite so; it is a kind of work that time only makes a man suitable for.

8896. Therefore any means by which you could ensure the employment of experienced men in the mines would to a certain extent be an advantage in a pecuniary point of view to the adventurers?—There is no question that men of experience are better in any places, whether underground or upon the surface.

8897. (*Mr. Holland.*) Is not that peculiarly so in mining?—I think it is so all over the world; the best men are the most valuable.

8898. Is not the experience of a man of more value as a miner than in almost in any other employment?—If a man is a smith he will fashion a piece of iron with a hammer, whilst another with a swag will not make it better work; it is quite a matter of practice; some men excel in one thing and some in another, and for breaking ground there is no doubt that the best men are the cheapest in reality.

8899. Are there any hot or close ends in the mines of which you have charge?—They stand at about 78° or 79°, that is about the hottest.

8900. Is there any difference in the length of time that a man can work in an end according to the heat of it?—As regards a man being able to work in an end, that depends upon what sort of condition he is in, and how he lives. If a man is in good condition, by practice he would be able to work longer in those hot ends than other men could.

8901. Do you mean i he has plenty of food?—Not too much food. I think that the drink does more harm very often to the men for working than the food.

8902. You do not mean that there should be any deficiency of food?—No; I think that if our men had better wages generally—of course some men are provident and some are improvident—but it is surprising as to food; we find some very good men taking very little animal food. In the Lelant Hills, high country, especially there is a great deal of gruel and vegetable food, and not much animal food. In the western district, from St. Ives to the Land's End for instance, or St. Just, they are men who do not eat much animal food; they take more gruel and vegetables, and they are strong men.

8903. Do they eat much wheaten bread?—Yes.

8904. Is it wheaten flour?—Yes, if ever so little.

8905. (*Chairman.*) Do they get milk?—Yes, very often in those country places.

8906. Are the majority of your miners tutwork men or tributors?—I should say that they are about equal or about half and half.

8907. Does that vary according to the different mines, or is it the same over all of them?—It varies in proportion; in some mines we have very much more tribute than tutwork; it depends in part upon the size of the lode, and the nature of it as well.

8908. A miner works two months, does he not, before he is paid one month's wages?—Generally.

8909. Do you always allow them subsist?—A man coming into the mine would be two months, but there are many men who are several months in a mine, so that it does not make much difference; those who shift about we do not like.

8910. Do the miners shift about much in this district?—It is quite a matter of the mine; if you let them get into debt it is a sort of lever to heave them out of the mine; and if they have the advantage of it they look out for a job somewhere else.

8911. Is there abundance of men now to be obtained, or is there any scarcity in this district?—Since the year 1847 we have had a difficulty in getting workmen; there is such a feeling for emigration that there is scarcely ever an abundance of men.

8912. Do you use any particular kind of candles in your mines?—We use all sorts of candles, but good candles are the best and most economical that can be used.

8913. Is there any particular kind of candle that you use?—The best quality we find the cheapest to use.

8914. What do you pay as the wholesale price for the best candles?—The price of candles varies with the price of tallow; we are entirely governed by that.

8215. At the present time what is the highest price that you pay?—There are different prices, but we can get a very good sort of candle for about 5*s*. 9*d*. for a dozen pounds.

8916. Are the miners limited to a certain quantity of candles?—The tutwork men are limited to 2 lbs. a week per man; the tribute men may have as many candles as they choose if they are getting wages.

8917. What do you charge them for the candles?—Sixpence and sevenpence a pound; we have no fixed rule for every mine; we charge just enough so that the miners shall not waste the candles; there is no object to make a profit upon them.

8918. What is the highest price of candles at Prosper United?—Sevenpence a pound.

8919. What do you charge the miners for powder? Sixpence a pound.

8920. That is what the miners pay you?—Yes.

8921. What is the cost price of the powder?—Fivepence halfpenny a pound.

8922. What do the miners pay for club money?—Sixpence per man per month.

8923. Is that money paid only to provide relief in case of the miners receiving hurts?—That is for the club money; we do not understand anything but club money.

8924. Is there a separate account kept of the club money?—No separate account; that is the club fund.

8925. Is there any separate account kept of the club fund?—No.

8926. Is that club money used to relieve the miners when they have sustained any visible hurt and in sickness, or is it confined to visible hurts?—It is confined to visible hurts; we do not recognise any sickness, only visible hurts.

8927. There is no separate account kept of the club money?—None at all.

8928. Is it considered that the club money belongs to the adventurers, except that a man is to be supported when he has received a visible hurt?—Yes.

8929. Supposing a mine to be stopped, would any accumulation of the club money fall into the general funds of the company?—Yes, that would be the case, but we find that the 6*d*. contributed by each man per month is fairly self-supporting.

8930. I suppose it must depend upon the number of accidents that occur?—Entirely.

8931. What allowance is made to a man who has met with an accident?—Thirty shillings per month, and in the case of death we give 10*l*., and the funeral expenses out of the club if it is rich; we always give the 10*l*.

8932. You give that to the widow, and pay the funeral expenses if the club is rich?—Yes.

8933-4. In case of illness there is no allowance from the club?—If we consider that a man is ill from underground work, but men are so liable to be ill many ways that the doctors disagree as to how they have become ill. Upon that point very often these men are connected with a provident club as well as the mine club, and if they can lie upon both they will lie there for a long time

8935. What is the charge made for the doctors?—Sixpence a month per man.

8936. Is that paid for the doctor attending only to himself, and not to his family?—It is only the man; it has nothing to do with the family.

8937. How many doctors are there to each of the mines?—There are generally two, in some cases three, but generally two.

8938. Are the doctors appointed by the adventurers?—Yes.

8939. Do the men ever go to other doctors in preference to going to the mine doctor?—In cases where they are in provident clubs they can go to the club doctor, that is, the provident club doctor, and to the mine doctor too.

8940. With regard to the boilers, have you any stated time for cleaning them out?—That depends upon what mine it is. In some mines we cleanse them out every month, and in some mines we do not cleanse them out so frequently; it is according to the quality of the water; not only is it apparent to the eye, but as to the chemical ingredients that that water is composed of; it is dangerous to work too long.

8941. How do you ascertain that, by experience?—Yes, from experience; and we know what the action of the water is on the pumps and on the boilers.

8942. When you find that that has taken place, I presume the boilers are cleaned out oftener?—Yes.

8943. Who is it that attends to that matter?—The engineer is expected to watch over it; but, as a rule, we look narrowly into it. I look into that, and as a rule we pay proper attention to the boilers.

8944. Has any boiler explosion taken place during the last five years?—Yes, in Wheal Kitty.

8945. Did you ascertain the cause of the accident there?—There was no means of ascertaining it. We had only our own ideas upon that point.

8946. Was a man killed on that occasion?—No.

8947. What is your idea as to the cause of that accident?—The engine had been idle from morning till night. There was rather a longer stop than usual, owing to their having different repairs to do, and on the Saturday the engine went to work at about eight o'clock, and they had not worked many strokes before the boiler blew up.

8948. (*Mr. Holland.*) What part of it?—Every part of it; it went down as flat as could be, and through things 600 feet off. It was rent like so many ribands.

8949. Have you any means besides the cocks of ascertaining the quantity of water in a boiler?—Yes, there are water gauges to some of the boilers.

8950. Was there one to the boiler you have mentioned?—No; but I think that every boiler in the county ought to have a water gauge if they only knew how to work them. The difficulty arises from want of experience. If they are put in, and they do not answer, there is nothing wrong; but it is for the want of knowing how to deal with them. If they can use water gauges to locomotive engines, working at 120lbs. to an inch, surely they can to engines working 40lbs. to an inch.

8951. How many safety valves are there to the boilers generally?—There is oftener one than two.

8952. Is it not the practice to have two safety valves?—We only have two safety valves on the same branch opposite. I think that all the safety valves should be kept under lock and key, so that no one should have anything to do with them. I think that the boilers require a great deal of attention.

8953. Have you carried that out in any mine with which you are connected?—Yes, in some, but not generally.

8954. Is the cost of it much, or sufficient to prevent its being generally adopted?—Next to nothing at all—a few pounds. It is a new idea, and it requires a long time to change an old course.

8955. Did you ever know them to load the safety valves?—Yes; it is the exception where they do not do it.

8956. Do they not very often load them with very odd things?—Yes, with anything they can find. The point is, if the steam is got up a little fast, and if the agent sees that the steam is blowing away, he wants to know why that is so, and sometimes the valve is kept down to prevent the steam from escaping.

8957. (*Chairman.*) Is it generally the case that the boilers are not sufficiently looked after?—Yes; there are some places where a great deal of care is taken about them, but that is the exception, and not the rule.

8958. I believe that in many of the mines in the county the men change their clothes in the boiler house?—That is getting done away with now to a great extent.

8959. Is not that a dangerous practice?—Yes; and it is improper in every way, both for their health, and in all ways it is improper.

8960. Is there any charge made in your mines for the barber?—No; if the miners cannot shave themselves they may go without it.

8961. In paying the miners their wages what proportion do you pay in bank notes and what proportion in silver and gold?—We generally get from the bank about half notes and about half gold and silver.

8962. Do you think that the circumstance of paying the miners in notes induces them to go to a public house to get them changed?—They cannot change them anywhere else if they are paid in notes, as a rule.

8963. Have you observed that the men have suffered at all in their health from working underground?—Yes, they suffer from the air, and some constitutions are knocked up more easily than others.

8964. Do you think that the air is the principal cause that affects their health?—A good many constitutions cannot stand water, and there are some miners a number of hours in the water.

8965. You mean when they are working in wet mines?—I mean when they are working in wet ends, or in a shaft where the water is always two feet deep that you are standing in, or 18 inches.

8966. You think that that affects the health of the miners?—Yes; some men cannot stand it.

8967. In a close end where there is poor air, what means do you adopt generally for the purpose of supplying fresh air?—That depends upon circumstances; if it is near an engine shaft we should force air in by a machine from the engine, but if we could get water we should prefer a waterfall; if we cannot get either, we must have a fan-engine.

8968. And have it worked by a boy?—Yes, or by a waterwheel sometimes. We work the fan-engines with a little water-wheel, and they answer very well.

8969. How do you judge when the air is poor, and it becomes necessary to use artificial means?—More from the candle and from one's own sensations than anything else. You find sometimes that certain gases will hang about the bottom of a level, and a man becomes weakened; he feels it.

8970. Do you know anything about cold damp?—Yes; there are certain rocks that will give out more cold damp than others; there are some rocks that it is peculiar to; although the air seems fair enough for a candle, yet it is bad for the constitution.

8971. Have any means been adopted for the purpose of ascertaining the state of the air?—I have never seen any machine that has been used to ascertain the impurity of the air.

8972. (*Mr. Holland.*) Can you point out some places in mines where that cold damp exists?—It arises more from the soft porphyry or decomposed granite; that is just the same kind of ground as would decay wood rapidly.

8973. Is it equally bad in dry as in wet mines?—If you have got a large quantity of water the water would drive out the air.

8974. You stated just now that there was some air that was injurious to the miners, but in which a candle would burn; could you point out those spots?—Yes; where there is a soft decomposed granite and porphyry

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it has more that effect than in other rocks that I have met with.

8975. Have you made any estimate as to the economy of labour effected by the use of the man-engine, or the value of the labour that is saved?—That is quite an estimate. There is no doubt that there is a very considerable saving; there is no question about that.

8976. Is it as much as a quarter?—I should think it was in many instances. If a man must climb up 300 fathoms he must save himself enough to be able to do that; whereas another man may work himself fairly up, and he may wear a coat to keep himself warm coming up by the man-engine; it is the last ounce, they say, that breaks the camel's back, and so it is in climbing.

8977. Have you formed any estimate of the value of cool air with reference to the quantity of work done; could not a man do more work in 60° than in 78°?—Yes.

8978. Could he do half as much again?—No.

8979. Could he do a third more?—I have never gone into that.

8980. The Commissioners have been informed that the miners work in 78°. Do you think that that is excessive?—I think it is when you get above 78° or 80°. It is not from that downwards so much, but it is above 78° or 80°; then there is a great loss of effective labour. It is unnatural for a man to work in an oven; it is too hot for a man to work in 80° for a great length of time.

8981. (*Mr. St. Aubyn.*) In a mine where a man-engine can be conveniently introduced, do you think it is conducive to the health of the miners?—No doubt of it.

8982. If a mine pays well, and is likely to go on for years, would it not also be economical to the adventurers to employ a man-engine?—Yes.

8983. The Commissioners were informed the other day, that in the Wheal Providence mines in Lelant, the cost of a man-engine would be repaid in less than two years?—If I were asked the question I should say no, because the depth of the mine is not great. The mine is only 120 fathoms deep, and I cannot fancy that it could make so much difference there; it is only in deep mines that they require a man-engine.

8984. With regard to ventilation, are you of opinion that a great proportion of miners' disease arises from bad ventilation?—I think that more of it arises from climbing; but there are some mines in which, although they are very well fit to work in, as far as the ventilation goes, there is no natural current. It is an unnatural atmosphere; for instance, you may stand on the surface at the edge of a shaft, and you will find that there is a nasty vapour that comes up, which you would not like to work in; but when you are underground you must work in that air, and that arises from not having the shafts frequent enough.

8985. Can you state to the Commissioners in a few words, what in your opinion are the best mechanical means of improving the ventilation in the Cornish mines?—That is a very difficult question to answer. The difficulty is to convey the air; but there are many means that might be employed in even so awkward circumstances. I think that if you have to force air in a distance, if you send it in by a pipe, that the area of your pipe should be in proportion to the length. For instance, it should be more in the cornucopian form; when you commence it should be large, gradually becoming smaller. If you take and use a four-inch pipe and you force air in for 100 fathoms you may burst the pipe; the air has no disposition to go on, and it becomes a fixed body, or it comes back again. The general working of the air in the Cornish mines is very little known compared with the collieries, because they have perhaps only one or two shafts; but they may have workings two miles off, and yet have a fair supply of air, while there is a large amount of gas arising.

8986. How may years have you been connected with mines?—For about 32 or 33 years.

8987. Are you of opinion that the miners, generally speaking, are now in better health than they used formerly to be?—Yes.

8988. To what causes do you ascribe their improved health?—I ascribe it first to this, that there is more attention paid to the comfort of the men when they come up from undergound. I think that it is very dangerous to come up from a deep mine, and then going anywhere to change. I think that they should keep up a moderate temperature until a man cools down; that I think would be a great advantage in the changing houses. I think also that the miners do not drink nearly so much now as they used to do.

8989. Is the ventilation of the mines improved?—There is more attention paid to ventilation no doubt.

8990. (*Mr. Kendall.*) At what depth do you think that a man-engine begins to pay well?—You must go back again. That depends upon the state of your finances, and the position of the mine; but I do not think there is any value in it until you get 100 fathoms below the adit.

8991. Up to that time you think that men can descend and ascend without much physical loss to themselves?—Yes, fairly well; a man climbs for a certain time and that does him no damage, it is the last fifty fathoms that does it.

8992. If you were to begin to work a mine, would you always have your shafts so formed that when you reached a certain depth you would be able to put in a man-engine?—As regards the beginning of a mine you come upon a very large question; if you begin you will go down in the course of the lode, and the lode sometimes will turn one way and sometimes another, sometimes north and sometimes south.

8993. Do you always in this neighbourhood go down with no underlie?—No; all about this district, the Camborne district, it is very hard ground, but out of it, in some districts that I am connected with, it is easier ground, and less difficult to work.

8994. I was thinking whether, where you have very fair ground, you would not sink a perpendicular shaft and drive a cross-cut?—We have no very fair ground; for instance, our granite is very hard, and our killas also is hard in places.

8995. Referring to the health of the miners, do they live much in their cottages here or not?—In towns I think they must.

8996. Do you think that that at all injures their health?—Certainly, if they have not sufficient sleeping berths it must be injurious.

8997. Is not that a matter that has been somewhat neglected in this county, and do not the men herd together in rooms, and sleep in too small a space?—Yes, and it is a great misfortune in many ways.

8998. It is pernicious both as to their morals and as to their health?—Yes, it is very bad altogether.

8999. You have had great experience in other parts of the county besides this immediate district?—Yes, more out of this district than in it.

9000. (*Mr. St. Aubyn.*) You are a western man, are you not?—Yes, but I speak generally of mines.

9001. (*Mr. Kendall.*) Do you think there is a want of good arrangements as to sleeping apartments of the miners?—Yes, I think there is a want of that.

9002. (*Mr. Davey.*) What is the deepest mine which you manage now?—160 fathoms below the adit.

9003. Do you use a skip there?—Yes.

9004. Do you prefer a skip at that depth to kibbles?—In what relation do you speak as to the skip; do you mean for drawing up the stuff?

9005. Yes?—If you have any shaft not a vertical shaft the skip is the most advantageous, because you can put in wheels to ease off the friction, and there is a great advantage in a skip over the old mode of drawing. If you have a verticle shaft and you divide them there is no harm, because the chains do not foul, but if you draw vertically the nearer you can keep it to the vertical the better.

9006. Do you think that you can draw as cheaply

by kibbles as by the skip?—We cannot, I am quite satisfied of it.

9007. Suppose that your mine was 100 fathoms deeper, what would then be the result; which would be the best, the skip or a kibble?—There is no question that the skip is the most advantageous anywhere; it must only be a strong prejudice which is opposed to it. When you come to work them there cannot be two opinions that the skip is the most advantageous; it is a common sense thing. Here is a box working in a guide; it does not vibrate or strike against the ground, or anything of that sort; there is no swinging to and fro; when the kibble strikes anything going at a great velocity there is sure to be something wrong.

9008. I suppose that you have tried many experiments as to the best mode of ventilation?—Yes, a good many.

9009. Did you ever try drawing out the foul air, instead of forcing in air?—I have tried both with a double set of pipes.

9010. Which do you think is the best?—I generally make it a rule to take up my air in a good place. Say, for instance, that I was going to drive a 100 fathom level, I should not go out to the 100 for the air. I would go to the 70, or 80, or 90. I would take up my air where it is good, and send it on; it is of no use to take the old air again. I have used lime (which I have found a very good thing) in the mouth of the pipe to improve the air.

9011. You have not mentioned about withdrawing the foul air, how did it answer?—It is a very good plan. I like extracting the foul air, but then I would never take up the warm air to send it back again.

9012. How did you manage to extract the foul air?—Simply by a pump from the engine worked by a rod. We have a double machine at Treloweth, for instance, a 30-inch cylinder, with a piston, and there is a top and bottom valve.

9013. (*Mr. Holland.*) What stroke has it?—An eight feet stroke.

9014. (*Mr. Davey.*) Do not you find generally speaking that as a new principle they sink the shaft after a certain depth upon the lode?—A question was asked about commencing a mine. In commencing a mine we sink upon the lode, but when you carry out a mine in a proper manner you after a while come to find that you must go on the underlie, and as soon as you can you get away upon the underlie, because whatever you sink vertically it is dead ground. You can get nothing out of it, and it takes a long time, and will cost more as a rule.

9015. Do you not think that is a new principle which has lately been carried out of sinking diagonally instead of perpendicularly. Formerly after you had worked a mine a certain time you would sink a great depth and then cross cut?—That arose from this cause: in the old days a large amount of attention was paid to drawing, and to draw well they could only draw vertically; but since skips have been introduced you can draw diagonally, or at a change of angles by having proper sheaves put in, and you save a great expense of dead sinking.

9016. And the present mode is an improvement in the working of mines?—Certainly.

9017. (*Mr. St. Aubyn.*) One witness has given it as his opinion that if the underlie was not more than two feet in a fathom it was more advantageous to have a kibble, but that if it was more than two feet it was better to have a skip. Is that your opinion or not?—I consider that when you go off the vertical line you you should have a skip.

9018-9. You would have a skip directly you go out of the perpendicular?—Yes, but there are very few of those cases. In a skip road your skip must be kept in good order, or you cannot work at all, whereas your other shaft will go on working until you cannot go on working any further. If you take the best means of drawing stuff in the country, in the collieries they always work guides to their vertical.

9020. (*Mr. St. Aubyn.*) Why should you not have guides in a vertical shaft?—They are advantageous in a vertical shaft. A skip is advantageous in a vertical shaft, it having less friction.

9021. (*Mr. Kendall.*) It is a great saving in a vertical direction, but greater still when you go down in a slant line?—Yes.

9022. (*Mr. St. Aubyn.*) In any of the mines of which you have the management, do the men use the skip to come up with?—No; we do not allow it. I think it is unsafe unless a shaft is set aside for it entirely. I do not think that stuff drawing and man drawing should go on in the same shaft.

9023. (*Mr. Holland.*) What danger do you apprehend from that?—In drawing stuff, with all the care which may be used, stones may fall into spaces, and may fall upon the men coming up.

9024. (*Chairman.*) Do you think that it would be practicable to make a skip a means of ascent and descent for the men in the mines?—I think that the drawing of stuff and the drawing of men are two separate things.

9025. Supposing that you had a shaft, instead of setting it apart for a man-engine, could not you set it apart for a skip to draw the men up with, the same as in the collieries?—It would not be so well to draw with a skip as with a man-engine.

9026. Do you think that it would cost more per day, or cost more in the erection of the machinery for a skip?—A good deal depends on the shaft.

9027. Supposing that the shaft is adapted for a man-engine or a skip, and that you put a skip, would not that be a cheaper cost in the first instance than putting in a man-engine?—It would be cheaper, but I do not think that it would be so safe.

9028. (*Mr. Holland.*) What danger do you apprehend?—From the breaking of the chain.

9029. If you can carry up half a ton of ore, cannot you carry up 2 cwt. of men?—If you carry up half a ton of ore and it breaks, it goes down; if you take up a man or two and they are killed, there is an end of it. You take one end of the question, namely, what is in the bucket, but you must bear in mind that in deep mines we may have three or four tons of chain drawing; it is not the weight that is in the bucket that breaks, it is the chain's own weight. If you are drawing say 250 fathoms deep you have three tons of chain; it is very often its own weight that causes it to break, and not the difference of weight of the kibble of stuff or of men.

9030. (*Chairman.*) Could you not substitute a wire rope for chain?—I am not so favourable to wire ropes, they answer very well in some places.

9031. What is your objection to them?—In the first place, in copper mines a wire rope will precipitate very fast.

9032. (*Mr. Holland.*) Will it do so if well covered with grease and tar?—They are always well covered till an accident occurs, and then there is a little bit not covered.

9033. Are those the only dangers which you fear, namely, bodies coming down the shaft and falling on the head, and the rope breaking?—Yes.

9034. If those could be effectually guarded against, you would see no objection?—Not at all; it is only a question of safety. I fear the stuff lodging about the shaft and the chain breaking.

9035. Do you find that the use of lime in the air pipe makes the air decidedly purer and pleasanter?—In my experience it has done so.

The witness withdrew.

Captain JOSEPH VIVIAN examined.

9036. (*Chairman.*) What is the principal mine of which you have charge?—North Roskear.

9037. Have you charge of any other mines?—I superintend North Crofty, a mine adjoining, and South Condurrow.

9038. I think that you have sent in a statement of

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the number of men employed?—Yes; a statement of the men and of their ages.

9039. What is the youngest age at which children work on the surface?—I should think some of them may be as low as about seven years old; they are employed at little light work.

9040. I suppose they are sent to that as their parents cannot afford to send them to school, and they are obliged to be sent to work?—Yes; as many as can well afford to do it send their children to school. We have a school here, and we support them from the mine.

9041. The young children of the families of miners employed with you are sent to the school?—They go to the British School.

9042. And the fees of the school are paid by whom?—By the mine.

9043. At what per head?—We pay, I believe at present more to the school than we have children there. A penny a week is our pay for each child.

9044. Is there any charge on the miners for the support of the school?—A great part of it is from the miners. There is a club, but the club in reality is provided by the adventurers. It is considered as a part of their cost of materials, and so on, although it is deducted from the men. There are many things that we deduct from the men to make them as economical as we can, but they do not really pay for it.

9045. The club money is not merely for visible accidents, but it also provides schooling for the children?—Yes.

9046. What is the amount of club money which the men pay?—Our club money is about 6*d.* a month per man.

9047. That, according to the rules, is for visible hurts?—Yes, for visible wounds.

9048. Is there no extra charge beyond that for the schooling of the children?—No.

9049. How are the fees which are paid to the school charged against the adventurers?—The club is deducted from the men the same as any other material with which they are supplied. It does not appear before the adventurers as a charge. The charge is for breaking a certain quantity of ore, or for excavating a number of fathoms of ground, amounting to a certain sum of money. The men's materials, powder, candles, clay, nails, and the various other things are furnished, and club and doctor. They pay 6*d.* to the doctor as well as to the club. Then the doctor takes them on all occasions. Formerly it was found by the surgeon that not only wounded men called upon them, but that men called upon them for colds, sprains, and one thing and another, and 15 or 20 years ago we altered the amount from 3*d.* a month to 6*d.*, in order that the doctor should attend on all occasions.

9050. From what fund does the money come for the children who are sent to school?—That is deducted in the club account. We will suppose that so many people may have been wounded, and so much money paid, and we finish with the school charge. We deduct 6*d.* for club, and 6*d.* for doctor, amounting to 1*s.* a man.

9051. Do the doctors attend the families or only the men?—Only the men.

9052. Have you any charge for the barber?—No, we do not deduct for the barber at our mines.

9053. How are the doctors appointed?—The doctors are appointed generally by the adventurers at a public meeting. There is some little objection occasionally, and some men believe that they ought to have the fixing of the doctors for themselves, and I have thought so too. If there is a doctor's fund to draw from, and if a man is wounded, let him say for himself whom he would like to have, because one man would like one doctor, and another man would like another.

9054. You think that that would be desirable?—It would be desirable if it could be carried out. We have nothing to complain of in our surgeons. Some men sometimes live miles apart. Many of our men live three miles from the mine.

9055. And it is often a long way to go to a doctor?—Yes; and then they like the doctor that they have had in their family.

9056. Would the sum charged against the men for the doctor be sufficient to pay the salary of the doctor if they selected their own doctor?—I think it would. I think that we could do it upon an equally small scale. Formerly we used to have from 1,000 to 1,100 people for many years at North Roskear, and now there are only about 500 or 600 altogether.

9057. How would it do if there were doctors and dispensaries for a certain district, combining small mines with large mines?—There are the same surgeons now to a great many of the mines, and, as far as I know of them, altogether they are very attentive men indeed, and very able men in the profession. At least I believe so.

9058. You have stated the deductions from the men. Amongst other things, candles are deducted. Do you use any particular kind of candle?—No; they are all tallow candles. We have been using composition candles from a patent candle maker's, Palmer's. The men like them very well.

9059. Is there any advantage in your opinion in those candles over the others?—I do not know that there is. Men in close places prefer them; they give a sharp smaller light, and they do not make so much smoke, but then they are not so handy for carrying through shafts which are wet, or where there is a strong draught blowing. If they once go out, they cannot be blown up again, which can be done with an ordinary candle. If Palmer's candle goes out, you must have somebody to give you a light, or resort to your match-box.

9060. Is the price about the same?—Yes.

9061. What is the wholesale price now?—5*s.* 6*d.* per dozen.

9062. What is the deduction from the men for candles?—We generally deduct considerably more than we pay.

9063. How much?—I think we are at present charging 50 per cent. more than we give. We make that sort of general rule to charge 50 per cent. more for everything, but I believe that at present we are charging 9*d.* per lb. for powder and 9*d.* per lb. for candles. We do not alter for a trifle when the price goes up and down. When they take a set they understand what they will have to pay for drawing, and candles and nails, and so on. We charge some of the tributors for timber, that is, for planking timber, not for timber for securing the ground; it is done in order to make the men as economical as we can, that is the main object, otherwise you might have to deliver more from the store, because it is all the adventurers' store; it is the same with the club and doctor. It is always looked at what a man has really carried away in cash.

9064. In the estimate of the average wages of the men, do you take into account the earnings of the tributors and tutwork-men and captains together or separately?—We never take in the agents at all. If we are called upon to show the average getting, we show the average tutwork-men's getting and the average tribute-men's getting. We generally calculate that the tribute-men get a little more than the tutwork-men.

9065. Could you furnish for the month's pay the average of the tutwork getting?—Yes, we look over it ourselves. There are the number of men and boys and the cost. When we have bargains to let we look over the thing, and we consider what the cost will be in breaking a fathom of ground, and how fast a man can break it, and what he can do it for.

9066. What would be the average wages of the tutwork-men now?—The average wages of the tutwork-men now in this neighbourhood are somewhere about 3*l.* 10*s.* per man.

9067. That is not saying that they all of them get that amount?—No; the first-class men get 4*l.* 10*s.* and 5*l.*, and so on, generally, and the second class a little further down, and the third class a little further

down still. There are many men who perhaps will never get more than 55*s.*

9068. Are you now alluding to the net earnings?—Yes, after everything is paid.

9069. So that the wages of the men vary very much?—They vary very considerably; it is the same thing with tributors and tutwork-men. Some fine fellows will speculate upon tribute, and will do a vast amount of work. If you average them for the year they will always do well; others will not do well; some will not work and some cannot work.

9070. And some get a bad pitch?—Yes, exactly like a company of adventurers working a mine.

9071. In getting a bad pitch, although a man may be a good man he may not get anything for four or five months except subsist?—He gets subsist always.

9072. How much subsist do you advance to a tutwork-man?—We do not profess to advance to a tutwork-man, though we do it occasionally. We do profess to advance to tributors; the tutwork-men wait for the pay day and take up their money as they like.

9073. What do you advance to a tribute-man?—About 2*l.* a month, or a little more; if he is a man worth notice we do not let him have less than 2*l.* a month, and sometimes a little more. There are men who call themselves tributors whom we do not call tributors at all; they have a pitch; we would rather have their room than their company; and we do not advance to them to much extent.

9074. A tributor who has to exist on subsist with a large family, probably gets into debt in those four or five months?—We have a man now at North Roskear, a first-rate old man, who has been working there for 30 years; the last two years he has always been speculating, and has done badly. I said to him the other day, "You are doing badly." "Yes," said he, "I never had such a long run before, but I shall make "it up again soon." I said, "You have not done "badly upon the whole; you have been here from a "boy." He is worth 200*l.* or 300*l.* probably; he has one or two cottages, and keeps a cow, and so on; we never let him go upon less than 2*l.* 5*s.* a month, though for a long time he has not earned any money.

9075. What is that man in the mine's debt, should you say?—About 25*l.*

9076. (*Mr. Holland.*) Is that quite safe?—No, not a farthing of it is safe. We rely upon the man as a speculator.

9077. (*Chairman.*) As you have known him so long a time as a good man you have done it?—Yes; and although a tributor may be in debt to the mine, yet the proportion of ore which belongs to the company being in most cases more than the amount of the debt the mine will still be a gainer.

9078. (*Mr. Kendall.*) Suppose that after a while the man gets a good start?—We keep back the money.

9079. The whole of the money?—That depends upon circumstances. The man that I mention was once in debt, with two others, 70*l.*; he got money in two months and paid every farthing off; they got 100*l.* each and paid their 70*l.* that they were in debt.

9080. First of all, I understand that you have a chance of being repaid in full, and if you are not repaid in full you are able to prove that on the whole, even though the men are in debt to the mine, yet taking the profits which they make to the adventurers, there is still a balance in favour of the adventurers?—Yes.

9081. (*Chairman.*) Taking an average of the men's earnings, it does not give you any idea of what is really earned by the different tutwork men and tribute men. The average does not give you the real amount earned by the separate men?—No.

9082. Some men therefore are well off, and some men are not well off?—Precisely so; and more particularly so with the tributors; some of them get a great deal of money, and others are speculating; a pitch turns out badly and they do badly.

9083. I suppose that in consequence a number of men get into debt with small shops?—We do not interfere with the miner's private business.

9084. But that is the consequence?—Yes; very often a great many get in debt to the small shops who ought not to do so; they are living faster than their means will allow, and faster than they have occasion to do.

9085. Do you think that the packmen induce the families of miners to get into debt?—Yes, and other people too.

9086. You think that the packmen going amongst the miners' families are a great evil?—I should suppose that they may be, but I think that they keep the shopkeepers in check, for they sometimes sell things a little below; they have no establishment to keep up.

9087. (*Mr. St. Aubyn.*) But they give credit?—They do.

9088. (*Chairman.*) Have you any rule as to your boilers being regularly examined?—I do not know that we have any regular rule; the boilers are tested occasionally.

9089. Have you ever had an explosion?—No; if the engineman does his duty properly it is impossible that an explosion can take place. The breaking out of a boiler is of little consequence, but the blowing up of a boiler is a very serious affair; and if the engineman sees that the feed is as it should be the boiler cannot explode. If the breaking out of a boiler happens we must patch it at once.

9090. Is the breaking out of a boiler a common thing?—It happens when the boiler gets old. The engineman says, such a boiler is getting leaky.

9091. When new mines are started are not many second and third hand boilers purchased?—Yes; the engineer has to examine them to see that the boilers are perfectly safe.

9092. Have you any water guage to show the amount of water in the boiler?—Yes, always; the engineman can tell exactly where the water is.

9093. Without trying the cock?—Yes, he has his gauge; we work about six inches of water upon the tube, and he can tell if the water gets one inch below.

9094. Is that generally the case in your opinion?—Yes.

9095. (*Mr. Holland.*) What sort of a gauge is it?—There is a swimmer gauge.

9096. Not a glass gauge?—No, we always depend upon the swimmer acting; many have glass gauges.

9097. (*Chairman.*) Have you more than one safety valve?—There is a safety valve for every boiler.

9098. Only one?—Yes, to each boiler; the boilers are connected, we do not depend upon one.

9099. With respect to roasting the ore, you collect the arsenic?—Yes, from the tin ores.

9100. Does it rise up in a vapour?—Yes.

9101. Does the vapour ever escape?—Not with us; we have houses sufficient from the calciner to the stack to contain 300 tons of arsenic, and though the price is now low it pays well for saving. The length of the flues from the calciner to the stack is from 250 to 300 yards.

9102. So that none of the arsenic escapes by any chimney?—None of any consequence to do any mischief; but sometimes where the stack has been too close to the calciner it has been the case; but people have got more awake to the thing. We have to reduce the tin; it is mixed up with arsenic, and copper, and iron pyrites, and one thing and another.

9103. Have you ever heard of any person suffering from the arsenic fumes?—No; all our people are very healthy people, and they work at the burning houses. We had a dirty girl at one time, and a complaint was brought on and it killed her; but it was entirely the fault of the young woman herself.

9104. (*Mr. St. Aubyn.*) How many years have you been connected with mines?—I am now 70 and I have been in the mines ever since I was 12 years old.

9105. Nearly 60 years in fact. Is it your opinion that the miners as a class are more healthy now than they were when you began?—Yes, considerably more so.

9106. From what cause?—I think that one great

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cause is that formerly they never carried down provision with them, nor water; but in the last 20 years there has always been a fresh supply of water brought to all the mines from the wells about; it is first rate water, and they have it sent down to them, or they carry it down in their canteens, it depends upon the depth that they have to fetch it, and they carry down their dinner with them. I think that is one cause of the improvement. And I think that the mines are now better ventilated than they formerly were. I also think that the footways in the mines are kept better than they were; they are kept away from sharp draughts, and the water is kept away from them. They are all drier, and there is every accommodation. They have a comfortable house, with a constant supply of warm water running through it, for them to wash in when they come up. Here every man keeps his own soap and towel, &c. They are all expected to go away clean; they wash themselves clean, and they wear better clothes than they used to do; they used to be without stockings and things of that sort, which is now out of the question. They went away dirty, the same as the German miners do; but now it is altogether a different thing, and I think that that has improved the health of the people very considerably.

9107. Do you think that the mines are as well ventilated as they could be?—All the mines that I am acquainted with are well ventilated, and so are all the mines about here, I should say for a certainty, for miles and miles, and, as far as I know, farther. I think that the Cornish agents have studied the ventilation of mines almost as much as anything connected with it. You will now find that 200 or 300 fathoms deep in the North Roskear mine the air is as good and as pure as it is in this room. We throw it down. We find that one shaft serves for the down draught and another for the up draught. Of course, when you get deeper you will get hotter as you get in, and some of the men in deep levels will have to work in hot places, and sometimes, rising against a shaft, those places will of necessity for a few months be warm and not so healthy as airy places.

9108. Could you suggest any mechanical contrivances for making the ventilation better than it is now?—I do not know that we could. In our mine at South Condurrow, where we have only one shaft, a pitman came down to me the day before yesterday and said, "The air at the bottom has got uncommonly fine, and I think it is bad." I said, "You have a large bellows and a pipe and every-"thing to it. In how long could you do it?" He said, "I could do it in two days." It is now working and sending down a stream of pure air. If we can command a draught we do so, and if not we use the bellows or a fall of water.

9109. Are you of opinion that where it is possible and convenient to introduce a man-engine it is conducive to the health of the miners?—I should always have a man-engine if it could be had conveniently, ut in some places you cannot have it.

9110. The convenience or the possibility of adopting a man-engine depends in a great measure upon the paying of the mine, does it not?—Yes, upon circumstances; you may have a shaft that you can part with in old mines which have been worked a long time. They frequently have a shaft that they can part with if they have the means of putting up an engine and having everything complete; then it is done; but in other cases, where you work hard and cannot make the two ends meet and have not a shaft to part with, it cannot be done; the very thing itself would sack the mine.

9111. Supposing that you could spare a shaft to adopt a man-engine, how deep would you go before you thought it necessary to give up the footways?—I should not trouble myself about a man-engine if the mine were only 130 fathoms deep, if the ladders were well arranged; sometimes they are not well arranged, they are too perpendicular or too flat. A proper pitman will know exactly how to arrange the ladder so as to keep the whole human frame in a proper position.

9112. You think that if a man does not hurry himself he can climb 150 fathoms without injury to his health?—Yes, I find no difficulty in climbing 200 fathoms.

9113-4. The length of the ladder depends upon the width of the shaft?—Yes; if you have a roomy shaft you may make your ladders longer, though I am never an advocate for making them long. Our ladders are generally about 4½ fathoms, but in some shafts which are a little sm aller we are obliged to have them a little shorter.

9115. Are the staves of your ladders 10 inches or a foot?—Ten inches.

9116. You consider that better than 12 inches?—Yes.

9117. It is not so fatiguing?—No; a man cannot fatigue himself so much, and he cannot injure himself so much with a 10-inch ladder as he will with a 12-inch one.

9118. Have you found any opinion as to the advisability of lighting mines with gas?—I should not think that that would be practicable; if a man is working with ordinary tools he is frequently shifting his light; he is driving one way and then another, and he shifts his candle in a moment to see exactly what he is doing.

9119. You have never had any practical experience of gas in a mine?—No.

9120. North Roskear was originally a copper mine?—Yes.

9121. But you have lately come into tin?—Yes.

9122. Do you observe any change of temperature in the ends when they come to the tin?—No, I think not, visibly. In the eastern part of our mine we have a place or two remarkably hot, and what the reason of that is I do not know; there is neither copper nor tin in the ends at present, but the water is hot and the air is hot.

9123. We have had evidence at St. Just that the copper was a great deal hotter than the tin, and that the men where they were working always knew when they were approaching copper by the increasing heat in the ends; have you observed anything of that kind in North Roskear?—No, never.

9124. What level is it where you find it so hot now?—At 140 fathoms below the adit, that is to say, 160 fathoms from the surface; we are 270 fathoms from the surface in the deepest part of the mine.

9125. In fact, that is hotter than the deepest part of the mine?—Yes, much hotter.

9126. Can you account for it at all?—No. It is near to a large cross course, which is the boundary of North Roskear and North Crofty.

9127. (*Mr. Holland.*) Is there much water?—Yes. We always find the air and the water of the same temperature.

2128. (*Mr. Davey.*) Have you any level coming under this 160 fathom level?—No.

9129. How far is there any level behind it?—I should think that the nearest level is something about 40 fathoms behind it.

9130. How far is this 160 fathom level from the bottom level?—The 160 fathom level is the bottom level in that district, the Crofty part is only to the 160 fathoms below adit.

9131. Is that the bottom part of that lode?—That is the bottom that we have worked down to in the eastern part of the mine. Then there is a great cross-course between. We have no communication below the 120 fathoms between our eastern and western district.

9132. Then you have never tried until now to follow the hot water in this district?—No.

9133. Do you know any instance where the hot water has been followed in this district?—No, I do not know that we have had much hot water about this district; that is the hottest place that I have seen in the parish at all.

9134. You have mentioned that you consider that

the health of the miners generally has been improved very much? —Yes.

9135. Do you recollect when you were a young man a number of men who went about the town with great coats on complaining of the miners' disease?—Yes. I recollect a disorder which seems to have gone from the country, men in decline. I should think that nearly 50 years ago there were a great many young fellows that went off in decline.

9135*a*. You used to see them about the streets in the summer time with great coats, laid up with the miners' disease?—Yes.

9136. You do not see anything of the kind now?—No, not at all.

9137. With respect to the boilers, you have stated that you always test them. In what way do you test the boilers?—We do not test the boilers, they are tested before they are put in; we have no means of testing them after they are in their places. They are tested with hydraulic presses before they are put in; that the boiler-makers arrange to do.

9138. In case of a leak, or anything which has affected a small space in the boiler, it will not cause an explosion but merely a break out?—Exactly so.

9139. Do you charge men for planking?—Yes, and for nails; not with the view that they shall be short of anything, but to make them as economical as we can.

9140. If you are driving a level, and it requires timber, do you charge the men for that timber?—No, it is merely the tributors. We do not charge them for putting in air sollers or anything of that sort.

9141. You keep a separate account for your club?—Yes, we keep our club account with the bank separately.

9142. How does it stand just now?—I do not know exactly. We have no great amount in the bank, because if at any time we should be short, we should say to the adventurers "We are short," and we should get a trifle to put to the club.

9143. Do you ever refer to the adventurers for assistance?—Yes, and we have never found it refused.

9144. Do you use any acid in cleansing your tin?—No, we have never used any.

9145. Do you suppose that any arsenic could arise from washing the tin, so as to injure the health of any people dressing it?—No, I think not; all the people are healthy enough. There is not a healthier set of miners in England than our men are, belonging to the calciners and the burning houses; and we keep girls by daytime and men at night to assist at the calciners'.

9146. (*Chairman.*) Do you use a skip or a kibble for drawing?—In some cases one and in some the other; we prefer the skip wherever we can use it.

9147. Do the men ever go up in the skip?—Yes, but I do not like it. We have not any wire rope, but if we had a wire rope which could be laid on, I would as soon go up in a skip as not; but I do not like it with a chain.

9148. A properly constructed skip, with a safety stop and a wire rope, you would consider sufficient?—Yes.

9149. (*Mr. St. Aubyn.*) Why do you make a difference in your mine between a skip and a kibble?—On account of the different inclination of the lode we cannot get the skip to act exactly. Sometimes it inclines to the north, sometimes to the south, and at other times is vertical, and the crookedness of the shaft makes it impracticable to work a skip.

9150. Do you not consider it more advantageous to have a skip in a diagonal shaft?—Yes.

9151. Could not the diagonal nature of the shaft be obviated by proper sheaves?—Yes, but sometimes we could not afford to do it; we have not the means.

9152. If you had the means it would be better?—Yes; a skip is as preferable to a common kibble as good living is to bad living.

9153. Would you have a skip in a right-down shaft instead of a kibble if you could?—Yes, skips are as profitable there as they are in any other place. You can have proper guides, and you may draw as fast as you like, and one never interferes with the other; but with kibbles, they will interfere and do a vast amount of mischief. We had an accident the other day by one kibble coming down upon the other, and it broke both chains.

9154. (*Mr. Davey.*) Supposing you had a very deep shaft, say of 280 fathoms, would that alter your opinion as to having kibbles or skips?—I would have a skip by all means in the world there, and wherever I could put it in. When I was at the German mines, I saw that they used a skip and wire rope, and when I came back I was asked what I thought of the German miners, and I said that we are better practised miners than they, but they beat us in drawing the stuff.

The witness withdrew.

Mr. ROBERT HART PIKE examined.

9155. (*Chairman.*) I believe that you are purser of several mines?—I am.

9156. Will you name two or three of the mines?—Carn Brea mines and Cook's Kitchen mines in this neighbourhood; Huel Kitty (St. Agnes) and Wendron.

9157. Do you think that in paying the men the payment of a large part in notes is any inducement to go to the public-house to get them changed?—No doubt of it; that is, where a number of men are paid together, and the sum of 5*l*. exceeds the amount payable to any one of them. Then, of course, it is necessary to obtain change, which I believe is only obtained at public-houses, and of course it necessitates spending a portion of money.

9158. In your opinion would there be any possibility of paying the tutwork-men other than once a month?—I should consider that it might be done. I believe that it is done in many of the foreign mines—the St. John del Rey and most of the mines in Cuba, and various other places.

9159. Might not a more frequent payment of wages in a great measure prevent the men from getting into debt?—It would obviate the necessity of it in a great degree.

9160. In carrying out any improvements in the working of mines we have been told that there is some difficulty on account of the stoppage which it would occasion in the works. Would not also part of the receipts of the adventurers be stopped for that time?—That is a cause alleged for the non-carrying out of very many improvements in mines. I have found it given as a reason and an excuse in many instances.

9161. Therefore, to those who look for a permanent investment in the mine it is a disadvantage?—It is a disadvantage, because, unfortunately, mining is not looked upon generally as a permanent investment. The greater number of people engage in mining simply with a view of raising a profit upon the sale of shares. The consideration is not so much to work a mine to a profitable issue.

9162. Does not that system tend to prevent improvements which would benefit both parties?—Yes, no doubt of it. Mines so got up have not in view the carrying out in a miner-like manner the operations of the mine; but a mine in full and fair course of working is frequently prevented from having the benefit of measures which would improve the revenue of the concern, by the unwillingness of the shareholders, even though they are bonâ fide ones, to submit to any temporary reduction in their dividends.

9163. A reduction which would send down the value of the shares?—Yes, that is the idea, and that if it was necessary to realise, they would have to make a sacrifice.

9164. Those improvements would tend not only to the advantage of the adventurers, but also to the health of the men employed?—Improvements of that

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nature might be adopted, and it is generally improvements in reference to the shafts which would facilitate the miners going up and down, but they would of course have the objection on the part of the shareholders that they would diminish the amount of the returns for some time.

9165. Is there anything which you could suggest to the Commissioners as likely to tend to improve the condition of the miner?—I am not a practical miner myself, but having a large connexion with mining, and having heard the opinions of many of our best mining men expressed, the greatest improvements would be in introducing facilities for the men getting up and down without the fatigue of ladders.

9166. You think that that should be more general than it is at present?—Yes.

9167. Have you any experience, from your knowledge of mines, as to the men suffering from any want of ventilation?—It sometimes happens that when it is necessary to communicate from one point to another, for the purpose of ventilation, the miners have to work in a very close place and bad air, in which it is hard to keep a candle burning, and a difficulty in breathing is experienced.

9168. Then if any additional means could be adopted while that necessary operation is going on of supplying fresh air, it would be very desirable?—It is done if the cross cut or communication to be made is an extensive one, or if there is a great deal of ground to open, then, of course, they introduce artificial means by pumping air; that may be done to a great extent, but if they are driving for merely a few weeks or a month they get on without it. The men bore the ground for blasting, and when they set fire to the fuze they leave their work, and perhaps it would take several hours before they could return to the place, on account of the smoke.

9169. And I suppose they are paid more?—Yes. I do not mean to say that the men get higher wages, but they work fewer hours, and the wages of course must be made up to them.

9170. Are you purser to any mine in any other part of the county?—At Wendron and in St. Agnes.

9171. Is the rate of wages less in St. Agnes?—Yes, there is more competition; there are more labourers in proportion to the labour.

9172. You think that that is the reason?—Yes, decidedly. I remember the time when you would have to pay more at St. Agnes than you would pay here, because for some time previous the mines had been poor, and very few men had been employed, and consequently they had to migrate from the place, and afterwards when the mines were again put on there was a difficulty in getting men, and men had to be brought from here to work the mines in St. Agnes. Now the population there has increased, and there are more men than are required, and they prefer remaining at home where they have a house or a family and working at lower wages, to coming away and getting more.

9173. Therefore it prevents the earnings over Cornwall being equalized?—Yes.

9174. Have the miners in St. Agnes an occupation besides working in the mines?—Not so much at St. Agnes, I think, as in Wendron; in Wendron they have; there is scarcely a miner there who has not a little piece of land with which he engages himself in the evening or the afternoon, and when he is not at work in the mine. I am not quite so familiar with the St. Agnes men as with the Wendron men, but I know that it is very common with the Wendron men, and I believe also at St. Agnes.

9175. How are the doctors appointed, is it by the adventurers?—By the adventurers, by a majority, or in a company which is under the management of a committee of the adventurers, it is done by that committee.

9176. The men have nothing to do in the mines with which you are connected with the appointment of the doctor?—No; but if they expressed themselves strongly against the appointment of any doctor no doubt he would be changed.

9177. Are the doctors appointed for life?—No.

9178. During good behaviour?—Yes.

9179. They are not re-elected?—No; they remain in office until they are dismissed.

9180. In the mines with which you are connected is there one uniform system with regard to the club money?—Yes.

9181. Is a separate account kept of the club money in each mine?—Yes.

9182. Is that looked upon as an account for the men, or an account for the adventurers?—It is looked upon and always treated, I think, as belonging to the adventurers, on the occasion of a mine being abandoned when the club fund ceases to be held.

9183. And it is regarded as assets of the adventurers?—Yes.

9184. Has that ever been disputed?—No; I never heard of a dispute. There have been frequent cases of winding up mines, and the money has been treated as an asset of the mine.

9185. What has been the largest amount of it in winding up the mine, in any mine that you have been connected with?—In any mine that I have been connected with it has always been very irregular, because I have always recommended liberality. In the Carn Brea mines, which are the most extensive mines in Cornwall, the club fund several times has 100*l.* in hand, but it is more frequently 50*l.* or 100*l.* in debt.

9186. Does that arise from there being more accidents, or from your applying that club money otherwise than to visible hurts?—We apply it to pensioning off old men who are unable to work any longer on the mine, who have been there for many years and their money is spent; we always make them some allowance, and we are not particular about the injury or the illness which is occasioned by the nature of their work, we treat an illness occasioned by working in the mine as a visible hurt. Then, again, out of the club fund we bury the men; if a man dies from an ordinary illness, not at all connected with his duty in the mine, we always pay for the coffin; any man working in the mine has his coffin from the mine, and that is always charged to the club at Carn Brea.

9187. Is any allowance ever given to the widow?—Yes; we generally allow 10*l.*, and sometimes more, never less than 10*l.*

9188. That is from the club money?—Yes.

9189. What allowance do you generally make to a man from the club money?—1*s.* a day.

9190. With regard to the candles, is there any particular kind of candles which you use?—We use those which we think are best adapted to the particular ground, or the nature of the air in the place.

9191. Do you use Palmer's?—Yes; we use some of Palmer's. In deep places, or in draughty places, I believe the men do not like them, they will not blow in again if they blow out.

9192. What is the charge for the candles to the men?—We charge 8*d.* a pound.

9193. And the same for powder?—Yes; there is a considerable profit charged upon everything, but the reason for that is to prevent the men wasting the articles; even now, with the charge which is made, if the men are not carefully watched, they will take out a great many more candles than they really want, simply to sell them to make a little ready money.

9194. (*Mr. Holland.*) To subsist on?—Generally for beer money.

9195. (*Chairman.*) What becomes of the profit on those candles?—It goes to the adventurers. In making up the account of a tributor or a tutwork-man, he is charged so many pounds of candles as a deduction from his earnings.

9196. (*Mr. St. Aubyn.*) Sometimes as much as 50 per cent.?—Yes, but that is all reckoned in. It amounts to the same thing. It is simply a check upon a man against his wasting too much. The estimate of the net earnings of the men is 3*l.* a month; it is just the same as with the smelters, they take 21 cwt. of ore for a ton.

9197. (*Chairman.*) We understand the earnings of

the men are generally calculated upon an average?—Yes.

9198. There are a large number of men of course who never come up to anything like that average?—Yes. I should say that fully one third have less than one third of the amount of the average; that is to say, for some time. Some men for a very considerable time are unfortunate.

9199. Then they have very little to live on during that time?—Yes; I have known them for 12 months not to have more than 30*s.* a month.

9200. (*Mr. Holland.*) How do they get on?—They get in debt, and, of course, live very hardly.

9201. Do they get food enough?—I should doubt it very much.

9202. (*Chairman.*) Then one third of the men on the average are perhaps not really well fed?—That is my opinion.

9203. (*Mr. Holland.*) Have the men often to go to the public-house to get their money changed?—Once a month on pay days.

9204. Is not that a serious evil?—It is a serious evil, but it is an evil which it is difficult to obviate; it might be done, of course, but there is a difficulty in getting gold enough from the bank. You would have to pay a premium for it.

9205. The miners now have to pay a premium for it?—Yes.

9206. Would it not be a less premium for the adventurers to pay?—The principal reason, I think, is that it saves the mine clerk trouble in counting the money out. A good many of the mine clerks prefer paying a lot at once. Until lately all the women were paid in lumps; perhaps a dozen were put on one bill and they were paid in gold coin and notes; as many were put in a bill as would make a 5*l.* note, and these girls all had to go to the public house. In all the mines that I am connected with we pay them separately.

9207. (*Mr. Davey.*) And that is general now?—Yes.

9208. (*Mr. Holland.*) The other system is broken up?—Yes.

9209. And with benefit?—Yes.

9210. With marked benefit?—Yes.

9211. Would not the same system be beneficial for the men?—It is very much improved, for instance, with the surface men.

9212. (*Mr. Davey.*) What proportion in notes do you pay here?—About half.

9213. Is not that more than usual?—It is.

9214. (*Chairman.*) Should you be ready to pay tutwork-men once a fortnight?—I should not hesitate about it at all; I think that it might be brought about. I think that it would be better if the surface men and women especially were paid once a fortnight.

9215. (*Mr. Davey.*) Do you think that it would be possible to pay the tutwork-men once a fortnight?—Not to measure up.

9216. Do you allow any subsist money to the tutwork men?—No.

9217. In some mines the tutwork-men get 1*l.* subsist at the beginning of every month?—That is equivalent to a fortnightly payment.

9218. Say that this is the 1st of August, those people who worked in certain mines in July received last Saturday 1*l.* each, and on the third Saturday they are paid off?—You pay them for July in August.

9219. The whole of the work done in July will be paid off in the third week in August?—Yes, that is three weeks behind.

9220. (*Chairman.*) The case as stated in St. Agnes where a man is paid all off is not the case here; there is still a month's work due to him in this district?—The pay days in the mine that I am connected with in St. Agnes happen to be nearer to the month of the labour doing; it is rather accidental, I think, than otherwise; there is always a month in hand.

9221. Do you think that the plan of paying up in full at the end of three weeks would be desirable?—Yes.

9222. You would be glad to see it carried out?—Yes, and I should be glad to exert myself to introduce it.

The witness withdrew.

Captain JOHN DAW examined.

9223. (*Chairman.*) What mines have you charge of?—Carn Brea and Great South Tolgus.

9224. In Carn Brea what is the deepest of the levels which you are now working at?—208 fathoms below the adit.

9225. And in Great South Tolgus what is it?—We are sinking below the 140 fathoms from the surface.

9226. Are there any means there for the men to come up and down, besides ladders?—We have a man-engine in Carn Brea for the men from the 105 fathoms below the adit. We now take them from the 105 fathoms below the adit, which is about 137 fathoms, and in 15 or 18 months I suppose we shall take them from the 154 fathoms.

9227. By increasing the length of the man-engine?—Yes.

9228. In Great South Tolgus have you any man-engine?—In Great South Tolgus we have no means but the ladders.

9229. Do you find any difference in working those two mines, the one with the man-engine and the other with the ladders?—Yes.

9230. In what way?—With the man-engine the men are obliged to stay down there for a number of hours; they are lowered by the engine down to the 105 fathoms, and then the engine does not go to work until about ten minutes or a quarter of an hour before their time is up, and therefore we have the advantage of the men's labour.

9231. (*Mr. Holland.*) How much more have you?—I think that we have about 15 per cent. more.

9232. (*Chairman.*) Do the men prefer waiting for the man-engine to attempting to climb the ladders?—They do. They would rather stay down two hours than they would climb up from the bottom of the mine. Last week some of the men were very much put out because we did not work the engine on the Saturday afternoon for them to come up. However, we did not know that they were down, if we had known we should have worked the engine. They complained of not having the engine to take them up.

9233. Do you think that you are able to have older men working in consequence of a man-engine?—Yes. We can send down a man who is able to work, and he will labour as well as if he had only been 20 fathoms below the surface.

9234. You therefore get more experienced men?—We do. That is the way in which we think that we have 15 per cent. more labour; in fact, for the first two months after we put the engine to work we found that we broke about that quantity of stuff more.

9235. (*Mr. Holland.*) That is upon the whole working of the mine?—Yes, upon the average.

9236. (*Chairman.*) Do you use a skip or a kibble to haul?—We use a skip nearly all through the mine.

9237. You think that that is more advantageous than a kibble?—Yes.

9238. It is more profitable?—Yes, we can work cheaper, we can work and draw with wire rope.

9239. You find the wire rope answer?—We find the wire rope answer much better than a chain, but we must have power, we give out two strokes of the engine to make one revolution.

9240. We have been told that the wire rope suffers by the action of the copper water and other minerals; have you any means of preserving it?—We do not work the wire rope down upon the angle of the lode. We work the wire rope over the horizontal pulleys;

then we have 100 or 120 fathoms of chain to the bottom end of the rope. We find that that iron does not crystallize the same as it does when it is winding over the cage.

9241. What is your reason for not working the wire rope further on?—The shafts then go away on the course of the lode, and the angle is not regular. We know that the wire will not bear the friction that the chain will.

9242. (*Mr. Holland.*) It is the underlie at the bottom?—Yes. We have about 100 fathoms from the shaft, and then we have a long piece from the cage to the shaft, and that goes down to the underlie.

9243. (*Chairman.*) I suppose that with power and guide pulleys it might be managed?—Yes, where the underlie is regular and well attended to. At Great South Tolgus we work the wire rope some 30 fathoms from the underlie, and shall go deeper; but then we add to that by putting proper guides and pulleys. At Great South Tolgus we have 14 feet diameter of the cage, and at Carn Brea 12 feet 6 inches.

9244. Do the men ever try to come up in the skip?—No, it is too fast; the engine makes about 7 fathoms at one stroke of the engine, and it is too fast, they do not like it; that is a very powerful engine.

9245. From your experience of the skip and the wire rope do you think that it might be made to answer for men going up and down?—I do think it might be, but there is a very great dislike among the miners in this country to be lowered by means of the kibble or bucket.

9246. But you yourself think that it might be done?—I do.

9247. You would not object yourself?—I should not object myself, and I should recommend it; but if anything should go amiss I might be tried for manslaughter or something of the kind.

9248. You are satisfied that the working of the skip is cheaper for drawing than the kibble?—I can only say one thing, we have been working in Great South Tolgus six years to the latter part of this summer, and we have only had five skip buckets made there, and we have four of them now in the mine. They have been very much repaired, in that time we have worn out one wire rope, and I suppose that the quantity which we draw is about 1,200 tons a month.

9249. Do you know what was the cost of the wire rope for the Great South Tolgus mine?—Yes, it cost us 68*l.*, and 250 fathoms of 4½-inch wire rope at Carn Brea cost us 60*l.*, or within 1*l.* of it; the price was 38*l.* a ton.

9250. At Carn Brea how long did the wire rope last?—We have been working the wire rope there about 12 months, and I do not know how much longer it will last.

9251. There is no effect from corrosion?—No; we well grease it, we rub it in well with the anti-friction grease, and we work there 12-feet sheaves over the shaft, and at Great South Tolgus there is a 14-feet sheave, so that the wire rope will not bear to turn quickly upon a sharp angle.

9252. How many kibbles do you think it would take in the same time?—I should not like to work it with kibbles, because one going up and the other down they are very apt to turn round and injure the rope, and very likely destroy it, but when working in guides they cannot do that.

9253. What is the greatest depth you are working now in either of those mines?—The deepest level that we are drawing from is 197 fathoms. The deepest point of our working is 208 fathoms, but we have not a kibble or skip there.

9254. Where the men are working are there any close ends now?—We have no close ends but what are woll ventilated; we have a direct current of air through them.

9255. How are they ventilated?—We have a waterfall; a height of water falling into a pipe, and that throws in a very good stream of air, and we shall do away with that in the course of a month or two. We shall communicate from one to the other, and shall have one ventilation all through.

9256. You consider that when once you have sunk a winze the ventilation is good?—We have then plenty of ventilation.

9257. How far would you drive beyond a winze?—We do not think of driving more than 25 to 30 fathoms where we are on the course of the lode, then we ought to sink winzes both for ventilation and for the advantage of working and to see what discoveries can be made.

9258. When you are driving at 30 fathoms is not the air sometimes close?—Sometimes; it depends a good deal upon the size that you carry your level; if you carry it a good size there is more room for the air to play.

9259. Do you ever put in air sollers?—Yes, or we put down a stream of water by zinc pipes.

9260. Does it ever happen to you that the candles will not burn?—We never like to put a man where the candles will not burn.

9261. Does it never happen that the air is so close that the candle will not burn?—It may sometimes, it will depend a good deal upon which way the wind is blowing; we do not allow men to work unless there is air for them to work in.

9262. Still the ventilation somewhat depends upon the way that the wind is?—Yes. I was in a mine last week where they had very good air except when the wind was blowing from the south.

9263. What mine was it?—Wheal Uny; there they had not the air so well last week as they had it before; that was owing to the wind.

9264. In what district is that?—It is very near Redruth Church; it is in Redruth parish; but we have no difficulty in the men working if we do not go more than 30 fathoms from winze to winze; there is plenty of air.

9265. Does the current of air come down the winze to that end?—Not always, sometimes it will go up.

9266. When it goes up what is the effect at the far end of the level?—We do not find much difference. We would rather that it should go up because it follows the driving; sometimes it goes up and sometimes down, and why it does so I do not know. You get two shafts without much difference in height, and you have one upcast and the other downcast. Sometimes you find the air going down the shaft this week or this month and up the next.

9267. Does not that affect the current of air below?—No, I do not know that it does; we have no difficulty if we do not go beyond 30 fathoms.

9268. Supposing that you drive a level in which there are several winzes and that you go 20 fathoms beyond, does the air from that level not go up the last winze instead of going to the end of the level?—It will depend upon the state of the level above.

9269. Of course the extreme end of the level is rather deficient if the air goes up a winze 20 fathoms from it?—Yes.

9270. Do you think that they generally attend to stopping the winzes properly so as to drive the air on?—Yes; the men soon find it out.

9271. Is it generally attended to?—The men will attend to those things themselves for their own advantage.

9272. Have they wooden doors given to them?—Yes, anything of that sort they are always provided with, because if they have not air we cannot get a sufficient amount of labour done.

9273. Do you not think that the men very often will, in order to save a little trouble, work on longer than they ought in poor air?—I do not think that our miners will do so.

9274. What means have you of ascertaining when the air is poor?—Only by the candles; that will soon tell us.

9275. Therefore you consider that if a candle will burn the air is sure to be good?—Yes.

9276. With respect to the boilers, have you ever had an explosion?—Yes, in several mines. We had

an explosion of a boiler in Great South Tolgus and also an explosion of a boiler in Huel Uny, and we have had two or three at Carn Brea. All the explosions that have come under my notice have been a regular collapse of the tube from one end of the boiler to the other.

9277. What do you think is the cause of that?—I do not know; it is generally thought that the water is below the back of the tube, but I have never seen anything like it before these last few years.

9278. Does this happen immediately on starting the engine?—No. We had an explosion at Great South Tolgus. I do not know whether the boiler was 5*l.* worse for wear than it was when it was brought out of the factory; it was a strong good boiler, and the plates were as good as when they were put in; and the boiler at Huel Uny was not in more than five or six weeks; it was not a new boiler, but it was thoroughly repaired, and it exploded. At Carn Brea we had one which exploded in about 12 months I think. The tube goes down as close as it can go; there is a collapse from one end of the boiler to the other.

9279. (*Mr. Holland.*) The internal tube?—Yes.

9280. Had the boiler been short of water?—I do not know that it had. There was something in Carn Brea last year; it happened at the time when the directors came on the mine; there were four boilers side by side, there were two on one side and one on the other of the one which exploded. I was standing off, and there were lots of people about; they wanted to know what the cause was. I actually looked up and saw that the steam was blowing away from the pipe—it went through the roof. I said to the engineman, "Go and turn the gauge cock of the "boilers;" he did so, and I found that the first boiler was flush. I followed him up with the others, and he turned the gauge cocks of the three boilers, and they were all flush of water, and in 20 minutes after the boiler exploded we were working the engine again. I never experienced anything like it before because there were three boilers which were flush to the top-cock, and this boiler had exploded.

9281. (*Chairman.*) Were they connected with each other?—They were all connected one with another.

9282. (*Mr. Davey.*) What you have described took place after the explosion?—Yes, the safety valve was above and the weight of steam pressed it down. The engineman was frightened.

9283. (*Mr. Holland.*) Was the internal flue for this boiler large?—The same size as the other.

9284. What was the diameter of it?—I suppose about 3 feet 6; about 3 feet and 3 feet 6 is the usual size.

9285. What pressure was it working with?—About 35 lbs. to the inch.

9286. Was it an old boiler?—No, it was a boiler which had been repaired; it was a good boiler.

9287. Had it been repaired in the internal tube?—Yes, it had been in thorough repair, but it was not a new boiler.

9288. How long had it been working since its repairs?—I had the whole of them repaired it might have been working 12 months; not more than that.

9289. Was the internal tube 3 feet 6?—Yes; the outer tube is about 6 feet and the inner tube is from 3 feet to 3 feet 6—sometimes it is 3 feet and sometimes 3 feet 4.

9290. The tubes are stayed at the side, are they not?—No. Some are made so, but not often; they are not stayed either from the back of the outside case or the bottom; sometimes they have pieces of iron which come down from the outside and take them up, but that is not common, but now there is a piece of T iron which goes round.

9291. Had this boiler that?—No. If the boiler should be 36 feet long I have been in the habit of putting 4 of those.

9292. So as to divide them into lengths of about 7 feet each?—Yes. If we have not T iron we got stiff angle iron.

9293. About what number of men have their wages saved 15 per cent.?—About 370.

9293*a*. About how much can 370 men earn; as much as 40*l.* year each on an average?—Yes, or more.

9294. If so, 370 would earn 2,220*l.* a year or more. Would not 15 per cent. of that pay the cost of the man-engine in 14 or 15 months?—We were breaking a large quantity of tin stuff, and after we had the engine we had so much more, that is, the way in which I estimated it. The man-engine and everything complete cost us 2,400*l.*, but then that includes a new engine and everything.

9295. That would pay in about 18 months?—Yes, it would pay well for every deep mine.

9296. Have you thought about skips for lifting miners?—Yes, and I thought about it before I recommended the man-engine; but our miners in the county have a very great dislike to be lowered in the buckets.

9297. (*Mr. Davey.*) You say that you approve of skips as deep as you work them, in preference to ladders?—Yes.

9298. Supposing that your mine were 100 fathoms deeper, what would be your notion as to using a kibble instead of a skip for drawing stuff?—If I was going 300 fathoms deeper I would have skips.

9299. Are you aware of any mine in your neighbourhood where they use the kibble?—They do in Dolcoath.

9300. But you do not consider that that is the most profitable way of drawing the stuff?—I am quite certain that it is not. I am prepared to test it at any time.

The witness withdrew.

Captain WILLIAM TEAGUE examined.

9301. (*Chairman.*) What is the name of the mine of which you are in charge?—Tincroft.

9302. Any other?—No.

9303. I believe that you have sent in to the secretary a list of the ages and the names of the men in your employment?—No, I have never been applied to for them.

9304. Will you send in a return of the ages and number of men employed underground?—I have not the least objection to do that.

9305. (*Mr. Holland.*) About what number of men are there underground?—From 200 to 240.

9306. (*Chairman.*) What is the depth of your deepest shaft?—From the adit 190 fathoms.

9307. What levels are you working at now principally?—From the 190 up to the 140 principally.

9308. How far from a shaft are you driving a level?—The furthest level is about 100 fathoms, I suppose.

9309. And how far from any winze?—About 30 fathoms.

9310. What is the extreme length which you would recommend driving from any winze?—About 30 fathoms.

9311. You would not go beyond?—It would vary; circumstances sometimes would oblige us to alter that; but generally speaking, 30 fathoms.

9312. But circumstances would oblige you to go beyond a fixed distance from a winze?—There may be shoots of ore that we want to sink in; then we should vary the distance.

9313. Is the air perfectly good at the 30 fathoms?—We find it so.

9314. How do you judge?—We judge from the clearness of the level, and the freeness with which the men can work.

9315. Do you judge at all from the burning of the candles?—Yes.

9316. How long is the powder smoke clearing away from the level?—It may be about a quarter of an hour at that distance.

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9317. (*Mr. Holland.*) Never longer?—No, I should say, not with us.

9318. (*Chairman.*) Is it then quite clear away?—Yes; generally speaking, a quarter of an hour clears it away at that distance.

9319. Have you ever had any close ends in your mine where the air has been poor?—Yes.

9320. How long have the men been obliged to work in that air when that has been the case?—We have set them to work an eight hours' course, but then they have not been compelled to continue the whole of that time there.

9321. They are obliged to leave before the eight hours' course is out when it is close?—Yes.

9322. How long should you think a man could work where the air is close and a candle will not burn?—We do not wish them to work at all where they cannot burn a candle.

9323. But they do work occasionally so in some mines?—We have never seen it; it has never come under my observation.

9324. What means do you adopt for supplying air when that is the case?—Either by air machines, or water falls, or air sollers.

9325. Have you any of them now in your mine?—Not any.

9326. You do not require it?—We do not require it.

9327. The ventilation is complete without it?—We consider it to be such.

9328. But your only way of judging is by the candle burning?—We can easily detect it if there is poor air or damp there; the men cannot work so freely.

9329. By their own feelings they complain about it?—Yes.

9330. Have you ever any cold damp?—No, not at present.

9331. Have you seen it?—I have.

9332. Have you any idea what that arise from?—We generally imagine that it arises from the damp of the granite, the stone in which we are working.

9333. When that is the case the candle burns very strongly, does it not?—No, not very strongly; it flitters; it does not burn strongly.

9334. How do you know when it is a cold damp; what is the sort of effect which you perceive?—It is close, and you feel heavy; you cannot work freely; you cannot breathe freely as you can where the cold damp does not occur.

9335. The cold damp is different from what you call poor air, is it not?—Very different.

9336. How can you discover the differe ge between the cold damp and poor air?—Where there is poor air the candle will not burn at all unless it is put in a different position. But we detect cold damp from the feelings; there is a curious feeling which comes over us, and we can almost see it about the level.

9337. You see a vapour?—Yes, a sort of a mist.

9338. Does the cold damp affect the wood in the mine; is there any white appearance?—I think not.

9339–40. Does the cold damp appear to be at the lower part of the level or does it fill the whole of the level?—Generally speaking we find that it is at the lower part of the level unless there is a stream of water; water may have a tendency to break it a little if there is a stream of water flowing through the bottom of the level.

9341. And that would make it ascend?—Yes, a little, I think.

9342. Do you find this cold damp when the men have not been working or while they are working?—We can detect it more after they have ceased working and when you go into the place again, but we find that the men feel very much from cold damp even at the time when they are working.

9343. How does it affect them?—It affects their breath; they cannot work freely.

9344. Does it affect their stomach?—I think that it has a tendency to affect them in the stomach.

9345. Do they use any remedy when so affected after working in the cold damp?—I do not know that we have ever had any cases; if a man is ill he goes for the doctor.

9346. Do you use any remedy to get rid of the damp?—We use the same means to get rid of the damp as we should to get rid of the poor air.

9347. (*Mr. Holland.*) Is the damp most usual in dry or in wet mines?—In my experience it never occurs but in the granite mines; the granite has a tendency to create a damp.

9348. (*Chairman.*) You have no other means to adopt for getting rid of that except what you use for getting rid of poor air?—That is all that I have ever seen or all that we have ever applied.

9349. How many underground captains have you?—Two besides myself; there are three of us.

9350. Have you any man especially to inspect all the machinery and all the ladders?—The captains and the timber men take charge of that.

9351. There is no foreman of timber men?—No.

9352. Do the men ascend and descend by ladders?—Yes.

9353. Have you ever thought of putting in a man-engine?—Yes, we have thought of it several times.

9354. Do you think that it would be desirable to have some such means for the men to ascend and descend?—Yes, very desirable.

9355. Do you think that it would answer for the adventurers?—Yes.

9356. That the men would do more work?—Yes.

9357. Do you think that you would get any older or more experienced men by it?—We might; but I do not know that there would be much advantage in it.

9358. For drawing do you use skips or kibbles?—Kibbles.

9359. Do you think that is the best mode of drawing?—I really cannot say.

9360. You have never tried the skip?—We have not.

9361. Is there any reason why you have never tried it?—There are several reasons why we have never tried it. I suppose the greatest is, that we have never been in a position to put down a skip, and the cost would be more than we could think of, and the delay in time; it would take months to put in a skip road in many of our shafts.

9362. And it would stop the mine paying?—Yes, for a certain time.

9363. So that even although it was ultimately to be a great saving and advantage you could not undertake it because it would stop the working of the mine?—I do not know; if it was clearly shown to me that it would be ultimately a great saving and advantage I might be induced to recommend it to the adventurers. I would recommend it to them if I was fully satisfied upon the point.

9364. Have you ever been down in a skip yourself?—I do not recollect that I ever have. I think that I did ride once in a skip, that is some years since.

9365. Have you ever had the cost of putting up a man-engine estimated?—We have thought it over; we thought that it would be from 1,500*l.* to 2,000*l.*

9366. Have you ever had under consideration putting a skip for the men?—We have thought of putting a skip to draw the men.

9367. Did you ever ascertain what would be the cost of that?—No; but the cost of a skip to draw the men would be nothing more than just an additional skip, to which might be attached a safety spring for the purpose of drawing the men. If we put in a skip road we may just as well draw the men over it as the stuff.

9368. Are the men limited as to the quantity of candles?—Yes, generally speaking.

9369. To 2 lbs.?—To 2 lbs. a week per head.

9370. What is the charge in the bill for the candles?—8*d.* I think.

9371. What is the charge for powder?—I think we charge them 8*d.* for powder.

9372. What is your rule as to club money, is it for visible accidents?—Yes.

9373. What is the amount of club money that the men pay ?—6*d.* a head per month.

9374. Is there a separate account kept of the club money ?—No.

9375. I suppose that any balance of the club money in case the mine was wound up, would be considered as belonging to the adventurers ?—Yes.

9376. (*Mr. Holland.*) Do the payment by the men and the payment to the men about balance ?—No, the men are in debt very much.

9377. (*Chairman.*) Then you do keep an account ?—Yes, we cannot rup it out without keeping an account, but there is no separate account. If we have five men on the club, those five men are charged as an engine would be charged ; we pay Tom, Dick, or Harry so much a month, whatever claim they have upon the club. There is no club account kept, but we can look at the books at any time, because our doctor's account is exactly the same as the club account ; they are in equal sums. The doctors are paid their pence, and the club is so much, but it is not carried to account ; it is made the adventurers' account.

9378. (*Mr. Holland.*) And you generally pay more than you receive ?—Yes.

9379. (*Chairman.*) Have you had many accidents in your mine ?—Latterly we have not.

9380. But you have a good many pensioners by reason of accident ?—Yes, several. We were rather unfortunate about two years since ; three or four holes exploded, and it threw some men on the club.

9381. Do you take any particular precautions more than other mines with regard to firing ; do you use cartridges ?—No, we have had them, but the men will not take them.

9382. What do the men use for filling in the powder ?—Iron ; that is not used for filling in the powder, but it is used for filling in the tamping on the powder.

9383. (*Mr. Holland.*) Do you put in the powder with a scoop ?—With a scoop or the top of the powder can.

9384. (*Chairman.*) Can you ascertain at all how those accidents happened ?—No. The last two that have come under my notice have been with the third laying of the tamping.

9385. It has gone off then ?—Yes.

9386. And you cannot account for it ?—I cannot account for it.

9387. Do you think that it could have cut the fuse ?—I cannot say at all ; it may have been that or may not.

9388. Might it have been from powder lying about if the hole was not properly swabbed out ?—It may have been ; it is a very rare occurrence that it all exploded with the third laying of tamping.

9389. Have you had any boiler explosions ?—No.

9390. Is your water pretty good ?—No, it is bad water generally speaking.

9391. How often do you examine your boilers ?—Every month.

9392. Is that a regular thing ?—Yes.

9393. Are the boilers then cleaned out ?—Yes, they are cleaned out every month.

9394. Is there a regular record kept that they have been cleaned out ?—No ; the engineer of the mine goes into the boilers every month to see how they stand, or we expect him to do so.

9395. How does the water act on the boiler, does it corrode the plates evenly over ?—No ; we generally find that it gets between the space left over the water, and just on the rim of the water.

9396. Have you any means besides the stop-cocks for the men ascertaining the quantity of water ?—No.

9397. Have you more than one safety valve ?—We have only one on some boilers, but we are adopting two on most of the boilers.

9398. Do you adopt any plan to prevent the man loading the safety valve ?—No.

9399. With respect to the men's deductions, are they charged for the barber ?—Yes.

9400. How much ?—Twopence.

9401. The charge for the doctor is 6*d.* ?—Yes.

9402. (*Mr. Holland.*) Are the boilers ever tested for strength ?—No.

9403. You never try their strength again ?—No, we never try their strength after they are put in.

9404. (*Chairman.*) Do your men change in the boiler house ?—No.

9405. You have dries and changing houses for them ?—Yes.

9406. Do the women work under cover ?—Most of them work under cover.

9407. Have they any place for getting their meals in ?—Yes.

9408. (*Mr. Davey.*) You have not any prejudice against the skip, if you had the means, if you could spare a shaft and could afford the money you would have one ?—It is more than probable that we should. I have no prejudice against them, although I must confess that I do not think there is the advantage in them that people run away with ; but I believe that we should try one if we had a shaft which was prepared to receive one.

9409. (*Chairman.*) How are the doctors appointed ?—They are appointed principally from the adventurers, I believe, generally speaking.

9410. Do not they very often become shareholders ?—They sometimes become shareholders, and then I suppose they think they have a claim.

9411. Are the men consulted at all with regard to the doctor ?—Very rarely.

9412. And you think that that is a cause of dissatisfaction with them ?—I think so.

9413. That they are obliged to pay to a doctor whom they may not wish to employ ?—In some instances they do.

9414. How many doctors have you to your mine ?—Three.

9415. Cannot the men choose which doctor they shall go to ?—No, the doctors generally divide their work according to the districts.

9416. The doctors divide among themselves the districts which they attend ?—Yes.

9417 Do they often appoint assistants ?—Most of them have assistants.

9418. (*Mr. Holland.*) Do they turn the mine work over to the assistant ?—They do not profess to do that I believe ; ours do not, and I believe that most of them do not, but the assistants are called in to help them. I suppose that the doctors like to find them work when they have got them and have the paying of them.

9419. (*Chairman.*) Is there any inquiry into the qualification of a doctor before he is appointed ?—That is what I cannot enter into. I do not know what arrangement they make, I only know that I see assistants.

9420. The assistants are not always qualified persons ?—I do not say that.

9421. Is there any security for their being qualified persons ?—I have never seen any security given for their being qualified persons ; we imagine that the doctors themselves make every inquiry to get the best assistants.

9422. But the men are not satisfied with the assistants ?—At times they are not. What I should like to see introduced would be that if there are three or four doctors about a district they should be named to the men, and that the men when they come into the mine should make choice to whom they should pay the money.

9423. (*Mr. Davey.*) Would there not be some difficulty about that in men changing frequently ?—There may be difficulty, but I do not see why it should not be overcome. There are three doctors in the mine ; the men might be asked, "Which will you pay your money to ?" "I shall pay my money to A, he has attended me for some years and he has done justice, and I shall be pleased ;" and I believe that being pleased is half the cure, if a man is satisfied with the medical man.

9424. (*Mr. Holland.*) Supposing that it should cost

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a little more for giving more trouble to the doctors, do you think that the men would be willing to pay a little more ?—That would be their business; perhaps they would.

The witness withdrew.

Adjourned to to-morrow at half-past 10 o'clock.

Wednesday, 6th August 1862.

PRESENT :

The Right Hon. LORD KINNAIRD, K.T.	JOHN ST. AUBYN, Esq., M.P.
RICHARD DAVEY, Esq., M.P.	P. H. HOLLAND, Esq.
NICHOLAS KENDALL, Esq., M.P.	

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

Mr. JOHN RICHARDS examined.

Mr. J. Richards.
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9425. (*Chairman.*) What mine have you charge of?—Wheal Clifford Amalgamated mines, in the parish of Gwennap.

9426. Have you the charge of any other mines but those ?—I look after a little mine called Pennance; but that has nothing but a shaft going down; that is also in Gwennap.

9427. Have you sent in a return of the number of men who are employed under you?—Yes.

9428. What is about the number of men who are employed underground?—Somewhere about 600.

9429. What is the number altogether employed on the surface?—I think there are 200 men who are employed on the surface.

9430. Including the women and children?—Including women and children, I think, we have there about 500.

9431. (*Mr. Holland.*) Making together 1,300?—Altogether about that number.

9432. (*Chairman.*) How young do the youngest children come to work?—About the age of 10.

9433. Do they work underground?—No, at the surface; some are under that, but in general we do not like to take them much before the age of 10; some are as young as 7, a few.

9434. I suppose the parents are obliged from necessity to send them so early to work?—Yes; they cannot provide for them otherwise; their gettings are not enough to keep a large family.

9435. To work underground, what is the youngest age at which you admit the children?—13; there may be a few under that age; but they are not allowed to do it.

9436. In what manner do the men ascend and descend the shaft?—By a man-engine; sometimes they go down by ladders; but they can always come up where the man-engine is; that is as far as the Clifford United mines are concerned; but at the Consols we have a shaft 120 fathoms deep, and they go down and come up there by ladders.

9437. What is the depth there?—The depth of the ladder is 120 fathoms, and 40, making 160 fathoms from the surface. The Old Consols is 274 fathoms under the adit.

9438. But you are not working there?—No; the water is let in, and we are keeping the water under at the 120 by one engine; we used to have five or six engines there.

9439. How long has the man-engine been working?—I should think from 18 to 20 years.

9440. Is it a double engine?—Yes. It has been working 18 years.

9441. Do the men come up at all in the skip?—Sometimes they will come up in the skip fast enough if the man-engine is idle.

9442. Do you think they prefer the skip to the man-engine?—No; the contrary.

9443. Could you work the mine without the man-engine?—Not at the bottom; the heat is so much; we could not work at the bottom without the man-engine or a skip; we must have one or the other.

9444. Because the heat is so great?—Yes; and that does weaken the miners; they cannot work a core as they could, or climb up; they would have the hardest work to go through at the latter part of the time.

9445. You mean that they would become so exhausted by the heat that they could not climb up the ladders?—I think they could not; they would not be able to do it.

9446. Would the mine be working now if there was no man-engine or a skip?—I do not think she would be working at the bottom; they might work the shallow parts; but I do not think we could pretend to work the bottom.

9447. What is the deepest level at which you are working now?—230 fathoms below the adit, and that is 40 or 45 I think; that is at the United mines; at Clifford the deepest level is 200 fathoms, and that 200 is very near as deep as the 220 in the United Mines, on account of the loss of level.

9448. What is the heat at Wheal Clifford?—The heat is 102° at eight fathoms and a half under the 200.

9449. What is it at the 220?—About the same; it may be 2° more perhaps.

9450. What is it at the 230?—Hotter, a pretty deal. I should think that you might call the heat there 120°.

9451. When did you last ascertain the heat there?—It was taken within the last four weeks I should say; we carry a thermometer down occasionally.

9452. Is the heat in the mine reported to you?—Yes.

9453. Are the miners working at the 230 fathoms?—Yes; we are driving two levels there.

9454. Does the heat vary much at the same level?—Not where it is a close end; where it is any way from the shaft the heat is just the same; we work at the 230 from three shafts. The men are working regularly from Taylor's shaft and from Garland's shaft.

9455. Does the heat vary when the men are working?—Perhaps the heat is a little more; a very trifle; not much.

9456. In what manner is the air carried into those close ends?—By what we call winzes; we communicate there at every 12 fathoms; we put down a shaft and throw every particle of fresh air that we can down into the level, so that it may ascend up.

9457. Have you no means of forcing it into the end of level?—Yes; we have; we put in air sollers where we a have a draught outwards, and keep it up from the bottom as high as this table, and the air rushes in.

9458. Have you got that now in the 120 fathom level, or in the 230 level?—No; we do not want it there.

9459. What do you mean by not wanting it?—The air is as good as we can make it.

9460. Do you mean that by putting in a soller you would not improve it?—Yes; at present in those levels we have a winze where the air comes down nearly to the end.

9461. How far are you driving now from a winze?—In Garland's shaft about six fathoms; and at Taylor's we are further, I suppose 20 fathoms. Then we are throwing in air there a very large quantity,

taking it up where the draught is uncommonly strong, like the wind through a large pipe.

9462. How many pitches are there in the 220 fathom level?—There are several pitches.

9463. Are they at work?—Yes; I should think that there are working in the back of the 220 fathom and at the back of the 208 fathom levels as many as 60 men in different pairs.

9464. Is the heat experienced by each pair in that level the same?—Yes; in this level the heat is not so much.

9465. Is the heat the same throughout?—Yes, it is exactly the same there.

9466. What is the heat at that place?—The heat there is about 96°.

9467. Are the men who are driving the 220 fathom level exposed to the same heat?—Yes, it is about 102° there.

9468. How long do the men work in a place where the heat is 95° without going back to obtain fresh air?—They work for four hours out of six, or five hours out of six, and they can stand it pretty well; they have been brought up from boys to it.

9469. How long can they work where the heat is 102°?—They cannot stay there I should think without going back an hour.

9470. Do the miners work where the heat is 95° for four hours consecutively?—Yes, very regularly.

9471. Where the heat is 102° you say they can only work for one hour?—Yes, they can only work for one hour before they go back.

9472. How long do they stop where they go?—They stop an hour, I should think, and I suppose that we can get about half the work out of a six hour core,—three hours work.

9473. At the 220 fathom level, how long do they continue at work?—Perhaps in the 220 fathom level we can get just the same as in the stopes, they stay in perhaps an hour and a half, then they go back for half an hour, and then they go in again, and so on; but they are obliged sometimes after the explosion of the powder, and until the smoke is cleared away, to come back.

9474. Suppose they were driving a cross-cut at the 230 fathom level, would there be any difference whether they were driving a cross cut, or driving towards the lode?—Yes, I should think they could stay longer in the cross cut than in the lode.

9475. For what reason?—Because of the fumes of the lode. There is more sulphur in the lode than in the country, the country here is all clean in the branches, the lode is hollow.

9476. When you cut a load, do you find more heat there than in the country itself?—Yes.

9477. And the lode gives out that heat?—Yes, the lode gives out heat more than in the cross cut.

9478. Can the miners work continuously for one hour in the 230 fathom level?—Yes, I think they can if they are used to do it.

9479. Do they do it?—I think so; we do not keep people there always to look after them. They are all upon what we call tutwork; we give them so much a fathom, and they must do their work when the month is out, or else they cannot eat.

9480. Do you never ascertain how long they are able to work?—They are able to work what I tell you I think.

9481. To the best of your belief, do they stay for one hour before they come out to obtain fresh air working in the 230 fathom level?—I think they do.

9482. You have stated that the boys who have been brought up to it can work longer in these hot levels than men who have not been brought up to it?—Yes, I did, they are more inured to it; it is just like where you are working in the furnaces in a great deal of heat with the smiths. A man brought in from the country cannot stand that heat the same as a man who is accustomed to be there, and these boys by being brought up always underground are the men for our hot levels afterwards. We bring them up with the temperature at about 70° or 75°, but the other men will not stay there at all—they stay there only a few cores, and they are off again; and likewise, if you put those who are able to bear the heat up where there is a cold draught, they will not get on so well.

9483. (*Mr. Kendall.*) They cannot bear the change from 70° to 90°, nor from 90° to 70°?—No, not for a month; they will take cold, and get ill.

9484. How are they affected when they become ill?—They are affected in the chest; in the pipes.

9485. They are so affected if they have been working in a hot level and change to a cold one?—Yes, they will get affected in the chest.

9486. Are there any men working in your mine who are thus affected?—There are two or three at the surface, not underground.

9487. Are the miners as much affected by a change from 70° to 95° as those are who change from 95° to 70°?—Yes, just the same.

9488. (*Mr. Holland.*) What effect does the increased heat produce upon them?—They get languid and faint.

9489. And not affected in their lungs?—Yes, they are.

9490. (*Chairman.*) If the miners shift from 70° to 95° they feel faint?—Yes, and languid.

9491. Are they not able to continue at their work?—No, perhaps they may work there for a day or two, and then they will want relief after a while; if they can stand it a month, they will be able to get on.

9492. Do the young miners suffer so much as to be obliged to leave off work altogether during the time of their training?—No; it just depends upon a man's constitution. Some will stay there and not be affected at all. I know many of them who are there that have been there for twenty years and who are not affected to appearance by it, but by and bye if they are taken ill they are gone very soon.

9493. (*Mr. Kendall.*) You say that you have known men who have been able to bear this excessive heat for twenty years, but when they are attacked with illness they are carried off very rapidly?—Yes.

9494. Do you recollect the state of the mine before you holed at Wheal Clifford at the 208-fathom level; when was the hottest time?—About ten years since, before we holed at Wheal Clifford at the 200-fathom level.

9495. Do you recollect what was the greatest degree of heat at that time?—I suppose it was 128°.

9496. How many men had you got working the hole?—We had working in one end, going eastward, 16 men, and we had coming from the other way against that, 12 men.

9497. What was the size of the drift?—The size of the drift was 7 feet high and 4 feet wide.

9498. Had you so many men employed as to have constant reliefs?—Yes.

9499. How many men used to be employed in the same core?—Four in one and three in the other.

9500. What was the mode of working that you pursued?—They would work in this way; the men would go in till they got tired.

9501. How long could they stand it at that time?—An hour, perhaps, was a long time; say half an hour.

9502. Had they plenty of water there to drink?—They always had plenty of water to drink; they had a long way to go back.

9503. Did those men fail much?—I do not think they did.

9504. Do you know anything about their appetites; did they eat well?—Yes; pretty well. The men stood the work like that pretty well; they were not working more than half the time; they were an hour down, or hardly that.

9505. Did you ever know a case of a man being scalded?—Yes; by leaning against the pump.

9506. Is there any chance now of the same degree of heat being found again?—I do not know. The only thing is this, that perhaps there would be at the bottom of the mine. We do not do anything under the 230-fathom level now. We have a shaft under

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that, about 5 or 6 fathoms; but lately we have abandoned it.

9507. Supposing you were obliged to sink in order to get to a deeper level, might not the same thing occur again?—Yes; I think it would.

9508. Have you ever adopted any means to remedy that?—Yes; we have. We brought down a fresh current of air, and threw it back through the bottom of the level, and brought it up, and in places it had the desired effect; but where that place is that I spoke of last we can now bring in a larger current of air than we did, and remedy it in part.

9509. But that is not done now, is it?—No; because we do not work in that very hot place.

9510. Would it not be worth while to do the same thing at the 230-fathom level?—We have a pretty good draught there.

9511. Is it not worth your while to try to reduce the temperature there?—I do not know how to do it.

9512. If you could introduce a stronger current of air would not that reduce the temperature?—Yes; I should think it would.

9513. Is it not the expense of bringing it down that stands in the way?—Yes.

9514. But it would be an advantage to the men, would it not?—Yes; no doubt. If we could get the same draught that we had at Taylor's we should remedy the evil, but it is a long way to bring it.

9515. How much do you think you could reduce the heat?—I should think we could bring it down to 114° or 115°. The remedy is a slight one, because very often the great heat will overcome the cool draught before it is in sometimes.

9516. Are you quite sure that the heat at the 230-fathom level does not exceed 115°?—I should think so.

9517. When was it tested?—I do not know. I do not think that it has been tested for a month, but we will try it next week if you desire to know.

9518. Is the water of the same temperature as the air?—Yes; very nearly. It does not vary more than a degree or two.

9519. How do you account for the great heat there?—My opinion is that there is some ingredient in the lode, whether sulphur or not I do not know.

9520. Is the lode a large lode?—The lode is as large in places as this room is wide.

9521. (*Chairman.*) Are you quite sure that the miners can work for an hour in a temparature of 116°?—I think so. They are ordered to work longer than that; and I think that the men do work that.

9522. How far have the miners to go from the end of the levels at the 230 fathoms and at the 220 fathoms for fresh air?—At the 230 fathom level, I suppose they must go back and climb up above 20 fathoms, and go in from that place to where the level is, and if they go up 20 fathoms they will have very good air.

9523. Then they go from the end after working to get fresh air every half hour, or every hour?—Every hour; but perhaps they do not go where the fresh air is, they go up to one level where the air is better.

9524. Suppose that a man's candle goes out, and he has no matches, or they have got wet, what might happen then?—They have always got matches.

9525. But suppose they had not got any, or that they had got wet, and would not light?—Then they must go to a neighbour; there are people working not far off.

9526. But how would they go along the level, would it be safe to go along the level without a light?—Yes, the light would, of course, be preferable, but repeatedly the miners have to walk a good way in the dark to get a light, but not since the present matches have been in use, they generally carry them with them.

9527. They have not to go on their hands and knees, groping their way along for fear of falling down through the winzes?—No.

9528. Did you ever know a man to find his way from the bottom of a mine to the top in the dark?—Yes, it is from the use of it.

9529. Are all the openings between one level and the other well protected?—Very well.

9530. The timber-men have charge of those matters?—Yes.

9531. Who is it that reports to you as to the state in which the mine is in those respects?—The agents very soon report it. They have to go through those places every day, and if any thing was defective, of course the timber-men are ordered to put it right.

9532. Is it perfectly safe to go along one of those levels without a light?—Certainly, to people who are used to it.

9533. Would they know that there were large gaps or holes running down to other levels?—Yes.

9534. Have you never known an instance of a man being obliged to go on his hands and knees for fear of falling down any of those holes?—Yes, if they have to go across a shaft or something of that kind, they must be very cautious, but where these winzes, or workings are at the bottom of the levels, which they pass every day, they can do that.

9535. In the dark?—Yes; but you will not find so much darkness down there since the lucifer matches have been in use.

9536. Is the air good down below although it is hot?—Yes.

9537. Does not the great heat in the mine cause a areater down-draught, and so bring in a current of gir?—No; if we want a current of air we send it down; but the air down there, the hot draught, is not so injurious as you might suppose.

9538. I understand that accidents are frequent, such as men falling from one level to another; do those accidents ever occur in your mine?—Very seldom; we had one man who fell in a shaft a little while ago.

9539. Was he climbing at the time?—No, and he had a candle alight with him.

9540. How did the accident happen?—He slipped his foot or his hand.

9541. There is no rail to protect any one?—There can be none in the shaft where they are sinking down, if you are sinking a shaft the whole length is only four feet long, and there is a pump going down there; here they had a rope to wind them up, and they must draw the kibble over their head.

9542. But that was while they were working at the shaft?—Yes.

9543. Have many accidents occurred in your mine during the last three years?—Not many.

9544. Can you state how many?—No.

9545. What allowance of candles do you make to the miners?—2 lbs. of candles per week to each man.

9546. Were more candles allowed to them when they were working in that hot end?—When it is very hot they have 2½ lbs.; but they do not burn 2 lbs. down in those hot ends, they only keep one light.

9547. What kind of candles do they use down there?—They are made of the best tallow.

9548. Do you use any patent candles?—Yes, we do, some of them.

9549. What do you charge per pound for the candles?—Sevenpence.

9550. How long is the powder smoke clearing away in the 220 and 230 fathom levels?—I suppose the powder smoke would take half an hour to go off, sometimes more, sometimes an hour, it depends upon how wet the hole is; if it is very wet it will make more smoke.

9551. What do the miners pay you for powder?—They pay eightpence a pound.

9552. What amount do they contribute for club-money?—Each man contributes sixpence per month.

9553. Is that to provide for visible accidents?—Yes, for visible accidents, or if they have been hurt by long continual working in the mine they are paid the club. If a man comes to perhaps fifty years of age, then we pay him the same as we pay to a man that is hurt if we have reason to think that he came by the illness there.

9555. What allowance do you make to them?—25*s.* a month.

9554. Is there any account kept of the club-money separately from other account?—Yes.

9556. Is the club-money that is contributed by the miners sufficient to meet the expenditure?—Yes, but sometimes it is not, sometimes it is more, but I think that our club stands on rather good ground now, there is a balance in hand.

6557. To what amount?—It is not very heavy; perhaps 70*l.* or 80*l.*

9558. Is there any charge made to the miners for the barber?—No.

9559. How are the doctors appointed?—They are appointed by the adventurers.

9560. What is the charge made to the miners for the doctors?—6*d.*; then the doctor must attend them through sickness or hurts; that is, the man himself, not his family.

9561. Are the earnings of the men more in this than in other districts?—No, I should think not; their gettings generally are about 3*l.* or 3*l.* 10*s.*; sometimes we give them as much as they can do in a month; if the ground is favourable they will get more money.

9562. But a miner may get less than that?—Yes; I should think that the average gettings are 3*l.* 10*s.* a month.

9563. Some earn more and some less?—Yes; where they are able men they are pretty regular.

9564. Are there more men who get more than that than those who get less than that?—There are more who get less than that.

9565. With regard to the boilers, does the water that is used injure the boilers?—They are obliged to bring water there; we do not use the bottom water for the boilers at all.

9566. You bring the water to the boilers?—Yes; and we pay a rent for the water; we have an engine to pump that water up from a shallow level in order to send it all round the mine to the different engines; we have large wells there as reservoirs to receive it, and we take it out as we want it.

9567. Have you ever known a boiler burst?—Yes; only yesterday, I am sorry to say.

9568. Was any body killed?—No; nor hurt.

9569. Do you know how that was occasioned?—I do not.

9570. Are the boilers examined regularly, or at any stated periods?—They are examined every month pretty regularly; we cleanse them, and they are examined all through.

9571. Is any record kept of such examination?—No.

9572. Was the engine at work when this accident occurred?—Yes.

9573. Had it been out of work?—Yes; the evening before it occurred they had cleansed this boiler, and they lighted a fire, and the boiler filled at four o'clock, and it worked on till midnight, and they stopped to change the bucket, went to work again, and they thought that they were working all right, and about seven in the morning off went the boiler.

9574. Have you any water-gauge?—We have a cock and a safety valve.

9575. But no water-gauge?—Not up.

9576. Do you test the quantity of water in the boiler by working the taps?—Yes; by working the cocks; we have two, one near about the level of the top of the tube, and another about three or four inches, which we call the working gauge.

9577. Is there more than one safety valve?—No; there is one to each boiler.

9598. You test the quantity of water in a boiler by the cocks?—Yes.

9579. Is there a float to the feed-pipe?—No; we force the water in.

9580. (*Mr. Holland.*) You have stated that there were 60 men working in the 220 fathom level?—Yes.

9581. At a temperature of about 95°?—Yes.

9582. Did they generally work only for four hours out of six?—Yes; about that.

9583. Was not one-third of their time lost thereby?—They worked eight-hour cores.

9584. In consequence of the high temperature they would be only doing three-fourths of the work that they would otherwise be able to do in cooler air?—Yes.

9585. Their net earnings would be something more than 200*l.* a month?—Yes; but you must add the cost to that (4*l.* 10*s.* a month); we must pay 4*l.* 10*s.* a month, and then we should have that returned again.

9586. Of which one quarter, or 50*l.* a month, is lost in consequence of the hot air?—Yes.

9587. Therefore, if you could reduce the temperature of the air, say to 70°, at any cost less than 50*l.* a month you would gain by it?—Yes; but I am sure we could not do it at that cost.

9588. If anybody furnishes you with a plan which enabled you to do it for less than 50*l.* a month, would you not be very much obliged to him?—We would try it.

9589. Do you think, from your experience, that a modification of the skip would supersede the necessity for a man-engine?—Yes; you could put a skip in at a good deal less expense; but then, if anything should occur from the rope breaking, the loss would be more than it would in the case of the man-engine.

9590. What objection have you to the skip, except the chance of the rope breaking?—Because we cannot bring the men up fast enough.

9591. But suppose you brought them up on stages, would it not answer?—Then we must have another machine on purpose for it; it would hinder us two hours a core; that is, two or three times a day; therefore it would hinder us six hours in the 24 in bringing the men up. You cannot go down with the skip more than about once in ten minutes, or six times in an hour, and we should not bring them up in that way.

9592. But with a double skip you would bring up twice as many?—Yes; but six times 4 make 24 men, and twice 24 make 48 in both lifts, and we can bring up in 20 minutes with the other 100 men; the man down at the bottom gets in, and by the time he gets up to grass there are 125 steps; that bottom man will have taken half an hour; but when they are on the rope they will not come up quickly enough.

9593. Have you any other objection to the skip?—None at all, I believe.

9594. You have mentioned two—the chance of the rope breaking and the loss of time?—Yes, in bringing the men up.

9595. The danger of the rope breaking and the skip falling upon the men might be easily guarded against?—Yes.

9596. If those difficulties could be overcome, your objections would be removed?—Yes.

9597. (*Chairman.*) Supposing you had an extra drum with the means of taking down nine or ten at a time, and two skips to be used only for the men, do you think that would answer?—Perhaps it would, but there would be the extra cost, and we do not want it with us.

9598. But do you think it might be made to answer?—Yes, I think that the skip might be made to answer to bring up the men. If there was any good prospect, I should prefer a man-engine; but in a small mine, and with bad prospects, I should prefer a skip.

9599. Has any accident ever occurred with the man-engine?—Yes, once.

9600. How did it occur?—The man missed the steps.

9601. Do you think there is no danger if the iron handles by which they hold on are off?—There ought to be none off.

9602. How could a man hold on without them?—He has to keep his hand on the side of the rod; the iron handles are off but very seldom.

9603. But if they are off, do you think there is no danger in it?—Not with people who are used to it.

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9604. Do you think it is safe to hold on only by the rod ?—Yes.

9605. Do you not think that for the safe working of a mine, it is desirable to have one man employed in inspecting the whole of the work, and to see that every one thing is in good working order ?—To be sure.

9606. Do you employ one man for that purpose ?—We have one inspector there to look after all the machinery in the mine.

9607. And also the foot ways ?—Yes.

9608. (*Mr. Kendall.*) Should you not consider that what was perfect safety for the miner would be rather dangerous for a perfect stranger ?—To be sure.

9609. The Chairman asked you just now about the danger in the different levels in consequence of the winzes not being covered over. You often leave them open, do you not, with a small plank placed across ?—Yes.

9610. If a plank six or eight inches wide were placed over a winze 50 feet deep, you would call that perfectly safe, would you not ? —Yes, I should say so.

9611. You would give a stranger a helping hand ?—Yes, we should be very cautious with them, and show them a light.

9612. If you were to cover over those winzes in order to accommodate a stranger, would not that a good deal interfere with the ventilation ?—Yes, very materially.

2613. Do you think that a miner has to crawl across a plank of that kind, when his candle accidentally goes out, twice a year ?—Not across a winze.

9614. Do you think he crawls anywhere twice a year, if his candle happens to go out ?—Perhaps he does.

9615. Ought a miner ever to be without a light ?—No.

9616. I suppose that for a halfpenny a year spent in lucifer matches, he could get light enough to guard against everything ?—Yes, the miners are not allowed to be without a light ; if they are, it is their own fault.

9617. Have you many men in your mine who have been disabled from working in very hot levels ?—There are four or five.

9618. I suppose you have more men who have become disabled from working in hot levels than from working in the cooler levels ?—Yes, I do not know that we have one there.

9619. Is there any difference in the look of the men who work in the deep levels ?—I do not think there is any great deal of difference in their looks, perhaps the very hot levels make them look a little more flushed in the face, and perhaps that is a bad sign.

9620. What is your opinion as to the general health of the miners ?—I think that the general health of the miners is pretty fair.

9621. Your mine is the hottest mine in the county, is it not ?—Yes, there is nothing like it, I think.

9622. Do you know much of the agricultural population ?—A good deal.

9623. Is there much difference between them and your miners ?—I should say that our miners do not live so long as they do by some years.

9624. How long have you worked underground ?—From the beginning. I have been a miner for 40 years.

9625. How old were you when you began to work ?—About 15.

9626. What is your age now ?—I am bordering on 70.

9627. Do you go underground now ? — Very seldom.

9628. How long have you ceased to go underground ?—I have not ceased at all ; but to go down regularly I have ceased about two years.

9629. Up to the age of 67 then you went underground regularly ?—Yes.

9630. Up to that time were you as strong as other men ?—Yes ; but I have not had as hard work to do as other men.

9631. Did you work your way up ?—Yes.

9632. For how many years did you work as a miner ?—For about three or four years.

9633. Your principal employment since that has been as an agent ?—Yes ; and my father was an agent before me.

9634. You have never had to perform the hard labour of a miner ?—Not for years.

9635. Your father was an agent before you, and I suppose you stepped into his shoes ?—I did afterwards.

9636. (*Mr. St. Aubyn.*) Can you state what is the average cost of a man-engine per fathom ?—3*l.* 10*s.*

9637. What is the average cost of a skip per fathom ?—About 30*s.*

9638. (*Mr. Kendall.*) If you could get rid of the danger connected with the skip, and you could also bring the men more quickly up, you would prefer a skip ?—I will not say that. I prefer a man-engine.

The witness withdrew.

Mr. JOSEPH JEWELL examined.

Mr. J. Jewell.

9639. (*Chairman.*) Of what mine have you charge ?—East Tolgus.

6640. Have you charge of any other mine ?—South Tolgus, West Tolgus, and Tolcarne.

9641. Which is the deepest of those mines ?—South Tolgus.

9642. Have you sent in to the Secretary a return of the number of men in your employ ?—Yes.

9643. How many men altogether are under your charge underground ?—There are 236 men and 56 boys.

9644. What is the number of the other persons who are employed ?—About 120.

9645. What is the deepest level in the mine ?—The 130-fathom level below the adit. A shaft or sumpt is down there for another level, for the 140-fathom level.

9646. Are the miners working at the 130-fathom level ?—Yes.

9647. What means are employed for the men to ascend and descend the mine ?—Ladders.

9648. Does the mine produce copper or tin ?—It produces copper.

9649. How far are any of the levels driven from any shaft ?—About 200 fathoms east and west.

9650. How far from a winze are you now driving ?—Some six or seven fathoms ; some about ten fathoms ; and some 15 or 16 ; after that we generally sink down winzes.

9651. What is the extreme length that you drive an end from a winze ?—About 20 or 23 fathoms is just as far as we go.

9652. Are there any hot or close ends ?—Nothing in particular that I can speak of ; none at all.

9653. Are there any ends in which a candle will not burn ?—None.

9654. Do you not require any artificial means for the purpose of throwing in air ? — Sometimes we throw it in by a waterfall ; the places get a little warm in 18 or 20 fathoms.

9655. Have you got that at work at present ?—We have at Tolcarne at present. We put it to work yesterday. That level is in about 17 fathoms from the shaft.

9656. How close are the pipes taken up to the end of the level ? — About three fathoms behind. We generally keep a false pipe, and when they blast a hole they take out that pipe and put it back again afterwards.

9657. How long is the powder smoke before it clears away where this pipe is ?—Probably ten minutes or a quarter of an hour.

9658. How long would it be if the pipe had not

been put in?—Probably half an hour or more. I should say more than that.

9659. Have any accidents occurred from blasting during the last three years?—One occurred in South Tolgus about two months ago.

9660. Were you able to ascertain the cause of that accident?—I believe it was through carelessness on the part of the man himself.

9661. In what way?—From putting in the tamping on the powder with an iron rod; that is not allowed to be done, nor in any of the other mines. He confessed it afterwards. His sight has been injured for a little while, but he will be able to work again in a few days.

9662. He has not lost his sight?—No.

9663. Do you supply the miners with wooden rods for the purpose of cleaning the hole previous to and after charging it with powder, not for tamping?—Yes; every man in the mines has got one.

9664. I suppose the accident occurred from the iron coming in contact with the gravel and striking a spark?—Yes; there have been instances when the fuze has been cut by the ramming bar, the "iron" as they call it, but not in our mines that I have seen or have known.

9665. What quantity of candles do you allow to each miner per week?—2 lbs. per week.

9666. What price do you charge them for the candles?—About 8*d.* per lb.

9667. Do you vary the price?—Yes; we send out for tenders; we ask the merchants what they will supply us with candles for for two months; and, in fact, they are at this time 5*s.* 3*d.* a dozen pounds, and we let the men have them at 8*d.*; In some of the mines it is 8*d.* We charge a little over in places, but that is just how we gave them out to the men before.

9668. Do you do the same with regard to the powder?—No, we charge them 8d. a pound for that, whatever the price of it is; but the price has been just the same for several years. If it came down to a much lower price, I dare say that we should take it down to 6d.

9669. Do you use any kind of patent candles?—No.

9670. Or any patent powder, or powder of any particular kind?—We have tried all the powders.

9671. Is there any difference as to the smoke that is made after an explosion?—Mr. Davey's powder at the commencement did not make so much smoke. I gave an account of that in a paper. I thought that the men might go in to work again in five minutes in an ordidary place, but I see very little difference now. I remarked it last week underground.

9672. Is the powder not so good as it used to be?—No; it makes smoke just like other people's powder.

9673. It would be an advantage to you, would it not, to have powder that did not make so much smoke?—Yes.

9674. Do you think that the smoke is at all injurious to the miners?—I do not think that it does them any good.

9675. Have you had during the last year any men out of employment, in consequence of having worked underground?—No.

9676. What amount do the men pay as club-money? 1*s.* per month for doctor and club.

9677. Is the club-money applied in cases of visible accidents?—Yes.

9678. Is there a separate account kept of the club money?—Yes.

9679. Are the doctors appointed by the managers or by the adventurers?—By the manager. Mr. Taylor generally takes it upon himself to appoint the doctors. I have been under him for 25 years, and it has ever been so since I have been with him. We appointed the doctors, or he did, a few months ago at West Tolgus.

9680. Does that mode of appointing the doctors give satisfaction to the men?—Sometimes it does, and sometimes it does not.

9681. With regard to the boilers, is the water that is used not injurious to the boilers?—Our water is very good.

9682. How often are the boilers tested and cleansed out?—Once in three or four months.

9683. Is there any regular time for that to be done?—Yes; we generally do it every quarter, or every four months.

9684. Do you make any record of the time when the boilers were last cleaned out?—Not exactly. The working engineer of the mine sees to that, he sees that it is done properly. We keep a working engineer on the mines, and he goes from one mine to the other to see that these things are attended to.

9685. Do you think that when the men are paid in notes they are induced to go to a public house to obtain change?—Certainly, they must go somewhere to get change.

9686. (*Mr. Holland.*) Is there only one doctor employed in this mine?—There are two at South Tolgus.

9687. May the men choose which they will go to?—Yes, which ever they please. There are two doctors in every one of the mines.

9688. And the men have a free choice as to which they will go to?—Yes; there are three doctors at East Tolgus.

9689. Does that prevent discontent?—I do not hear but very little said about it. I put a question to the men about it. Some of them will complain a little at times.

9690. Is it much better to have two doctors than only one, so as to give the men a choice?—Certainly.

9691. (*Mr. Kendall.*) Do you think it would be a good plan if, instead of having doctors specially appointed to take the mines, you had doctors for a district, and if they agreed to attend to any man who might come to them?—I think that that would be a very good plan.

9692. Do you think there would be any difficulty in getting the medical men to fall into such an arrangement as that?—I cannot say. I think it would be a good plan, for then a man might choose his own doctor.

9693. And then the doctor would have the doctor's money, whoever he might be?—Yes.

9694. Is your mine a healthy mine?—It is very good.

9695. Is it well ventilated?—Yes.

9696. Have you many men on the sick club?—There is not one at this time.

9697. Then, I presume your club is rich?—Sometimes we have accidents, but I understood you to speak of men who are laid up through disease from bad air.

9698. Have you no case of a man who is laid up from having breathed bad air?—Not one at this time in our mines.

9699. Have you had many men laid up from that cause?—No.

9700. Is the natural ventilation in your mines good?—Very good indeed.

9701. Have you very seldom to resort to artificial means?—Yes.

9702. (*Mr. St. Aubyn.*) You have no doubt as to the man-engine being a better thing than footways, where it can be conveniently introduced?—I think it is most essential for the well being of mankind. I did belong to the mine where Mr. Richards is, where a man-engine was put up, and I found it very good.

9703. You have a preference for the man-engine, as compared with a skip?—Yes, I prefer a man-engine to a skip myself.

9704. Do you consider that the health of the miners generally in this district is better than it was when you began mining?—I do think so; very much better.

9705. To what do you think that improvement in their health is attributable?—It is because the mines are better ventilated.

9706. Can you suggest any means for improving the ventilation in the mines to a greater extent than

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it is already improved ?—I do not know that I can; it is generally owing to the shafts being sunk at the proper distances, and to winzes being sunk in the intermediate ground.

9707-08. Speaking generally, do you consider that the mines in this part of Cornwall are ventilated as well as they can be ?—I do think that they are. A great many of them are where I have been down.

The witness withdrew.

Mr. JOHN CADY, CAPTAIN PASCOE } Examined.

Mr. J. Cady. Capt. Pascoe.

9709. (*Chairman to Mr. Cady.*) I believe you have charge of the South Frances mine ?—Yes.

9710. Are you the purser of that mine ?—Yes, and Captain Pascoe is the manager.

9711. You use a skip at that mine, do you not ?—Yes.

9712. How long have you had the skip in operation ?—Since 1857.

9713. Is it employed for taking the men up and down as well as for drawing ?—Yes.

9714. What was the original cost of the skip, the wire rope, and the fitting up of the whole machinery? —In the statement of those particulars which I will now hand in, I have gone rather over than under the mark in the calculation. I am sure of that.

The following paper was handed in:

Notes on drawing Guides, and Skip in use in Marriott's Engine Shaft at South Wheel Frances.

In making the following calculations as to cost of construction, working, &c., 150 fathoms' level from surface is taken as a datum.

Outlay for guides, 150 fathoms at 25*s.*, 187*l.* 10*s.*

	£	s.	d.
Do. wire rope 300 fathoms	50	0	0
Do. skip, springs, &c.	20	0	0
	£70	0	0

	£	s.	d.
These guides would last about 10 years with proper attention in repairs, giving therefore a cost per month	1	11	3
Calculated to stand 3½ years would be per month	1	13	4
Maintenance of way per annum, 5*l.*, would be per month	0	8	4
Wages of engine-man, lander, fillers, and smith, per month	12	10	0
Cost of coal, oil, grease, &c., per month	10	0	0
Patent fee	0	10	0
	£26	12	11

The low estimate of 50 tons of stuff and men drawn per day, at 26 days per month, would give 1,330 tons per month=4·76*d.* per ton.

The guides are 6-inch square rods, hoppers, or filling plats to hold as much as skip, and no more.

9715. Has the new system enabled you to effect a considerable saving ?—Yes, considerable.

9716. Can you furnish the Commission with accurate information as to what the saving is ?—Yes, we can furnish it, I should say, decently fair, or an approximate estimate. The hoppers for filling are the invention of Captain Pascoe, and they are so contrived that they shall hold measure for measure exactly the same as the skip; it was difficult with the old hopper, for when the door fell, that door did not stop the stuff from running into the skip, and Captain Pascoe's idea was that if we had measure for measure, it would be better, as it would then be simply to lift the door, when its contents would fill the skip. During the journey of the skip to the surface and its return the hopper is again filled, so that we can fill with a single skip equally as fast as if we had two skips.

9717. How long is the skip going down and coming up ?—About four minutes or five minutes in the usual way of drawing. We could do it faster if we were driven to it. I have not assumed it to be so fast in the statement I have handed in. I have put down 50 tons a day only.

9718. Could you draw more than 50 tons a day ?—Yes, we could draw 100 tons a day with the greatest ease by simply employing another engine man, and working a little longer cores.

(*Mr. Pascoe.*) We could pull up 100 tons in rather less than 12 hours.

(*Mr. Cady.*) Yes, if we were driven. The pulleys we use are of large diameter. It is a very important matter that the rope should be wound over a proper pulley.

9719. How is the rope wound ?—It is wound round a perpendicular drum, and the pulley over which it goes to the shaft is 14 feet, and the drum is 11 feet in diameter. We could not make it larger.

9720. How do you obviate the objection that has been made with regard to the wire rope corroding ?—That is most easily done; we have simply a box that is filled with grease, and the rope runs over the surface of it, and so the rope is lubricated.

9721. (*Mr. Holland.*) Is there a great consumption of grease ?—No.

9722. (*Chairman.*) Do you know the particulars as to that ?—I have estimated that in the statement I have just handed in.

(*Captain Pascoe.*) There is very little consumption indeed when the rope is got into proper working order.

9723. Do the men make any objection to going up and down by the skip ?

(*Mr. Cady.*) No. They make great objection if they are prevented. It is quite the other way.

9724. No man objects to the skip ?—No, but we hear great complaints if they do not get up and down by it.

9725. Have you a safety catch ?—Yes, Bennett's patent catch.

9726. Can you stop the skip at any level by signal? —Yes, we can. The nature of the engine shaft is perpendicular to the 30 fathom level. From thence we go on an incline of 18 inches in a fathom all the way to the bottom of the mine—we break that angle by pulleys, or shaft rollers, as they are called, and our roller is nicely contrived—the skip may pass as freely as a bird can fly, at the angle; but with reference to the kibble, that shaft being under an underline, it would be necessary to have bed plank from the bottom to the top, three inches thick, and consequently very expensive; the bed plank, all scantled and sawed out of American and Norway deal, in proper lengths, and sometimes they would haul out, then the chain working upon them would be just like a saw, and they would not stand very long; now we have a skip, and we want nothing of that. It is kept out from the rubbing and the wear by the guides, and consequently the saving is very great indeed.

9727. (*Mr. Holland.*) Have you made any estimate of the saving effected in the available time of the miners by the use of the skip ?—The saving effected in the time of the miners is this, that they can come up by the skip in two minutes from the level, and they would have had to climb at least half an hour at that average depth.

9728. To how many men would half an hour be saved ?—80 men a day.

9729. What amount of fatigue or labour do you think the exertion used in climbing up would be equal to—as much as an hour and a half ?—The old men have remarked to me that they would as soon work half a day as climb up that depth.

9730. What would be a fair average to assume, taking the men altogether ?—A quarter of a day.

9731. Do you mean a quarter of a day's fatigue?—Yes.

9732. Would it be fair to assume that the saving in the wages is equal to 25 per cent. as the result of employing a skip?—About 20 per cent.

9733. One fifth?—Yes.

9734. Is not the liability to catch cold diminished by the men being able to come up cooler?—Yes, very much.

9735. Do you think that the frequent catching of cold is one of the causes of the miners' complaint?—I have no doubt that the over-action of the heart by climbing, and their getting into the great heats that that they do very much predispose them to catch cold, but that is quite done away with by coming up in the skip.

9736. I think you stated that it has been in operation for four or five years?—Yes.

9737. Have you observed any diminution of disease among the miners since its introduction?—No, I never did; the fact is, they are constantly shifting.

9738. Can older men work with comfort in your mine than worked there before?—Yes, they can, most decidedly.

9739. (*Mr. Kendall.*) How many men can come up at a time in your mine in the skip?—Five; four can do it easily.

9740. Can they come up in about four minutes?—They come up in two minutes, they descend and ascend in that time.

9741. How many men can you take up and down in a day, so as to keep to their hours?—We can send down four, and bring up four every five minutes.

9742. Is yours a single skip?—Yes; we could not with two skips pretend to put a wire rope to any of the different depths with that rapidity.

9743. Has it a patent safety catch, so that if the rope break the stoppage is instantaneous?—It has.

9744. Would the men be liable to be jerked out from it or not?—No; they could not be jerked out, as the skip is high enough to cover the neck.

9745. There would be a shock, would it be a dangerous one?—Not at all; the shock would be very little, because at the greatest speed it scarcely goes nine miles an hour.

9746. Have you made any experiments with it?—I have seen the rope pulled right out of the socket by the engine-man, when the skip full of stuff caught in the guides, I should think with nearly a ton of ore in it (ascending); we also put on false pieces of hempen rope, to the wire rope and let the wire rope bag, and then we cut the hempen rope in two.

9747. (*Chairman to Capt. Pascoe.*) Have you inspected other mines?—Yes, many.

9748. Do you see any difficulty in the case of an underlie, in applying the skip?—No, I do not, with proper care; we are working a wire rope in another shaft in South Frances, and there we have four or five turns, and that is working very satisfactorily indeed.

9749. Are you of opinion that the skip for the purpose of taking the miners up and down might be applied, generally speaking, throughout all the mines?—I should say so, most decidedly; of course in many mines where they could probably hardly afford to go to the expense of a man-engine. I think they might pull the staff up, and send the men up and down just as we do with perfect safety.

9750. And also with economy?—Yes; considerable economy, I should say.

9751. Have you ever considered whether it would be possible to have two wire ropes and two drums, and put one out of gear, so as to have a carriage for the men to go down in instead of a skip?—Our shafts will not admit of that.

9752. I mean setting one aside at the top, and working the other down the same place?—Yes, I understand that; they send them down in the coal mines, I think, something like that. I do not think we should gain anything by it.

9753. It has been suggested, that there would be a difficulty in sending down a sufficient number of men by a single skip; but if you could send down a carriage containing eight or ten men, as in coal mines, would not that surmount the difficulty?—Yes; but our shafts are not so large, and therefore we could not have a platform large enough.

9754. Could not the men stand one over the other, in tiers?—Yes; it might be done very nicely, I think.

9755. (*Mr. Holland.*) How would you prevent the wear of the rope in dragging along the floor of the shaft where there is a large underlie?—By rollers.

9756. Those rollers would have to be more numerous in proportion as the steepness was less?—Yes.

9757. Are the rollers a serious expense?—No, a mere trifling expense, just a little bit of oak; they make them in a very little time.

9758. (*Mr. Kendall.*) What is the weight of the rope per fathom?—From 10 to 11 lbs.

9759. Did you ever go down a mine by a man-engine?—No.

9760. You are hardly acquainted practically with the merits of a man-engine?—No; but I know that in a skip there is scarcely any presence of mind required by it as compared with a man-engine; you must always have presence of mind to go from step to step.

9761. What are your changing hours?—At two o'clock, at ten o'clock, and at six in the morning.

9762. You expect all the men to be at the surface or down at the 120?—Yes, they can work for half an hour longer by riding than they could by climbing.

9763. Have you any rule as to ascending and descending?—Yes.

9764. How is it done?—The men receive a signal.

9765. I mean as to the order in which the men get into the skip in going down?—The first pair there take their turn, they do not interfere one with the other.

9766. There is no quarrelling about it?—No.

9767. Suppose there were sixty men to come up the last five would have a long time to wait would they not?—We have never so many as sixty at a time.

9768. What is the greatest number that you have at a time?—Thirty or forty men.

9769. Supposing that there are forty men at 2 o'clock, you can only take down five at a time?—They would go down six at a time.

9770. What is generally the number taken down?—Six.

9771. Then the last man would have to wait half an hour?—Yes; but when he goes down he goes fresh to his work at once. We thought it better to have them at one place, because some might be at the 100 fathoms, some at the 114, and some at the 124; and they must give signals from one place to another, and that might cause confusion.

9772. Although the five men who come up last may have to wait half an hour, it does not give rise to any angry feelings among them?—Not at all. If the men at the 100 fathoms wish to go at the 100 they are taken out there. The skip is stopped at the level and they are discharged. The skip is then sent to the 120 at once to take up the pairs of men.

9773. (*Mr. St. Aubyn.*) Are the shafts sometimes right down, and sometimes diagonal?—Yes; they are. Two of ours are perpendicular for thirty or forty fathoms from the surface. After that they go on the course of the lode on an incline.

9774. Evidence of this kind has been given, that where the shafts went straight down kibbles were more advantageous than skips; is that your opinion?—No.

9775. The witness also stated that unless the underlie was more than two feet in a fathom kibbles were better than skips; do you agree with that?—No; I can say this, that if there is an underlie of two feet in a fathom, it would be just as bad as one of three or four feet for a kibble, as it must come up rubbing all the way.

9776. Both for convenience and as a matter of economy you consider the skip superior to the kibble?—Yes; considerably. We have no trouble whatever now, whereas when we had a kibble we were always in difficulties. I think you will find that the majority

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of agents in Cornwall will tell you so. There may be probably a prejudiced person or two.

9777. What had you in your mine before you employed a skip, a footway or a man-engine ?—A footway.

9778. Have you had no opportunity of comparing the skip with a man-engine ?—No ; but we are perfectly satisfied as to the superiority of the one over the other.

9779. What number of miners go down every day at your mine ?—I think 180 go down every day.

9780. Are there at least 180 miners who work underground every day ?—Yes ; of tributers and tutworkmen, I should say, somewhere about that number.

9781. Each of those men once in 24 hours makes one journey up, and that makes 360 journeys by the skip in 24 hours ?—No ; not by all of them. Some of them are working shallower, and in parts of the mine too far off from the main shaft, to use the skip. It is principally for the tutwork men.

9782-7. Should you say that you make 300 journeys up and down by the skip with the men ?—No, not with the men. Supposing 100 men made use of the skip, there would be about 40 journeys per diem.

9788. How many years have you had the skip in operation ?—About five years.

9789. Has an accident ever occurred ?—We have had a man and a boy killed, but not by regularly coming up at the proper time. They ought not to have got into the skip ; they were cautioned not to do so.

9790. Has no accident ever occurred from the legitimate use of the skip ?—Not one.

9791. Have you ever known an instance in any mine where, when a skip has been adopted, they have employed another means for carrying the men and stuff up and down ?—No.

9792. (*Mr. Holland.*) If properly used you are of opinion that the skip is entirely free from danger ?—Yes ; I ride up and down in it every time, and I think it is perfectly safe.

9793. (*Chairman.*) You have inspected several mines, and you are well acquainted with them ?—Yes; I have inspected a great many.

9794. It has been stated in evidence before the Commissioners that in some cases cold damp is found, have you ever seen that in a mine ?—Yes ; in granite mines.

9795. I believe that is different from what is called poor air ?—Yes.

9796. Can you describe what it is ?—I suppose it must be occasioned by a dense sort of foulness in the air, and granite mines are more subject to it than in the slate.

9797. Is yours a granite mine ?—Yes.

9798. Is there cold damp in your mine occasionally? Yes ; in some places occasionally.

9799. Does the cold damp arise from the rock ?—Yes ; I should think so. We have it more especially in granite than in the killas. It accumulates in the mines where they have not been worked for a long time.

9800. Did you not find something of the sort lately ?—I never found anything myself nor have I heard any complaint.

9801. What means do you take to prevent it ?—We have generally, at every 15 or 20 fathoms, air winzes from level to level, and in some places we have been compelled to force in air by machines, and we have forced it in by a jet of water. We have tried different means, and I think that a jet of water is a very good thing in many places, especially in rises.

9802. What is the deepest level at which you are now working ?—At 154 fathoms level, or 176 fathoms below the surface.

9803. Have you found any cold damp there ?—No.

9804. When were you down in that level ?—It is about a week ago since I was down at that level. I should have been there if I had not been away. I generally go there once or twice a week.

9805. You cannot state with regard to the last week whether any cold damp has been found there or not ?—I never heard of any.

9806. Would it be reported to you if there was any? —Yes ; but we have never had any complaints from that level at all. It is more especially in some places where they have not got circulation.

9807. How do you judge whether it is cold damp or poor air ?—You will find that the candle will burn very well.

9808. Although there is cold damp present ?—Yes.

9809. Does it rise beyond a certain level in the mine ?—Yes ; it is throughout the place of working ; there is no question about it. If the men ceased long from work they would feel a coldness come over them ; but generally speaking we have good communications ; several shafts.

9810. (*Mr. Kendall.*) Where have you seen the worst effects produced by this cold damp ?—Sometimes in winzes, when they have been sinking down below the levels, or in rises.

9811. But principally in the winzes where they have not been working for some time ?—Yes ; it accumulates there.

9812. Have you ever seen it in a rise above ?—Yes.

9813. And has the effect been the same as in a winze below ?—Yes.

9814. (*Mr. Holland.*) Has it not been found in a level ?—Yes.

9815. What is the peculiar feeling that is produced if you are in it ?—You feel a chilly coldness come over you if you stop.

9816. Do you find any difficulty in breathing ?—Not at all.

9817. Do you think it affects the health of the miners ?—Yes ; if they continued in it long, I should think it would.

9818. I think you say that it only arises when men have ceased to work for some time ?—No ; sometimes it is when the men are employed daily in it ; but in the levels we try to do all we can ; sometimes there is a current of air through a level ; but it does not ascend or descend, and sometimes we try to use means to get it up.

9819. Are these cold damps of frequent occurrence ?—No.

9820. Are they of rare occurence ?—Yes, they are.

9821. Poor air is never found except in mines which have been worked ?—Yes.

9822. Is it not exclusively found in mines which are worked ?—No.

9823. Do you think it ever occurs in mines which have not been worked for some time ?—I think so ; in many mines which have not been worked it is very dangerous to go into them at all.

9824. (*Chairman.*) Can you point out the difference between cold damp and poor air ?—In poor air a candle will scarcely burn ; but in cold damp it burns very well.

9825. (*Mr. St. Aubyn.*) Cold damp has no effect upon the candle ?—A very little indeed ; you would think you had capital air by looking at the candle; it does not even waver sometimes.

9826. (*Mr. Holland.*) Does cold damp ever produce a feeling of faintness ?—Not that I am aware of.

9827. (*Chairman.*) Do you think you could procure a bottle full of this cold damp ?—I do not know whether we could now ; but a bottle might be put down.

9828. I suppose it is not very commonly met with ? —No ; our men are now tolerably healthy.

9829. (*Mr. Holland.*) Is a miner of 40 years of age, generally speaking, a much more skilful miner than one of 30 ?—A man who has been working underground all his life up to the age of 30 ought to be a skilful miner.

9830. Would he be as skilful as a miner of 40 ?—Pretty nearly.

9831. Can men of 30 generally climb as much as 100 fathoms without suffering distress ?—No, they cannot.

9832. Could they climb as much as 50 fathoms at that age without suffering distress ?—No ; they would require a stopping place.

9833. Do you consider it of great importance that all mines as deep as 50 fathoms should be supplied with the means of lifting up the men ?—If they employ a skip to draw the stuff, it is of great importance to land the men with the same ; we find great use in a skip in case of an accident. We brought up a man who was injured to the surface in a quarter of an hour from the time that he was injured, who otherwise, I have no doubt, would have died ; we also use it instead of a capstan, as it saves much expense in taking down and putting up our pumps. We have to employ, perhaps from 18 to 20 men at the capstan, and it would take at least five hours to change the pump, to take it down and put it up, and we do it now in an hour and a half without the men.

Note to 9716.—The wire rope now in use was put on in July 1857, and for the five years previous to that date the cost of chain, kibbles, &c., used was 1,142*l.* 1*s.* 2*d.*; estimated cost of repairing shafts, stands, &c., 300*l.*; smith's cost for ditto, at 50*s.* per month, 150*l.*: total 1,592*l.* 1*s.* 2*d.* For the five years ending July, 1862, the cost of the wire ropes, skips, &c., had been 773*l.* 10*s.* 1*d.*; repairs of shaft, 25*l.*; depreciation of stock, &c., 75*l.*: total, 873*l.* 10*s.* 1*d.* During the former five years the ore sold amounted to 20,836 tons; and during the latter five years it amounted to 21,564 tons. In addition to these results, which were so much in favour of the new system, he put the number of men drawn up by the wire rope and skips at 40 per diem, or 1,300 per month, which he calculated as equal to 780 tons per annum, or nearly 4,000 tons for the five years.

The witness withdrew

Captain JAMES POPE examined.

9834. (*Chairman.*) Of what mine have you charge ?—Huel Basset.

9835. Have you charge of any others ?—South Basset and East Basset.

9836. You have sent in a return of the number of men employed ?—Yes.

9837. Are those mines copper or tin ?—Both.

9838. What is the deepest level at which you are working now in South Basset ?—75 fathoms below the adit.

9839. And in East Basset ?—110.

9840. How do the men ascend and descend ?—They climb ladders in both mines.

9841. Is the mine granite or killas ?—South Basset is granite ; East Basset is killas.

9842. Is there any difference in the temperature of either mine ?—Very little.

9843. Are there any ends which are close or hot ?—Yes, one in East Basset, the 110 fathoms, is close at this moment.

9844. Do you know the heat there ?—No.

9845. How far are you driving that level off a winze ?—It is about 10 fathoms off a shaft, there is not a winze yet, in about eight fathoms more we shall begin to intersect the lode, and then we shall put a winze.

9846. Have you any artificial means now for putting in air there ?—The air is very good, we can accomplish the work very well.

9847. What do you mean by a close end ?—The air is not quite so good and there is not a proper ventilation ; all the ventilation that we have is what comes from the engine shaft. The engine shaft is divided into two parts, so that it will give a ventilation for 20 fathoms tolerably well.

9848. Does the candle burn well ?—Very well.

9849. How do you judge that the air is not quite so good there ?—We generally find that by the burning of the candle.

9850. In the end where you say it is close, will a candle burn well ?—Yes.

9851. (*Mr Holland.*) Then why do you call it a close end ?—By the temperature, you can feel that the temperature is hotter there than in other places.

9852. (*Chairman.*) The candle has to be put on the side a little, I suppose ?—In some places, but not there.

9853. In any other places in that mine ?—No, not at present.

9854. Do you think it likely to be so when you get further from the shaft ?—No, I do not see that it will; we shall have a winze to communicate.

9855. But before you communicate with the winze ?—No, we can accomplish it very well.

9856. How long does the powder smoke take getting out from that end ?—Perhaps about ten minutes.

9857. Not more than ten minutes ?—No.

9858. (*Mr. Kendall.*) When you use the words "a close end," you mean not a close end but a hot end ?—Yes. The miners call it a little close.

9859. (*Chairman.*) When the miners say that it is a little close, do you take any additional means for putting in air ?—Not latterly.

9860. Why not ?—At one time we only had one shaft, and then we were obliged to put in an air machine until we had a proper communication with another shaft.

9861. And now you think that the ventilation is very good ?—Yes ; it depends upon the way of the wind, sometimes it will go down one shaft, and sometimes down the other, but it goes down one and comes up the other.

9862. Have you ever observed whether it changes suddenly ?—Not very suddenly.

9863. (*Mr. Holland.*) Does it change frequently ?—Yes ; when the wind gets south, the mine appears a little closer than when it is north, it is not so fresh.

9864. Do you mean that when it is warm weather the mine is closer than when it is cold weather ?—Yes ; we always find that in the summer season it is closer than in winter.

9865. When it is a south wind it is warmer ?—When it is a south wind it is warmer than with a north wind for any length of time.

9866. (*Chairman.*) You have no means of judging of the air except by the candles I suppose ?—No.

9867. Have you more tutwork men or tribute men ?—The numbers are much the same as when the report was sent. I believe that there are one or two different, but nothing more than that.

9868. Do you use a skip or a kibble for drawing ?—A skip in part and in some part a kibble.

9869. Do the men go up in the skip ?—No.

9870. Did they never try to go up in the skip ?—They have occasionally gone up, but we do not allow it.

9871. Which do you consider cheapest for drawing, the skip or the kibble ?—The skip.

9872. Have you ever made any comparison of the cost of the kibble and of the skip ?—No, I do not know that I have ; I should think that there would be more than one third part less with the skip than with the kibble, or about that, on the average.

9873. What is the description of shaft where you use the skip, is it underlie ?—There is some perpendicular and some underlie. I think that there is the greatest difference in the underlie.

9874. (*Mr. Holland.*) How much underlie ?—From one foot to three feet in a fathom.

9875. The greater the underlie the greater the advantage of the skip ?—I should say so.

9876. (*Chairman.*) Have you any reason for not allowing the men to go up in the skip ?—We are fearful that an accident will occur.

9877. Is it wound with a chain ?—Part chain and part rope.

9878. The skip is not fitted for men ?—No, it is fitted for nothing but for drawing stuff.

9879. Have you ever had any idea of applying it for the men ?—No, not in our mines. In some of the mines the men sometimes go down in it, but there have been a few slight accidents, and perhaps that causes the difference.

9880. (*Mr Kendall.*) Where were the accidents ?—I do not know that I can exactly say where the accidents have been ; it is almost done away with now I believe for men.

9881. (*Chairman.*) Do you know any mine where it is in operation expressly for men ?—No, not expressly. I believe that they use it very frequently at South Huel Frances, but not always.

9882. Have you been down in it at South Huel Frances ?—Yes.

9783. (*Mr. Kendall.*) How do you like it ?—I like it very well, it is much easier than climbing.

9884. (*Mr. Holland.*) Do you consider it quite safe there ?—It appears to be safe as there has been no accident.

9885. Did you see any cause of danger?—No.

9886. (*Chairman.*) Have you had any accident in your mine for the last three years ?—No.

9887. Have your boilers never burst ?—We had one boiler burst, but no accident occurred except the bursting of the boiler.

9888. How did that occur ?—We could not ascertain how it occurred ; we think that it was from the feed not being properly up, from there not being enough water in it.

9889. Have you any other means of ascertaining the quantity of water in the boiler except by the cocks ?—No.

9890. Have you more than one safety valve ?—We have two in some boilers, and only one in others.

9891. Can the men weight the safety valves as they like ?—Yes.

9892. (*Mr. Holland.*) Do they do so ?—We do not allow it, but it may be done.

9893. (*Chairman.*) Have you had any accidents from blasting ?—No, we have had no accident whatever for the last three years.

9894. Do you use any different precaution from what is used elsewhere ?—No ; we have been fortunate in having had very few accidents. I believe that in blasting nearly the whole of the mines are upon the same principle.

9895. Do you use cartridges?—We do sometimes, but seldom ; the men make their own cartridges with us ; they make them of paper.

9896. No they always use that ?—Nearly so.

9897. Do you think that there is safety in that ? — I should say that it is quite as well as the others if the ground is not very wet. If the ground is very wet then we use cartridge.

9898. Does a cartridge of that sort prevent the powder lying about the mouth of the hole ?—Yes, but it is seldom used ; when it is bored down, if the hole is dry they do not use the cartridge.

9899. Then if it is not swabbed out properly there is danger of powder lying about ?—Yes.

9900. That is a cause of accident ?—Yes.

9901. Did you ever hear of an accident being caused by air getting in between the tamping ?—A hole went off once when I was a young man, but I could not account for it. I blasted a hole once, and it did not heave its burthen. I went to tamp it a second time and it went off. I cannot tell how it did not do me much injury.

9902. Was that before the safety fuse was introduced ?—Yes ; that was when we used quills.

9903. Do you not think that the fuse might have been alight although you were not aware of it ?—I do not know how it occurred, because a new charge was put in the hole and newly tamped up. The old charge was blown out of the hole ; I put in another charge, and tamped it a second time, and it exploded.

9904. (*Mr. Davey.*) Did it do anything on the first occasion ?—Yes ; I think there was a crack in it, and I suppose that there must have been powder in that crack.

9905. (*Mr. Holland.*) Did you use an iron tamping tool ?—Yes.

9906. (*Chairman.*) Do you suppose that in tamping with an iron tamping rod there would be any powder mixed up with the tamping ?—There was a crack in the hole, and I suppose that the tamping iron must have struck fire against the rock and have ignited it ; that is what I suppose ; I am not certain about it.

9097. It would be desirable to have a tamping rod which would not strike fire ?—Yes ; that would be the best means.

9908. (*Mr. Holland.*) Did you ever use such ?—No.

9909. (*Chairman.*) Do the men use oak sticks ?—No ; the swabbing sticks are deal principally.

9910. They have only the swabbing sticks to put in, they have no others ?—Just so.

9911. Do you use any patent powder ?—No.

9912. What candles do you use ; do you use any patent candles ?—No, we have the candles from the different chandlers about the county.

9913. What are the men charged for the candles ?—I think the price is now 5*s.* 6*d.* a dozen lbs., but we generally charge them a little more than that.

9914. How much do you charge them ?—7*s.*

9915. Are they limited to any quantity ?—Yes ; 2 lbs. per man per week.

9916. Do you know what is the charge for powder?—It is now 50*s.* a cwt.

9917. What are the men charged for it ?—8*d.* per lb.

9918. Have you any charge for the barber in your mine ?—Yes.

9919 How much ?—3*d.* per man per month.

9920 Do the surface men pay that ?—Yes.

9921. And the underground men ?—Yes.

9922. (*Mr. Holland.*) How old are they when they begin to pay ?—As soon as they become established as men, some as low as 15 or 16.

9923. Although they have no beard ?—Yes ; although they have no beard they pay sometimes.

9924. (*Chairman.*) As soon as they take a man's share of work they pay ?—Yes.

9925. What club money do they pay ?—6*d.* a man.

9926. Is that club money for visible hurt or for sickness ?—For visible hurt.

9927. What is the doctor's fee ?—6*d.* per man per month, that is including sickness as well as hurt in our mine.

9928. Is a separate account kept of the club money ?—Yes.

9929. Do you consider that club money in case the mine was stopped to belong to the adventurers ?—Yes.

9930. (*Mr. Kendall.*) Why ?—In case more accidents occur than the club is sufficient to pay, the adventurers advance money and pay for them, and if there is any little balance in hand I think that they ought to receive it.

9931. (*Chairman.*) At present is there any balance in favour of the adventurers ?—Yes. I cannot tell exactly the balance at Huel Basset, but it is somewhere about 100*l.* I think.

9932. I suppose that if the balance is the other way it is on account of more accidents ?—Yes ; sometimes it leaves a balance and sometimes it is otherwise ; if it is against the mine the adventurers advance money to support them.

9933. Has the mine ever been in a position that you have had to advance money from the adventurers to pay ?—Not since I have been in Huel Basset, indeed I think that we have given the men new underground clothes once or twice out of the club money, such as an underground shirt, and so on ; it has been once or twice done.

9934. Supposing that you had a large balance in your favour, should you be justified in applying that money for men who were off work from sickness ?—

No; according to the rules of our club we could not do that; sometimes it is done.

9935. Have you ever done it?—No; I believe that it is done in some mines.

9936. (*Mr. Holland.*) Do you pay burial money out of the club?—We have done so some past years—but latterly it has been very little; not more than a pound or two a month is paid now.

9937. Then latterly has the fund been nearly all exhausted?—No; we have more than 100*l.*

9938. (*Chairman.*) How are the doctors appointed?—The doctors are appointed by the adventurers at a meeting generally.

9939. How many doctors are there?—I think three in Huel Basset.

9940. Can the men select which doctor they will go to?—The doctor who is nearest generally attends upon them.

9941. It is divided into districts?—Yes; they divide the money between them, and the nearest doctor generally does the work; but the doctors generally agree with each other; they never refuse, and the men generally go to the doctor that they like best; the doctor who is liked best will have most work.

9942. Have you ever had a boiler accident?—Never but one, and that was through the bursting of a boiler.

9943. Do you know what proportion of the money is paid to the men in notes and in change?—I think two-thirds is paid in notes and one-third in cash.

9944. When the men are paid in notes where do they get change?—They frequently go to some inn and get change, and some of the men who are in tolerably good circumstances keep money in their pockets on the pay-day and change the notes for the others, because they can change all the local notes in any market town.

9945. (*Mr. Kendall.*) You say that two-thirds of money is paid in notes?—About that; but I hardly know the proportions.

9946. You say that these notes are generally changed at an inn, or somewherk?—Yes; they generally go to market on the market-day, and they change their money for thoir proxisions.

9947. If they change a 5*l.* note at an inn, is there any understauding that they are to drink so much of tne 5*l.* note?—No; the men on the pay-day generally have something to drink; a glass of ale or a glass of grog.

9948. But it is not an understood rule that they are to spend at least 1*s.* out of 5*l.*?—No; there is no understanding whatever that I am aware of.

The witness withdrew.

Captain JOSEPH COCK examined.

Capt. J. Cock.

9949. (*Chairman.*) Who is the head clerk of your mine?—Mr. Henry Burchett.

9950. Of what mine are you agent?—St. Day United.

9951. You have sent in a list of the men employed?—Yes.

9952. What is the deepest level at which your men are working?—164 fathoms under adit.

9953. How do the men ascend and descend?—By means of ladder footways.

9954. What distance is there between the staves?—We have four footways, two of which are 11 inches between the staves, and two a foot between the staves.

9955. Which do the men prefer?—They take the foot generally, for speed I suppose; they are both very good footways.

9956 Have all the footways the same inclination?—Yes; about the same; there is one footway nearer to their work.

9957. (*Mr. Holland.*) What is the inclination of the ladders?—They underlie.

9958. About how much?—About two feet in a fathom.

9959. Both the 11 inch and the 12 inch?—Yes; that is from a certain level below adit; 30 fathoms below adit where the under-lie comes in.

9960. (*Chairman.*) How do you draw up your stuff, by skips or kibbles?—We have two skips in the mine, and we have kibbles.

9961. Do the men come up in the skips?—I never heard of any.

9962. Which is the cheapest, drawing by skips or by kibbles?—I think that, if properly carried out, skips would be preferable.

9963. They would draw at a less cost?—I suppose that they would.

9964. Do you think that the skips could be made for the purpose of taking the men up and down?—It could be done; but I should not advise it.

9965. Why should you not advise it?—For two reasons: first, I consider that no chain nor rope which might be attached to the wym is adequate to the work, for safety; and secondly, I fancy that men would be too impatient, and would go in too many, as there would be no agent to protect or detect them in going up, and even if the rope be strong enough, they might have their limbs broken by coming in contact with some timber or ground in coming up.

9966. I suppose the men could be detected when they came to the surface if too many came up?—Yes, of course.

9967. (*Mr. Holland.*) Surely that could be prevented?—You cannot prevent men 100 fathoms underneath.

9968. You might spale them if they disobeyed your orders?—It is useless to spale a man if he is killed. You may fine a man a pound, and yet he may think that the agent is out of the way, and say "I will go up this way."

9969. (*Chairman.*) Do you think that the men would prefer the skip to the ladders?—I think not.

9970. Not if they were allowed to go up in the skip?—I never heard of any in our mine who felt any inclination to do so. I never knew a single man to come up in that way yet.

9971. What weight do you haul up by the skip?—The skip is 7 cwt., and the stuff is somewhere about 12 cwt.; that makes from 19 to 20 cwt.

9972. Supposing that four men came up in a skip, what would they weigh?—Clothes and all, we will say perhaps 1¾ cwt. to a man.

9973. Would not a rope, which was strong enough to haul up the material, be strong enough to haul up the men?—I have known a full skip to come to grass, say with a ton, and I have known the same chain to part in going down empty with the 7 cwt.

9974. Have you ever used a wire rope?—No.

9975. With a chain everything depends upon one link; one link is the strength of the chain?—Of course.

9976. If you could get a rope as to which there was no chance of its breaking, and if it did break the skip would not go to the bottom, would you not advise the use of it?—I do not know where we could get that.

9977. You have never seen it?—I have heard of ropes and cables being very strong, to hold, as it has been said, the world, but they have parted.

9978. Did you ever hear of a catch in the skip, so that if the rope broke it could not go down?—Yes.

9979. Have you ever seen it?—I have seen it and have seen it slip the catch. It is not a safe way in any manner I should say. I would not recommend that.

9980. You would not use it yourself?—I should not like to do so.

9981. You would prefer climbing the ladders?—I would rather do it.

9982. What height of ladders would you climb sooner than go up in a skip?—Any length of any mine in this neighbourhood, to any depth; say 300 fathoms, for instance.

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9983. Does climbing affect you?—It does not affect me.

9984. Do you think that men are affected by the climbing?—Yes; if they climb too fast. It is like working too hard, or eating too much meat. If a man does anything to over-burthen himself, of course it injures him.

9985. What is it which you think affects miners' health?—Of course I have my own opinion upon it, but I do not mean to say that I am right in all cases. I think that men often drink a little fast and injure their health, and sometimes they stay a little too long without meat, which is injurious to health. And another reason is, that I believe they climb too fast. But taking it moderately in eating and drinking and climbing, I think that miners have a chance of living pretty long. Sometimes I think that foul air does it.

9986. Have you ever worked in foul air yourself?—Yes.

9987. What was the effect?—I never felt any bad effect.

9988. Have you ever heard of men being affected by it?—Yes.

9989. How does it affect them?—In different ways. Sometimes they feel weakness in their limbs. They sometimes complain of weakness in their knees, and sometimes complain of their stomach. They have no appetite for meat and such like, and then they gradually decline away. A shortness of breath comes on; there appears to be a contraction of the lungs; and they are unfitted for labour and for working.

9990. Has it come on suddenly with any man that you know?—Gradually.

9991. Do you know any man now affected in that way?—If I brought my mind to think a bit no doubt I should be able to name some.

9992. Have you had any ends with foul air in the mine of which you now have charge?—I do not remember any. Our mine is well ventilated. I suppose that there is not a mine in the county of Cornwall better ventilated. We have upwards of 100 shafts from the surface to a certain depth in the mine.

9993. (*Mr. Holland.*) At one mine?—Yes; in the United mine; there are three or four mines united.

9994. (*Chairman.*) In any of these mines does the timber decay?—In some places.

9995. Is there a white fungus?—A white fur, but we see but little of it. I have seen it in Tincroft more especially. I was agent there for two years and three months, and there I saw a good deal of it. In our mine there is but very little. It is a rare case to see it. We have a very strong air in our mine.

9996 The timber does not go so fast where there is a strong air as where it is close?—No.

9997. Have you ever seen what is called cold damp?—Yes.

9998. In the mine of which you now have charge?—No.

9999. What is the difference between cold damp and poor air?—With cold damp a candle will burn bright, but if you stop after perspiring you will feel a chill go through your body. In foul air a candle will not burn; it will go entirely out.

10,000. In cold damp is it worse on a Monday morning, when the men go to work or after they have been working?—In some places. It just depends upon the air coming there. I have worked in places where we have been obliged to drive the air out before going to work. We go up with a jacket and beat the air entirely out.

10,001. Have you ever worked where you have been obliged to throw in lime before you went in?—I have seen it done, but I cannot state the effect. I have burnt reed underground in poor air. It is straw, but it is the stiff part of the straw.

10,002. Is that in the case of cold damp or poor air?—That is in the case of poor air—to burn up the poor air. I heard some old miners speak of it, and of course we tried it just to prove it.

10,003 Did it produce any effect?—No effect whatever. I think it made it worse. I would rather light up a coal fire than do that.

10,004. The smoke did not get away?—Straw causes a great deal of smoke and there not being air to carry it away it was of course there, and we were obliged to leave the place for a certain time before it went away.

10,005. The powder smoke also takes some time to get away?—Yes.

10,006. How long does it take for the powder smoke to get away from any end in your mine where you are now working?—In places it will take twelve minutes, from that to a quarter of an hour, and in some places you blast the hole and the men can go to their work immediately, and there is no effect.

10,007. When you are sinking a winze, I suppose that it does not get away so quickly?—Of course when you get down eight or nine fathoms it will lie a little more, but our mine is so ventilated and the air is so strong that it brings it up very quickly.

10,008. Have you ever had an accident in blasting within the last three years?—Yes; one. We had one in May 1861.

10,009. Did you ascertain how that was occasioned?—By putting the tamping rod on the third floor of tamping.

10,010. How is that to be avoided?—We can hardly tell in those cases; some miners have said one thing and some have said another. One of the men was not killed stone dead; he lived about an hour after he was hurt, and he spoke several times; he said that he was tamping as easy as any hole that he ever tamped in our ground, and he did not know the cause.

10,011. He was tamping with an iron tamping rod?—Yes.

10,012. What kind of tamping had he?—I fancy that it was some blue killas beat up fine. I am not certain, but I think that that was it.

10,013. Was the country hard?—Yes; the whole was in hard country, I think 20*l.* per fathom.

10,014. Have you had any boiler explosions?—There was one some four years ago; the tube went together, the case, I believe was not affected; that is the only case which we have had.

10,015. Is the water good?—Our condensing water is very good; we get it from the granite rock, it is pure water; I believe that it is good to drink.

10,016. Had the boiler which exploded been in use for some years?—Yes.

10,017. How often are your boilers cleaned out?—Just when the engineer thinks proper; sometimes in two and sometimes three months.

10,018. There is no periodical examination of them?—No; we have an engineer in the mine, and of course he has command over those affairs.

10,019. Do you use any patent candles?—We use the hard grease, and sometimes it is of a softer nature; we get some Palmer's candles, the men do not like them very well.

10,020. For what reason?—Because the wick is not large enough.

10,021. They cannot blow it in when it goes out?—If it goes out it must stay out, unless they have a match to light it.

10,022. Has each man a supply of matches in his pocket?—One or more generally have matches.

10,023. But not all of them?—Not all of them.

10,024. What are the men charged for candles?—I think 8*d* a pound.

10,025. What are they charged for powder?—Eightpence a pound, I think.

10,026. What club money do they pay?—One shilling a month; that is for doctor and club.

10,027. Are you aware whether there is any separate account kept of the club money?—Yes; there is.

10,028. Do you know anything about the state of the fund of the club money now?—No; the purser has to do with that.

10,029. Is there any charge for the barber in your mine?—No.

10,030. (*Mr. Holland.*) Have you any other objection to the men riding in a skip, except the idea of

their being injured ?—I never saw a wire rope nor a chain that I would trust myself with.

10,031. Is it not very difficult to prevent the young miners climbing too quickly? Do they not frequently climb too quickly ?—Of course, when they first commence.

10,032. Do you think that a good deal of disease is produced by quick climbing ?—I do not know that; I am sure that I could not answer that question. Miners are, of course, in the habit of getting up as fast as they can.

10,033. Are miners an unhealthy class of men ?—Our men are very healthy.

10,034. But are not miners as a class very unhealthy? —Taking them as a general rule, of course they do not live as long as men who are accustomed to be in the pure air.

10,035. Is not climbing one of the causes of their not living long ?—It may be; our doctors do not say much about that; it is the foul air more especially. I take Dr. Arthur to be of as great experience as any in the county, and he is a very clever man.

10,036. Do I understand you to mean that quick climbing is not a frequent cause of disease ?—Not a frequent cause. If you over-climb or over-eat yourself, or over-do yourself, it is injurious; it is like a horse, if he is running too fast he will not be so well afterwards.

10,037. If it be proved that a very small number of accidents do happen with well regulated skips, would your objection be removed ?—I should not like a skip at all.

10,038. If it be proved that very few accidents do happen to men who ride in well regulated skips, would your objection to riding in skips be removed ?—I think that there are two or three objections which arise against it. If you could ensure my life in coming up, of course I should have no objection to it. A very small proportion of those who go down the ladder are killed.

10,039. (*Chairman.*) But there are some who fall away from the ladders ?—Yes; they may be taken giddy.

10,040. (*Mr. Holland.*) How many are killed indirectly by disease produced by climbing ?—I cannot tell; we have heard that in coal mines a great many have been killed who have been coming up in skips; the rope breaks and away go the men, and they are dashed to pieces; and we have seen and heard of some who have been killed coming up by the man-engines.

10,041. (*Mr. St. Aubyn.*) And you have heard of some who have been killed coming up the footways ? —And some have been killed coming up the footways.

10,042. (*Chairman.*) I see that by the return, several men have been killed by falling from one level to another, falling from the 70 fathoms to the 150 fathoms; how does that happen ?—Sometimes it happens in the dark, there being no light.

10,043. Several have been killed in that way ?—There have been a good many boys and some men. I believe that in nine cases out of ten, men and boys too are killed by heedlessness, by not taking proper care.

10,044. There must be some place for them to fall through when they fall ?—Of course the shaft is there.

10,045. If they are said to fall from one level to another, that would not be falling through the shaft, would it ?—You could not fall through a winze from the 100 to the 170 fathoms.

10,046. But there is one case of falling from the 160 to the 190 fathom level, how would that happen ?—That must be through an open shaft, of course.

10,047. Or a winze ?—No winze, but an open shaft.

10,048. (*Mr. Davey.*) Are the man-engines looked upon with favour by the miners ?—I have no doubt that they are.

10,049. Would you erect one ?—Yes, if I saw a proper place and had the capital to do so. I have no objection to them.

10,050. But you do not think so much of the benefit of a man-engine as to put yourself out of the way to erect one ?—In our mines, where they do not work more than two or three years standing, it is hardly worth while.

10,051. (*Chairman.*) What do you mean by that ?—In a mine which will not stand to work more than wo or three years, it is useless to put up a man-engine; many mines do not work more than two or three years before they stop.

10,052. (*Mr. Davey.*) In your own individual mine, at St. Day United, would you put up one ?—Very likely we might, when the mine got in a position to do so.

10,053. (*Mr. St. Aubyn.*) You are decidedly of opinion that the skip is an unsafe mode of bringing men up ?—I think so.

10,054. Have you ever been at South Frances ?—I have been there, but not underground.

10,055. You did not go down in the skip ?—No.

10,056. Are you aware that upwards of 57,000 journeys have been made in that mine with the skip since its introduction, and that no accident has occurred from it ?—No, I am not aware of it before now, if it is so.

The witness withdrew.

Captain JOHN MICHELL examined.

10,057. (*Chairman.*) Of what mine have you charge? —Grambler and St. Aubyn.

10,058. I believe that you have sent in to the Secretary a list of the men employed underground?—I have.

10,059. What is the greatest depth of your mine ?—The greatest depth that we are working at present is about 84 fathoms from surface.

10,060. Have you charge of any other mine ?—No.

10,061. Is your mine copper or tin ?—Both. We are working copper now. We get a little tin occasionally; but it is chiefly copper.

10,062. How far are you driving a level from any shaft or winze ?—I think the furthest level that we have from any shaft or winze is about 63 or 64 fathoms.

10,063. Is it close at all there ?—It is a little close, but we have a waterfall throwing in air to the men.

10,064. Is it one of the usual waterfalls ?—Yes, the waterfalls about ten fathoms.

10,065. How long is the smoke getting away there ? —It is not very hard ground, perhaps they fire a hole once in eight hours, or something like that, but the smoke does not stay more than about a quarter of an hour, or twenty minutes. We have put pipes in.

10,066. Before you put the pipes in, the smoke did hang there ?—Yes, we put them in of course for our own advantage as well as the men's, for we find that by putting in airpipes we get our men to work an hour or so longer in the eight hours. There is no doubt about that. I suppose that in ground of 4*l.* or 5*l.* a fathom, it will make 10*s.* or 15*s.* a fathom difference whether we give them good air or not.

10,067. Before you put in the pipes, how did you judge that the air was not good ?—Of course experience tells us when we get into any poor air, because we can tell by the smell, and also by the smoke lying after they have shot the holes.

10,068. And by the candles ?—A little by the candles; but we are not far enough off to judge by the candles.

10,069. Have you anything like cold damp ?—All granite mines are a little subject to cold damps.

10,070. How do you judge of the cold damp ?—We can tell partly by the feelings and partly by the timber; the timber does not stand so well where there is cold damp.

10,071. It decays ?—Yes, it is owing to the decomposed granite chiefly that the cold damp is caused, and it will decay timber twice as fast as otherwise.

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10,072. Can you perceive the cold damp more on the Monday morning when the men have not been down?—No, I think not. I consider that the air has more action on the cold damp because there is less taken up by the men in those places. We do not find that there is more cold damp on Monday mornings with us.

10,073. When you have perceived this cold damp, has it been when you have been sinking a winze or putting in a rise or a level?—Sometimes in sinking a winze or a rise we see a little of it.

10,074. Does it appear in the shape of a vapour?—A small vapour. We see it just about a foot or a foot and a half from the bottom of the level.

10,075. (*Mr. Holland.*) Do you never see it at the top?—No, we find it at the bottom of the level, and if you put a candle at the bottom of the level it will waver just the same as a current of air, while at the back it will burn quite clear.

10,076. If it is always at the bottom of a level and not at the top, how does it get into a rise?—There is more of foul or poor air in the workings above the back of the level. The cold damp is in the lower part of the level, the fresh or good air is in the upper part. When I was a boy I held a candle at the bottom on purpose, and I saw it waver very much, and I used to fancy that it was then good air, but the men told me that that was nothing but cold damp, and that is all in the bottom of the level. In the back of the level it is good air, and the candle will burn quite clearly. The good air has an action to keep the damp out.

10,077. (*Mr. Davey.*) Supposing you are sinking a winze, and you come up on the Saturday and go down again on the Monday morning, will you find any accumulation of damp there?—Yes, we find more in the winze than anywhere.

10,078. Do you find an accumulation there on the Monday morning which makes it difficult for you to work there?—Yes, there is more in the winze than anywhere.

10,079. (*Chairman.*) Are the men's gettings in your mine the same as in this part of the district?—Yes, I think so. I do not suppose that there is much difference in the men's gettings, they generally come pretty well to a level. The men will find out that for themselves. If they find that they can get more in another mine, there they will flock.

10,080. Will they leave a district for that purpose?—Not for a few shillings, because of their house and family; they have some difficulty in removing them; but I do not think that there is a great deal of difference in the men's wages.

10,081. Are the earnings of the men pretty equal?—The tributors generally get a little more than tutwork men; but there is a great deal of difference in men in gettings, because there is a great deal of difference in the work—in their practice and experience—some men get wages where others would scarcely get anything.

10,082. It is an advantage to have an experienced man?—Yes. I am sorry to say that a good many of our experienced men have emigrated.

10,083. Do those whom you have now earn enough to live well?—Yes; they average, I should think, about 3*l.* a month.

10,084. I suppose that there are a good many who do not earn that?—A good many do not earn more than about 50*s.* or 55*s.*; but a good many earn 3*l.* 10*s.* and 3*l.* 15*s.*

10,085. In the case of those who only earn 50*s.*, is that enough to live upon?—They are chiefly young men; a married man who has any care and thought about working need not work for less than 3*l.* a month.

10,086. If a man has a bad pitch, he may not earn money for two or three months?—Some men will take a pitch on speculation; and if a man is of opinion that there is ore in that pitch, he may work for six or twelve months and only just get a bare living.

10,087. How does he live during that time?—If he goes and speaks to the shopkeepers that he deals with, they stand by him.

10,088. Do they trust him?—They will trust him for months if they know that he is honest.

10,089. Do you think that the shopkeepers trust the men much?—Yes; very much.

10,090. Do you think that there is always a month of the men's wages in hand?—I believe that it is pretty general.

10,091. Is it so with you?—A good many of our men are so.

10,092. Does not it necessitate, when they first get to work, going to the shop?—Whenever they get work they go to the shop I believe; but some men never do that, they go with ready money, and they live very much better. I believe that a good many of the shopkeepers get 20*s.* for every 15*s.* worth that they sell, because if you are in debt to them you must take the article which they wish to sell or get nothing.

10,093. So that if a man goes fresh to a mine, and does not get any money for two months, he must go to the shop to a certain extent?—He comes from another mine.

10,094. But suppose that he is out of work?—Then he must have subsist. Where a man is in debt he cannot find fault with weight or anything.

10,095. (*Mr. Kendall.*) You have said that if a man is a prudent man he need not get less than 3*l.* a month; you mean to say, I suppose, that if he likes it and wants to be sure of his money, if he goes upon tutwork he can get his 3*l.* a month?—Yes; there is no fear of that.

10,096. But if he chooses to speculate with the chance of getting 5*l.* or 6*l.* a month, on the possibility of not getting 30*s.* a month, that is his own look out?—Yes; we give a tribute according to what we think that a man ought to get as wages, 3*l.*, 3*l.* 10*s.*, or 4*l.* a month; but if he goes to pitches where there is 12*s.* or 13*s.* in the month, it is a speculation. If he meets with a bed of ore he will get 20*l.* very quickly, but he may not get 20*s.*; but of course he is not obliged to keep there.

10,097. (*Mr. Holland.*) Is it a very rare thing for a man to be on starving earnings for several months?—A very rare thing; he may do very badly for two months, but scarcely ever for four; he may once upon a time, but it is not general. In setting a pitch, no agent wishes a man to get nothing.

10,098. (*Mr. Kendall.*) Did you ever know them cut it down to a halfpenny a month?—Yes, and to nothing. I have myself taken a pitch for ten weeks for nothing.

10,099. In order to get into the work?—In order to get into the work in the next two months in that particular pitch.

10,100. It is put up at a sort of Dutch auction?—The limits are called out; perhaps there may be 300 or 400 people, and each will call out some amount of money—some a farthing, and some nothing. I recollect that we, four of us, called out nothing, and we had to work for ten weeks for nothing; and we broke 600 kibbles full and brought it to the surface for nothing.

10,101. What did you get your next take?—I think that we had 5*s.* 6*d.* the next take.

10,102. Did you get good wages then?—I think that we got about 7*l.* or 8*l.* a man per month—that in the four months just made the difference. Sometimes you may get a little more, and sometimes the next two months may not be more than on an average. Of course, that is not the agent's fault—it is the fault of the man who takes the bargain.

10,103. (*Mr. Holland.*) Can those who take bad pitches live on credit pretty well for a time, or are they badly off?—They live pretty well.

10,104. There is no half starving during that time?—No. Of course, if they do badly for eight or ten months, they pinch themselves, especially where they have a large family; but that is not general.

10,105. Is it a common or a very uncommon thing for tributors to be badly pinched?—Very uncommon if a man is willing to work.

10,106. (*Chairman.*) Tutwork men have stead

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earnings?—Much more steady than tributers; but there is a good deal of difference there; when you set a bargain, you set a price according to what you think they ought to have a fathom, or what they ought to drive in one month. If they do not work, or the ground proves unfavourable, of course they do not get so much as you calculate upon, but nine times out of ten they get their 3*l.* or 3 guineas a month.

10,107. You think that the miners have quite enough to live well on?—Yes, it appears so, for a more independent set I have not seen for many years, they are growing so every year.

10,108. Compared with what other men?—I cannot compare them with any other men. You can scarcely speak a word to them; if you do so, they will give up their place and go to another, or will stay out of employ for a month.

The witness withdrew.

Adjourned To-morrow at half past ten o'clock.

Thursday, 7th August 1862.

PRESENT:

The Right Honourable Lord KINNAIRD, K.T.
NICHOLAS KENDALL, Esq., M.P.
JOHN ST. AUBYN, Esq., M.P.
RICHARD DAVEY, Esq., M.P.
P. H. HOLLAND, Esq.

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

Captain WILLIAM RUTTER examined.

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10,109. (*Chairman.*) You are captain of the South Crofty mine?—Yes; I am what they call the managing agent, not the purser.

10,110. How long have you been in the mine?—About 29 years.

10,111. You were first underground captain?—Yes, and I go underground now sometimes.

10,112. You have sent in a return to the secretary of the number of men?—Yes.

10,113. Do you know about how many men there are in your mine?—I cannot tell exactly, but, surface and underground, we have about 50 just now. We are now putting up a new engine on another part of the mine, and we have not therefore so many employed.

10,114. During that time have you had more men than that?—Yes; we have had more than 700 or 800 men; more than 1,000 worked in the mine for many years. The mine is now divided. It was then East Crofty, and now it is North and South Crofty.

10,115. Your experience relates to when you had a larger number of men?—Yes.

10,116. With regard to the club money, what amount do the men pay for club money?—First of all, when we commenced with East Crofty, the men paid 8*d.* in the pound; that is to say, if they got 3*l.* per month, they paid 2*s.*, and the merchants gave us a penny in the pound on their bills. After a while we found that we were accumulating very fast, though we were very liberal in club matters, and we reduced it to 6*d.*

10,117. Is the club money confined to visible hurts?—Never in any case with us. The rule says that it must be a visible hurt, but we have always slipped over it as a matter of philanthropy, and we have relieved men when they have been home with severe colds and so on, and have continued to do it all the way throughout. After a while we found 6*d.* too much, and we reduced it to 4*d.* Since then the merchants have declined paying us anything, but we can do very well with 4*d.*

10,118. What allowances do you make to the men? Have you any fixed allowances?—For what we call working pay, if a man is slightly hurt we give him 14*s.* per month, 6*d.* per day. For sick pay we give him 1*l.* 8*s.* per month. If he has a broken leg, for example, we pay for persons watching him, and bandages, and anything that he wants. If he wants a bed or a mattress, or anything of that sort, we have always given it. We have been able to be liberal with the club, and we have done so.

10,119. In case of a man being off work for some time, do you continue to make him an allowance?—Yes; we have had men home for years, who have been fairly worn out in the mine, because miners do not live to be very old. I have stood upon the hill, just where we cross North and South Crofty, many times, to look at the faces of the miners as they came up, and you will see very few old men; it has been sometimes complained of when men have had what we call a holiday. I have said you cannot err much in that. When I heard people complaining of a Whit-Monday or Whit-Tuesday, which are holidays with us, and that they do more harm than good, I have not thought so. With all their holidays, they die off very early, prematurely. If you stand at any place in the mining district, and look at the men as they pass by, you will find very few old men.

10,120. With regard to the club money; is the 4*d.* in the pound charged to men even with small gettings? What limit have you?—It goes in the same ratio whether it is 1*l.*, 2*l.*, 3*l.*, 4*l.*, or 100*l.*; it is 4*d.* in the pound. If they get a start, and a man gets 100*l.* (and they have got that sometimes), they pay the same poundage, because they can then afford it very well.

10,121. Does a man who only gets his pound or 30*s.* in a month pay?—Yes; we would rather for him to pay if we gave him a few shillings out of the club afterwards.

10,122. So as to keep up the rule?—Yes.

10,123. Do you consider that 4*d.* in the pound would be sufficient, without the contribution from the tradesmen to maintain the club in the way in which you manage it?—It will do very well for all accidents as far as my experience goes. It would not do to continue on a sick list to every miner, perhaps, but it is done with us, generally speaking. We never turn our backs upon a poor old sick man.

10,124. It must depend very much upon the number of accidents how far the club money will go?—Yes. Sometimes we find that they are more frequent than at other times, but recently, since we have had a fuse and so on, the accidents have not been so many as they were.

10,125. In other mines they pay 6*d.* per month, and in some instances 9*d.* for club money. What proportion would your plan bear to that?—I think that our plan is about 1*s.* per month, averaging it. It is not less than 1*s.*, I should say, but it enables us to step over the bounds of accident. We have sometimes given as much as 5*l.* for a person who has had a defect in his breath, and sent him to Truro, to Dr. Bullmore, or some one else. We could not do that if we were screwed down too tightly.

10,126. You think that with the 1*s.* a month that enables you to relieve sickness as well as hurts?—Yes, in special cases.

10,127. You prefer the plan of 4*d.* in the pound, being in proportion to the earnings of the men, to making a general 1*s.* per month?—The great advantage of the poundage is simply this, that if a man should be successful, and get 20*l.*, 30*l.*, 40*l.*, 50*l.*, 60*l.*, 70*l.*, or 100*l.*, he can then afford to help us; it raises the funds.

10,128. Is 4*d.* on the gross earnings or the net

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earnings?—On the net earnings. We always suppose the club money and the doctor and barber to be the men's own private money. If you asked us to give you the average gettings of our men in the mine, we should give you the average, deducting for materials, but not deducting for club, doctor, and barber.

10,129. At what age do the boys go down into the mine?—The law will not allow a boy to go down until he is 13 years of age.

10,130. What law?—The law which was passed some years ago. There is a law; I am sure of that. He never ought to be allowed to go underground till he is 13 or 14. It is a law which passed somewhere about 20 years ago. We have acted upon that law, under a penalty of 50*l.*

10,131. At what age does a boy working in your mine pay to the club?—We do not require it till he is fairly allowed to go underground.

10,132. Are these payments to the club by men at grass as well as underground?—Yes; they are as liable to an accident on the surface sometimes as underground. There is a little private understanding. If a boy is at the stamping mill, and is hurt, in some cases a trifle, such as 2*d.* a month, has been deducted; but we do not do it; but if we have a boy hurt we always relieve him.

10,133. Supposing that a man takes a boy of 14 underground with him to help him, do their joint net wages pay to the club?—Sometimes they do, and sometimes they do not. If there are three men in a pair, and they want a stiff boy to go down with them to make up the fourth, we then always deduct for a fourth man; and if there is one man and a boy, we call them two, so far as that goes.

10,134. What amount of club money have you ever had accumulated?—When it was East Crofty we had as much as 2,000*l.* once in Mr. Tweedy's bank, but we have always from the beginning kept a separate account.

10,135. What became of that money?—I am very sorry to say that the adventurers devoted some of it to working the mine afterwards. I told the purser there and then, tooth and nail, that they were taking the blood and bones of the men.

10,136. Then you as manager protested against it?—I did. I was not the manager of the mine at the time, but I could not help opposing it. I thought we should not have done it. I would rather have put 1,000*l.* of it to raise an hospital, as we were trying to do at one time.

10,137. I suppose that that is the only time when they have done it?—Yes. As long as I have had the management I have always taken care not to deduct more from the men than would about do, just to keep about 20*l.* balance; that is enough. There is one thing which we have always found in the case of a failure of accounts, we have always found the men willing to put on a penny or twopence in the pound for a little while till we raised the fund again.

10,138. Then in that case you would communicate to the men the state of that account?—Yes. I should say to the men at once, Our club is exhausted; will you consent to put up 2*d.* in the pound, to make it 6*d.* for a little while? If so, hold up your hands; and they do it with a great deal of pleasure.

10,139. You think it very important that a separate account should be kept?—Decidedly. Our account is kept as distinct as possible.

10,140. Is that account laid before the adventurers?—Yes, every two months; at every account meeting.

10,141. You are of opinion that this money belongs to the men, and not to the adventurers?—Most decidedly, I should say. The adventurers are merely trustees on behalf of the men.

10,142. You state that the men die prematurely; from what cause, should you say?—I think the general cause is debility; damp air under ground. I paid attention to it for 40 years, more or less. Every day of my life I studied something about mining. I have been underground longer than that. It is very different now to what it was many years ago. We are more particular in driving our levels, and keeping a dead level in. We do not go up so much on an incline as we did, and we do not drive levels so far now, without sinking winzes, so that the mine is better ventilated. Another thing is, that the ladders and footways are much better; we have seats. When I was a boy we did not think of stopping anywhere; we ran 100 or 120 fathoms like a cat.

10,143. If there is a gradual rise in the level to the height of the level itself the air will not go beyond it?—No. I have many times seen, after a hole has been blasted, that the smoke has been going back about half way down the level, and the air has been coming in under. If you carry your level wide and high, seven and a half feet high, which is the proper level, and what we generally carry, and not less than three feet wide on the average, back and bottom, or perhaps three and a half feet (that is our rule), if you carry a plain surface, the air will finds its way at the bottom, and the foul air will come out at the top.

10,144. Supposing that you drove the level with an incline down, would it have the same effect?—No; air will not run down hill nor water up.

10,145. What do the men pay for candles?—Eightpence with us.

10,146. And what for powder?—Eightpence.

10,147. Is it always the same price?—About the same. They do not cost us so much, but if we did not put a tolerably heavy price on them they would carry them away to barter for tobacco and other things.

10,148. Do you think that that price completely prevents it?—Not completely, but it does, to a great extent.

10,149. What proportion of notes and cash do you pay?—About half.

10,150. Where do the men get the notes changed?—Some in coffee houses and others in the alehouse and shops where they purchase goods.

10,151. Is it not an inducement to go to the alehouse?—Not much; we have very little to complain of in that way in this county.

10,152. The men are very temperate?—Very indeed; you can see that by the houses which you see studded about; occular demonstration is best.

10,153. (*Mr. Kendall.*) How are those houses built; are they on lease?—Yes, on lease for three lives; that is a bad system.

10,154. You prefer a term of years?—Yes, by all means in the world.

10,155. (*Mr. Holland.*) You have stated that there are very few old miners to be seen coming out of a mine?—Yes.

10,156. What do you call an old miner?—A man coming up strong in years; a man of 50 or 60 years is very old for a miner after working underground.

10,157. Are there very few of 50 or upwards?—Very few of 60 underground.

10,158. What becomes of the old miners?—They dwindle down; they waste away in time.

10,159. Do many of them take to other employments?—Some few.

10,160. Do a large proportion take to other employments?—Not a large proportion, but many do for a little while.

10,161. When did you drop the club charge from 8*d.* to 4*d.*?—That was about 20 years ago.

10,162. Does 4*d.* about keep you clear now?—Yes.

10,163. Were your allowances much more liberal when you were at 8*d.* than they are at 4*d.*?—No, we accumulated a large sum then. I do not know that we were more liberal then, than we are now.

10,164. Do you think that miners are much less unhealthy than they were 20 years ago?—I think that, upon the whole, the miners are more healthy now than they were 20 or 30 years ago, because we are more particular.

10,165. And you think that the effect has been very considerable?—Yes, I think I must say that it has.

10,166. Are the miners more careful than they were in keeping out of powder smoke?—I am sorry

to say that they are too fond of going into the smoke too soon.

10,167. Why ?—Because they want to see what the hole has done, and how much ground has been rent off. Sometimes they will go in in a cloud of smoke, and rap away at it the same as if they were going to get 5*l.*; they will do it.

10,168. Does going into the powder smoke produce any evident effect upon them ?—I think that the powder smoke, with the dampness of the air, is one of the causes which brings on premature death with them.

10,169. You think that it irritates their lungs ?—Yes.

10,170. Does it make them cough badly ?—No, not much, but they look very pale.

10,171. Do they suffer much from dust ?—No,

10,172. Do you think that any effectual prevention against the consequences of powder smoke would be very beneficial ?—I think that if it could be laid down as a rule (and I do not see why it might not) that men should not go in so quickly after the explosion as they do, if a certain fine were put on them in the mine, the agents might effect it a little ; but I do not know who else could, because the men are down out of sight.

10,173. Supposing that any simple instrument could be invented to enable them to breathe without breathing powder smoke, would it be beneficial ?—We are obliged to have it in some places, what we call a duck machine, to suck out the smoke.

10,174. To draw it out ?—Yes.

10,175. Suppose that an instrument could be invented to keep the powder smoke out of the men's lungs ?—That would be of service.

10,176. Would they wear it ?—Yes, I think so. I will give you my experience of dusty ground. I have found that neither working in a very wet place, nor yet in a dusty place, ever affected me. I was years that I could not eat a bit of meat underground, having no appetite, but was quite well and hearty. I could jump into the scales, and pull down 9 or 10 score, after working 12 years ; I have done it many times, and have been agent more than 30 years. Dust did not affect me, because I liked to work with my lips closed, and as soon as my nose got pretty well filled I out with it ; but everybody does not do that.

10,177. (*Chairman.*) Why should not men let their beards grow, and wear a moustache ?—It would be a very good thing. You know that Providence has put a net in their nose, a net that will catch the dust, and out with it.

10,178. (*Mr. Holland.*) Men who have not taken that precaution have suffered much more than you have ?—Yes.

10,179. Are you sure of that ?—Yes. When I worked in St. Ives district I lived at Hayle. I went down there every Monday morning, and came home on Saturday afternoon, and they said that I and my comrades did not look like Over Hayle men. It was not drink. I have been for 13 years together and have never drunk anything except water, coffee, and tea.

10,180. Are the men of that district more affected by dust than in other districts ?—No; but they do not work so many hours underground in that district as in this.

10,181. Do the men working in Over Hayle generally look ill ?—Yes.

10,182. Why ?—On account of their working more hours than on the other side. The mines were deeper in many instances.

10,183. Were they very dusty ?—Not particularly dusty. You must go down in the shallow mines, in the clay slate, to get dust; not in the ironstone and granite.

10,184. Are the killas mines more dusty than the granite mines ?—Yes, a great deal ; because there you work pick and gad, and in the others you bore and blast.

10,185. What is your explanation of the granite mines being more unhealthy than the killas mines ?—Because there is more cold damp in granite. I have men now who come over the hill and say, Can you give us a job ; they say they have been working in the granite, but they do not like to be down there so well.

10,186. How does the cold damp affect them ?—The granite in some way produces a colder, sleepier damp than the clay slate does.

10,187. What effect does that produce upon the miners ?—It debilitates them.

10,188. Does it make them more liable to lung disease ?—I am sure it does.

10,189. Is that a prevalent opinion among miners ?—I think so ; it is my opinion, at all events ; miners say so.

10,190. And in your opinion that is in consequence of the greater amount of cold damp in a granite mine ?—Yes.

10,191. And not the greater prevalence of dust ?—No.

10,192. Is there more blasting in granite mines than in killas mines ?—Yes, because you work more ; you work with a pick in killas mines, and blast less.

10,093. May not the effect be partly owing to the less prevalence of powder smoke in killas mines ?—That may be a cause, but if you go into a deep granite mine you will find a sleepy coldness. I have proved that to be the case, and I have heard hundreds say so as well.

10,194. After there has been a blast of powder a great deal of that gas is produced which when cold becomes cold damp. Does that explain it partly ?—That is one reason, I should say, but I do not think that that is all the reason.

10,195. (*Mr. Kendall.*) Your working miner is a very moving fellow, is he not ; he goes from one place to another a good deal ?—Yes.

10,196. They shift very much ?—Some do, and some not. We have some men in the mine who have been there from boys.

10,197. But very few, I suppose ?—Very few ; many do shift. If they are not pleased with their work they go somewhere else where they think they can do better, and very often they come back, and say that they wish they had never gone away at all.

10,198. You say that when your club gets low you let the men know it, and they willingly come forward and pay a higher sum ?—Yes.

10,199. And I suppose they also know when the club is in pretty good condition ?—I suppose they do ; but there is a pretty deal of what we call dignity about the Cornish miners; they do not like to be beholden, if they can do without it.

10,200. When you had your 2,000*l.* balance, I suppose the miners knew it ?—Yes, they knew it very well.

10,201. When men take, they make their calculations ; if they have to pay 8*d.* in the pound, or if they have to pay 4*d.* in the pound, they act accordingly ?—I do not know about that. I do not suppose that that comes much into their calculation, because the object of 8*d.* or 4*d.* in a month is not much ; they suppose that it may be wanted for the club, and therefore they do not grumble about it.

10,202. You do not think that it enters into their calculations at all among their items ?—I do not think that they think much of it ; they think a little of the drawing sometimes ; it comes out sometimes very heavy ; but our drawing is very easy, and it is so in many other mines ; in others, again, it is more heavy.

10,203. If these men do not make any calculation at all, and are constantly shifting, of course, they pay more for their club than they are likely to draw for their club, they are making a nest egg for other miners ?—Yes ; they cannot do themselves good very well without doing good to others.

10,204. You say that the balance belongs to the men, and not to the adventurers ?—I think so.

10,205. If the men shift very frequently, if two-thirds of your men shift, the balance can hardly be said to belong to the men in the mine ?—No. If I work in this mine, and you in that, and we change, we each have the same benefit.

10,206. That would be all very well if you paid

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the same in both mines, but if in one mine you paid 4*d.* in the pound, and in another 8*d.*, and in another only 2*d.* in the pound, which is what is generally paid, there would be a great difference?—Yes, but they do not notice that. I can give you a case which happened once in Redruth. There happened to be two or three deaths, and at last a man said, "All the money will be "got from us if we do not look sharp," and before the next month he was dead himself.

10,207. When a part of the 2,000*l.* balance in that club money was expended, and you thought it right to remonstrate, did the men themselves make any remark on it?—They did not like to grumble about it; they did not bring anything forward specially.

10,208. Was there a feeling of discontent among the men in consequence?—Yes, the men did not like it; I am bound to say that.

10,209. (*Mr. St. Aubyn.*) In your mine do you use a man-engine or footways?—Footways.

10,210. Do you consider a man-engine advantageous where it can be used?—Most certainly. I will give you a case. In Great Alfred, when Mr. Field was the principal, they came down, and put that mine to work. Some years ago he asked my opinion, because I had worked in the mine before. Mr. Field asked me what I thought about working the Great Alfred. I told him, "If you put up a man-engine, and put a machine "to raise the miners, you may succeed, but I would "not give a farthing for it else." For men to come up 300 fathoms, it being very hot down there, is a tolerably tidy day's work, with nothing else.

10,211. How deep would you go in a mine before you began to use the man-engine?—I think the man-engine is of very little use before you are 100 or 150 fathoms deep, and then it is time to get it to work.

10,212. You think that a man, if he did not climb too fast, could come up 100 or 150 fathoms easily?—Yes.

10,213. Have you ever been down the skip at South Frances?—No.

10,214. Have you any opinion about it?—I have an opinion, but still it is my own. I know that in the collieries they go all right on skips. I do not like them.

10,215. But you have never had any practical experience of it yourself?—No. I have seen them down in Sunderland nearly 50 years ago.

10,216. If skips could be made as safe as footways, you would think it an improvement to bring the men up by them?—Yes; it would do very well indeed, if they could be.

The witness withdrew.

GEORGE SMITH, Esq., LL.D., examined.

G. Smith, Esq., LL.D.

10,217. (*Chairman.*) You are chairman of the Cornwall Railway?—Yes.

10,218. And a director of the West Cornwall Railway?—Yes.

10,219. You are a magistrate?—Yes.

10,220. You have been long resident in the centre of the mining district?—Yes.

10,221. I believe you are also working a patent for the safety fuse?—We were the original patentees, and hold a patent for improvements in the manufacture of the article still. The original patent has expired many years ago.

10,222. You have several establishments for the manufacture of the safety fuse?—Yes, in different countries.

10,223. The safety fuse has been of great use in saving the lives of men in blasting, has it not?—Very much indeed. It has diminished accidents to a very great extent.

10,224. There are still accidents from blasting?—There are.

10,225. And sometimes from cutting the fuse?—I have never known an accident to arise from cutting the fuse. I have known the fuse cut, and explosion to take place, but the miners never use tamping so hard, and hammer it so violently very near the charge as to cut the fuse; and as the moment the fuse is cut, if it ignites, the smoke ascends from the hole, they have time to get away to some distance. There must be some warning; even the burning of an inch of the fuse would allow the men to go several yards.

10,226. Have you ever turned your attention to what the accidents which still take place from blasting arise from principally?—I think that the larger number of the accidents now arising from blasting arise from what they call picking out the hole, when the fire is not conveyed to the charge. If the fuse is carelessly inserted into the charge, the tamping settles the charge down so as to separate it from the fuse, and then, although the fuse may have a very perfect action, the fire is not conveyed to the gunpowder, consequently, the hole does not explode, and they pick it out, in doing which they sometimes get to the charge, and mix up the gunpowder with the hard tamping matter, and explosion takes place.

10,227. What instrument do they use to pick out a hole which has not gone off?—A small sharp iron; and sometimes I have known them bore it out with the borer; and I have known them press down the charge with an iron tamping bar in a dry hole, with dry gunpowder at the bottom of the hole, and they have used that instead of a piece of wood.

10,228. Could no instrument be invented to use, either for picking out a hole or for driving the tamping, which would not create sparks by contact with the stone?—My opinion is that a hole never ought to be picked out under any circumstances; and in most of the mines there is a rule to the effect that on any accident occurring from picking out a hole no relief is to be given from the club. I think it is always better that a new hole should be bored.

10,229. But a man having gone to the labour of cutting out a hole, it is natural that he should like to make use of it?—Yes.

10,230. Could you enforce any such rule as you mention?—I am afraid not, so as to make it universally operative. Another cause of accidents is, I believe, the neglect to use what they call a wet swabbing stick, after the charge is inserted in the hole. A great many of these causes would be prevented by the use of cartridges. They very seldom bore the hole perpendicularly, but give it such a direction as shall effect their purpose in blasting the largest quantity of ground. Then if it is put down in a sloping direction, and the charge is inserted by pouring the gunpowder into the hole, the upper part of the gunpowder will of course be considerably above where the surface of the charge is, when it is properly pressed. In every case after the charge is inserted, it should be carefully pressed down until its upper surface is at right angles with the direction of the hole; a first layer of soft tamping should then be put on the charge, and then a damp swabbing stick put in, so as to destroy any grains of powder that may still remain about the sides of the hole. Unless this is carefully done I believe no tamping bar whatever will ensure the safety of the miner. The powder against the sides of the hole would be liable to take fire and convey it to the charge.

10,231. Would copper coming in contact with the lode or the country create a spark?—No; but the pulverising of the tamping against the sides of the hole might.

10,232. (*Mr. Holland.*) You think that the two materials rubbed together might produce fire?—Yes.

10,233. Are you satisfied of that?—I have not a doubt of it. If they used tamping, as some of the mines prepare it, I do not think that that would apply, but I know that hard tamping is used which would strike fire.

10,234. (*Mr. Kendall.*) Supposing that you had a metallic bar which would not strike fire, and that that metallic bar struck off a bit of hard ironstone, and brought it in contact with something very hard, such

as flint, in the tamping material, would those two bits jammed together ignite ?—I have no doubt of it. At the same time I believe that if you had a tamping bar, the lower part of which would not strike fire, you would diminish the cause of accidents very seriously, but I do not think that it would entirely prevent them.

10,235. (*Chairman.*) You think that a cartridge also would be an advantage in the way of safety ?—I think that it would, and generally speaking, I believe the holes being usually damp, the cartridges would pay for themselves in the saving of gunpowder.

10,236. What objection do you suppose would be urged against the general use of cartridges?—Several. In the first place there would be an objection to them on account of their size. The holes are bored of different sizes. Sometimes at the beginning of a *core* the holes are different from what they are at the end, on account of the wearing of the borers, and if a small cartridge is put into a large hole it will crush and break under the operation of tamping. There are several inconveniences which stand in the way, especially as the miners' habits are so confirmed in the insertion of the gunpowder in the ordinary manner.

10,237. Those habits are, perhaps, one of the greatest difficulties to overcome ?—I believe so.

10,238. You have of course seen a cartridge made by the men of brown paper on the spot ?—Yes.

10,239. And placed on a stick which fits into the hole?—Yes, that would obviate the thing to some extent.

10,240. Do you think that there are any other objections which can be urged against the use of cartridges than what you have stated ?—No, I am not aware of any other, save and except the labour of providing them, and the inconveniences connected with them, which I have mentioned.

10,241. I see that a great many accidents occur in mines ; have you ever turned you attention to what are the causes of those accidents, independently of blasting ?—The accidents which usually occur, and which come under my notice, are of a kind to indicate the means of prevention themselves, men falling away from the ladders. Some accidents occur which I suppose no human foresight could deal with at all, such as the falling of stones and loose ground. I have known several men in the last year or two injured and one killed by that means.

10,242. (*Mr. St. Aubyn.*) You do not mean falling down the shaft, but the falling away of the country ?—Yes ; and stone accidentally falling away down a shaft or from the level.

10,243. (*Chairman.*) Are you aware of any accidents happening in this district by falling down a shaft, falling away from a ladder, or by falling from one level to another ?—They cannot fall from one level to another without falling down the shaft.

10,244. Or winzes ?—Precisely so. I have not known of any accidents arising but from persons falling from the ladders.

10,245. Then falling from a shaft or from one level to another has not come under your knowledge ?—No ; nor falling down a winze. I have not heard of any such case recently. As far as I am informed, very few cases occur from the falling away in a shaft ; they do sometimes.

10,246. Are there any accidents from falling down an abandoned shaft, from its being left open at the top, and not protected ?—I think that I have not not known but one such case for many years.

10,247. Is it within your knowledge that there are many abandoned shafts which remain open and unprotected ?—Not many. You find one here and there, but I do not think they are numerous.

10,248. Is there any law compelling the abandoned shafts to be protected ?—I am not aware that there is. I have never known a case in which a representation made to the proprietors of the mine or the mine agents has not been attended to.

10,249. All such cases, I suppose, would come before a coroner's inquest ?—Yes.

10,250. Are you acquainted with the plan adopted with regard to the club money in the mines ?—I do not know anything but what is generally known upon the subject.

10,251. Is it generally considered that the club money is the property of the men or is the property of the adventurers ?—The agents and adventurers look at it as the property of the mine, and the men look at it as their property ; they have quite made up their minds about it.

10,252. Whose property do you consider it to be ?—I really do not know how to answer the question. The allegation on the one side is that it is estimated in the wages ; the allegation on the other side is that it is no more estimated in the wages than other mine cost, as sharpening the borers, or anything of the sort, and that what the men have really to take up as the balance is their wages ; that is what the men say. I cannot give an answer as to where the exact line of property is, but I have a very strong opinion where it ought to be.

10,253. Will you state that opinion ?—I think that the understanding ought to go on the principle that the club money belongs to the men. I think that it ought to belong to the men, and I think that the club money ought to be of such an amount, and the club based on such principles, that it should belong to the men.

10,254. (*Mr. Kendall.*) In case a mine stops with a balance in hand, what is to be done ?—If my opinion were asked upon that subject it would be that in such a mining county as ours there ought to be a central fund for particular cases, and for the relief of such aged and infirm miners as the circumstances of the case would meet, and that all those balances should be appropriated to that object.

10,255. Would it not be a better plan that as long as there were any parties receiving money when the mine stopped, they should receive the money out of those balances as long as they lived ?—I believe that they do not receive more than a year or two at the outside.

10,256. (*Chairman.*) Is that the practice at present ?—Yes.

10,257. Is this money ever applied to purposes connected with the mine ?—Yes ; I have sat at a mine board myself, and seen 300*l.* or 400*l.* balance of the money in the club appropriated to pay merchants bills.

10,258. Did you concur in that ?—I demurred to it, certainly, but I was met by the answer, "What are "you to do with it ? You cannot divide it among "the men, and the men who are now working in the "mine have not been the contributors to it any more "than those who worked in the mine many years "ago."

10,259. Is there any provision made when men cannot work from sickness ?—It is the usual practice, I believe, that when a man is sick his comrades share with him the loss for that taking.

10,260. (*Mr. Holland.*) During the period of the take ?—Yes. If they take for a month or two, I understand that the sick man receives the same as those who are working, until the expiration of that take ; then of course he is not included in the new take, and he receives nothing.

10,261. (*Chairman.*) How is a man maintained who is sick and cannot work, and has not laid by anything ?—He has no resource at all but what he has provided providently for himself. If he has been provident, and joined himself to a provident society, he is in the same position as any other working man.

10,262. How are the doctors appointed ?—By the adventurers.

10,263. Do you think that there is any dissatisfaction among the men at the way in which the doctors are appointed ?—I do not think there is ; I have heard grumbling, but very seldom.

10,264. In your opinion do men suffer in their health from working in the mines ?—My impression is that

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there are diseases engendered in consequence of working in the mines.

10,265. Have you any suggestions to make how any of those diseases might be obviated ?—Nothing, but the general remark that any contrivances which would save the men the labour of ascending by the ladders must, I think, have some effect upon them.

10,266. Anything which would benefit the men would benefit the employers ?—No doubt of it.

10,267. How are the schools supported in this neighbourhood ?—By private contributions, with Government aid.

10,268. (*Mr. Holland.*) Individual contributions ?—Individual contributions.

10,269. (*Chairman.*) Do the mines contribute at all to the schools ?—I do not think it is general; but in Camborne we have a very large and I believe a very excellent British school. There are one or two mines which charge the men, I think, 2*d.* or 3*d.* a month, and then they send their children to the school free. There are two or three other mines which contribute from the mine fund.

10,270. Where it is charged is it charged upon all, married and unmarried ?—I believe so. There are other mines which make small annual grants of 10*l.* or 12*l.* a year to the funds of the school, and then they have the privilege of sending children.

10,271. At what age do the children go to work at grass ?—At all ages; from six years old.

10,272. Are there evening schools ?—Very few indeed.

10,273. Should you say that it is necessity which induces the parents to send the children thus early to work ?—It is rather, I think, the family convenience. Perhaps the father and an elder brother are working as tributers, and they have to employ boys and girls ; if they have girls or boys of their own whom they can put on and take care of, and look after and receive the pay for, it serves their purpose better than employing strangers.

10,274. Therefore there are a number of children who have not at present the means of education ?—There are great numbers of them who have no means of education beyond what they get in Sunday schools. The Sunday schools in this neighbourhood do a vast amount of good, and thousands of children are taught to read in them.

10,275. (*Mr. Kendall.*) Have you any idea of the proportion of those who are taught and those who are not taught ?—We have, I suppose, a gross population in this town at present of about 8,000. Our schools number about 1,000 children; that is to say, the Wesleyan schools; and I believe that all the other denominations together would be quite as much. I should think that there are 2,000 children in Sunday schools in the town of Camborne.

10,276. (*Mr. Holland.*) Could it be ascertained accurately ?—Yes ; you can have those figures before you.

10,277. (*Chairman.*) How is it as to the day schools ?—Of day schools there are very few. I do not know how many children attend the National school. I suppose that the British school would have at least 300, or from 300 to 350. I have a very strong impression that the provisions of the Factory Act ought to be applied to all our large mines.

10,278. (*Mr. Holland.*) What provisions ?—Provisions for obliging the proprietors to educate all children under a certain age for so many hours a day.

10,279. (*Chairman.*) At what age do they go underground, generally speaking ?—Some of them go underground very young. I am not very well informed upon that subject.

10,280. Is there any law preventing their going undergound before a certain age, as has been stated here ?—Not that I am aware of.

10,281. (*Mr. Holland.*) Is there a popular impression that it is illegal to send them underground below a certain age ?—I am not aware that there is. When they are put underground young they are almost always taken down by fathers or brothers.

10,282. (*Chairman.*) A great proportion of the children who attend the Sunday school are employed at mines ?—A very large proportion of them. I think there would be no great difficulty in applying the provisions of the Factory Act, which I have mentioned, to all mines employing, say, beyond a certain minimum of men.

10,283. (*Mr. Holland.*) What other provisions would you suggest ?—I have not looked at the matter with reference to any other point.

10,284. Do you think that the hours of labour ought to be restricted ?—No ; I think that the hours for which they are now occupied, if divided between labour and education, would not tax them too much.

10,285. That would be practically a restriction of the hours of labour ?—Yes, precisely the same as in factories, which has operated so very satisfactorily.

10,286. Do you think that there is the same urgent necessity to restrain the labour of mine children as to restrain the labour of factory children ?—I think not. I do not think that the children in mines are physically injured now ; but as the age at which they go to the mines precludes the possibility of their learning anything but what they can learn on a Sunday, and seeing that only reading is taught in these Sunday schools, I think the children should have some other means of education.

10,287. (*Chairman.*) Do you think that a large number of the miners are in debt to the small shopkeepers ?—That is most certainly the curse of the population.

10,288. Does that arise in any degree from their always being a month's pay in hand ?—I am afraid it does.

10,289. You think that a more frequent payment would be an advantage ?—I think that a more frequent payment would be very beneficial.

10,290. Do the miners' families get into debt through the temptations afforded them by travelling packmen ?—Yes.

10,291. Has any means ever occurred to you of putting a stop to that to any extent ?—No, I do not know what could be done in a legislative way to prevent it. These men certainly inflict serious injury upon the comforts and the morals of the people. They go round with their packs, and they exhibit their finery, and coax the women to take it, and tell them that they may pay 6*d.* a month or 1*s.* a month, or anything of that sort, and when once the goods are received they have them entirely under their power, and summon them by a dozen at a time to the County Court.

10,292. Are the parents responsible for the debts incurred by their children to these packmen ?—The debts are generally incurred by the parents, or with their knowledge.

10,293. (*Mr. Holland.*) By the wife ?—By the wife generally.

10,294. (*Chairman.*) Do all these packmen pay licence ?—Yes ; a hawker's licence.

10,295. Do you consider the miners in this neighbourhood temperate or otherwise ?—There is a vast difference in them in that respect. I think that upon the whole you cannot say that they are generally intemperate.

10,296. (*Mr. Holland.*) We were told yesterday that if men would always wet the tamping well when a charge has missed fire they could draw a charge without danger; what is your opinion upon that point ?—I have been told so too, but I very much doubt that.

10,297. You think that the hole ought to be absolutely abandoned if it misses fire ?—That is my opinion. It depends upon the nature of the tamping. If you had some kinds of tamping, like soap-stone, or what they use very often, soft elvin, I believe that if it were tamped down hardly in a hole it would hold water for a month without destroying the charge. I do not think that the water would permeate that solid mass of tamping in any reasonable time, so as to destroy the charge, and then the only course to be

taken is to dig into the dry tamping so far as to allow the water to wet the powder, and in doing that there must always be danger.

10,298. Could not such tamping be safely picked out with a copper tool ?—I do not think it could.

10,299. Would it be just to prohibit by law the picking out of a hole? To make it an offence ?—I should not be sorry to see this done. I have two men now whom I see every week, both stark blind, and they incurred their blindness in each instance, I suppose, for the sake of getting a shilling or two.

10,300. Does not a man endanger other lives as well as his own by picking out a hole?—There are usually two men, and a hole is not picked out unless they both agree to it.

10,301. Are the adventurers careful to appoint doctors who will be acceptable to their men ? Is that a matter of careful consideration ?—I believe it is. In the 40 years that I have been very intimately connected with the mining of this neighbourhood, I have not known but one instance that has excited serious dissatisfaction.

10,302. There is no job in it ?—I think not.

10,303. It is done with a fair view to the men's interests and wishes ?—I believe so.

10,304. Is there generally more than one doctor to a mine ?—Very frequently.

10,305. And have the men a free choice as to which doctor they will go ?—Yes.

10,306. There is no compulsion ?—Not where there is more than one surgery, except the compulsion which geography gives. When in a large mine there are two doctors they are often reside in different districts.

10,307. Would it be desirable to have a wider choice of the doctors of a mine; for instance, to have in a district a number of mines connected together with the same doctors ?—I do not think that necessary.

10,308. (*Mr. Kendall.*) Supposing that, instead of having a couple of doctors employed to superintend one mine, you had a district of mines and a district of doctors, so that each man might employ whatever doctor he liked, and that doctor should take up the amount which that man pays to his mine; how do you think that that would act ? He would then have the nearest doctor, or the man of his choice ?—I really do not know.

10,309. If feasible, do you think that it would act well ?—It might in many cases be an improvement, but as far as my observation goes I have not heard that there is any practical grievance in the present mode of appointing surgeons.

10,310. You have had very large experience, and according to your experience you find that, taking the doctors and the men, they very fairly agree with each other ?—I think they generally do.

10,311. And that the men are very fairly content ?—As far as I am informed.

10,312. I suppose that under any system, there would be a little grievance now and then ?—Most certainly.

10,313. I understand from you that a great number of the children in early life are employed by their parents in certain processes in bringing the ore to market which the parents raise ?—Yes.

10,314. And that leads to their absenting themselves at an early age from school during the week days ?—Yes.

10,315. Have you ever been able to form any idea as to whether this early exposure on the mines is likely to be more prejudicial to their health than if they were allowed to spend their early years at school ?—Yes, I have thought so; and before the passing of the Factory Act I felt very strongly impressed that there ought to be some legislative prohibition of the very early employment of children.

10,316. Even as far as we are concerned in this county ?—Yes; but subsequently to that I have thought that the other solution would be rather preferable.

10,317. Which other solution ?—That is, of insuring to them, say a couple of hours or three hours a day for education on the mine by a schoolmaster appointed by the mine.

10,318. As a question of health, do you think that much disadvantage arises to the children by their being exposed to work early ?—I do not. I do not think that the question of health is a serious one. I think that it is more an educational question.

10,319. (*Mr. Holland.*) The children's labour is not heavy, is it ?—No. In very cold wintry weather they occasionally suffer rather severely.

10,320. (*Mr. St. Aubyn.*) You have been accustomed for a great many years past to observe the condition and habits of the mining population ?—Yes.

10,321. Have you observed within the last 20 years any improvement in their physical condition and in their general health ?—A very great improvement; a very great improvement in their manner of living, and consequently, I believe, in their physical condition altogether.

10,322. From what causes do you think that that improvement arises ?—I think very much from the improved character of their dwellings. I think that that is a very material cause, and consequently they have more cleanliness and better order in their families a great deal than they had when I was a boy, 50 years ago.

10,323. Their food is better ?—Their food is much better.

10,324. You mentioned in the former part of your evidence that the climbing was injurious to them. From what you have observed, do you think that the introduction of man-engines has been of advantage to the working men as regards their health ?—I have no doubt about it.

10,325. Do you know, from your own knowledge, that the ventilation is better in mines than it was now, say 30 years ago ?—I can scarcely say from my own knowledge, except from the improved ventilation of mines, which I know simply from looking at plans and sections rather than anything else.

10,326. You know that mines are better ventilated ?—I know that mines are better ventilated now than formerly.

10,327. Do you consider that that has had a beneficial effect on their health ?—I think so.

10,328. You spoke just now of an association which you thought it would be desirable to found for the relief of miners who were permanently disabled from working; how would you propose that it should be supported ?—I really have not thought of the organization of the thing.

10,329. Did you mean to substitute it for the clubs, or would you have it supported by contributions in the general way ?—I had no idea of its being substituted for the clubs; I meant it to be supplemental to the clubs.

10,330. Would you have it supported by contributions from the men themselves, in the same way that the clubs are, or would you have it supported as infirmaries are supported ?—I did not contemplate that, but something of that sort might be possible: Whenever it has passed through my mind, which it has done very cursorily, I have thought that contributions from the mines and from benevolent individuals might be given to it.

10,331. But not from the miners themselves ?—I never thought of that. I may state that I believe that the quarter part of the population of Camborne live in houses which are the property of labouring miners.

10,332. Do you mean leasehold houses ?—Yes; I think that there are 800 houses in this town the property of labouring men, and almost entirely of labouring miners, which they have built themselves, and which they have for three lives. I am told that the aggregate amount of house property belonging to labouring miners in Camborne exceeds 50,000*l.*

10,333. You consider that an evidence of their prudent habits ?—Of their prudent habits, and of their temperate, orderly, and good conduct.

10,334. Do you think that miners are more in the

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habit of living in their own houses now than they were 30 years ago ?—Yes, beyond all comparison.

10,335. And that is an evidence of their improved habits, and their increasing prudence and foresight ? —Yes.

10,336. (*Chairman.*) What is the cost of building one of those houses ?—From 50*l.* to 80*l.*

10,337. Do they borrow a part of the money to build ?—Sometimes, but seldom.

10,338. (*Mr. St. Aubyn.*) What would each miner pay on his house as the ground rent ?—4*s.* or 5*s.* ; 1*s.* a lace.

10,339. (*Mr. Kendall.*) Have all those houses gardens ?—Almost all of them.

10,340. What is the extent of the gardens ; how many yards ?—From five to ten laces. A lace is 18 feet square.

10,341. (*Mr. St. Aubyn.*) Do you find that the men not only take a lease of houses on lives where the house is already built, but that they build houses themselves on waste land ?—Almost all these houses have been built by the miners.

10,342. Where do they get the money ? by mortgage partly ?—Not extensively. The way is this : The fluctuations in miners' wages are such as to give any prudent, good miner, once or twice in his lifetime, at least an opportunity of getting 40*l.* or 50*l.* as a start in a month or two.

10,343. (*Chaiman.*) You allude to tributors ?—I allude to tributors. The only difference is, where a man has a wife who will manage without going deeply in debt. If they are deeply in debt, every one of those starts is swallowed up. If they have managed to live without getting into debt when they get this start, the first thing they do is to build a house.

10,344. (*Mr. Kendall.*) Almost every active and clever miner, if he is prudent, becomes a tributor ?—Most certainly.

10,345. And every tributor, if he is a prudent man, and has a fair chance, has in his lifetime one or two chances of making a start, coming into a batch of ore, and making large wages ?—Yes.

10,346. And he builds a cottage entirely with his own money, or with money which he borrows ?—Just so.

10,347. (*Chairman.*) Do you mean that every miner, or even the majority of miners, are tributors ? —I should question whether the majority of miners were not tributors at some part of their lifetime.

10,348. (*Mr. Davey.*) They were so before emigration, but not since ?—Perhaps not.

10,349. (*Chairman.*) At present are a majority of the men tributors or tutwork-men ?—I should think that the majority are not tributors now.

10,350. A tutwork-man has not the same chance as a tributor ?—He has no chance of these starts.

10,351. (*Mr. Kendall.*) Latterly, in consequence of these starts, the mine agents have become more cautious, and they set the men to stope, instead of tribute ?—Yes.

10,352. (*Mr. St. Aubyn.*) What do you suppose is the number of working miners now living in Camborne, at a rough estimation ?—I can scarcely say. There are 800 labouring men who have cottages, and by far the greater number of them are miners.

10,353. (*Chairman.*) We have been told that the men shift very much from one mine to another ; is it your opinion that that is the case ?—They do, from one mine to another, although I do not know that that is the case to any great extent. Where a mining district fails, as some have done, and another becomes prosperous, of course the men have to remove.

10,354. But otherwise you do not think that a man who has a house of his own, or which he has furnished, would be willing to leave and take another ?—I do not think that they are accustomed to peregrinate.

10,354*a*. We have been told that the average earnings of the men are from 3*l.* to 3*l.* 10*s.* a month, but in an average some must earn a great deal more and some much less. Do you know what are the lowest earnings of the men ?—I do not. There is a vast difference in the men ; some men are really not worth 10*s.* a week ; sometimes the tributors work for nothing.

10,355. In the average wages are tributors and tut workmen included ?—When people talk about an average, they should explain their own terms. I have sometimes great jealousy about averages. I do not know what is included in them.

10,356. You would not take that as a guide as to the earnings of the men ?—If any one told me that the men in a certain mine averaged so much, it would go for nothing with me, unless I saw how it was made up.

10,357. (*Mr. Holland.*) When tributors get a start, is it common with them to waste their money, or are they generally prudent ?—It is not at all common for them to squander away the money ; it is a very rare thing ; they generally get a house of their own.

The witness withdrew.

Trevu, Camborne,
28th Jan., 1863.

My Lord,

Since giving my evidence before your Lordship and the other members of the Mines Commission, I have been led to inquire into the opinions and feelings of the miners on the manner of appointing the mine surgeons, and extent to which they are satisfied with the existing arrangements in use for that purpose.

And from careful and extensive inquiry, I find that I was much mistaken in the evidence I then gave on this subject. Althongh the men but seldom loudly complain, and are not forward, for obvious reasons, to speak on the subject, I am convinced that there is among them an extensive and deep-seated dissatisfaction with the manner of these appointments, and not unfrequently with the professional men who are so appointed.

I have now no doubt whatever that any measure which would give every man the free choice of a surgeon in any case of accident or illness, would be hailed by them as a great boon.

I have the honour to be,
Your Lordship's very obedient servant,
(Signed) GEORGE SMITH.

The Right Honble.
Lord Kinnaird, K.T.
&c., &c., &c.

Captain EDWARD RICHARDS examined.

Capt. E. Richards.

10,358. (*Chairman.*) What is the name of your mine ?—Great Wheal Busy.

10,359. I believe you have sent in a return of the number of men ?—Yes.

10,360. When had you a boiler accident ?—I do not know the exact time, but I think about October last.

10,361. In the course of the last two years there were three other explosions ?—Yes.

10,362. And you attribute that to the water, do you not ?—Yes, the foulness of the water. I think that the last was from the neglect of the engine man ; the man in charge. I think that two of them may be attributed to the men in charge ; what we call the engine man.

10,363. Was not it from not attending to the stopcocks ?—Yes ; to the gauge cock.

10,364. (*Mr. Holland.*) A neglect of the feed ?—Yes, we thought so.

10,365. (*Chairman.*) Have you two gauge cocks ? —Yes, to each boiler.

10,366. Have you any water indicator ?—Yes.

10,367. (*Mr. Holland.*) A glass gauge ?—Yes, inside.

10,368. To show the level of the water ?—Yes.

10,369. (*Chairman.*) In the other case you think

that the water had to do with the explosion ?—I am not prepared to say; it was heat a good deal. This is a piece of the boiler plate (*producing the same*), which was deeply honey-combed, more than half of the metal being dissolved away in parts.

10,370. How long do you suppose that boiler had been in operation?—I am not prepared to say; but it will be like that in three months in some cases.

10,371. (*Mr. Holland.*) How thick was this plate, to begin with?—Half an inch, I think; some of them are five-eighths, and some are half-inch plates.

10,372. Is this the top plate of the internal flue? —No; the side plate.

10,373. (*Chairman.*) How often do you examine your boilers?—We examine them very frequently; once in a month or less than that.

10,374. (*Mr. Holland.*) It blistered and blew out? —Yes.

10,375. (*Mr. Kendall.*) What destroyed this plate? —The foul water.

10,376. (*Mr Holland.*) Was it a coppery water?— Yes; there was a good deal of acid in it.

10,377. (*Mr. St. Aubyn.*) At last the plate got so weak that it blew out?—We think that it was blown out from the neglect of the man in charge of the boiler. This one was what we call cleansed the following day.

10,378. (*Chairman.*) Have you ever had any analysis made of the water?—Yes. We are now about to erect a little engine to pump up pure water off from the boundary of our set. We commenced the engine-house a week since.

10,379. You have had the water analysed?—Yes; it was very impure.

10,380. (*Mr. Holland.*) What impurity was there? —The acid of copper.

10,381. Have you a copy of that analysis?—Yes.

10,382. Can you furnish us with it?—Yes, I think so.

10,383. (*Chairman.*) If it were the acid of copper, might not such water used for boilers produce more or less the same effect?—The water in some mines is very much worse than in others. Our water underground at the 100th fathom level will cut off a half-inch iron in three or four weeks with a drop falling on it. We hope to prevent this now, and to have pure water coming into the boilers. We hope to get it in five weeks from this time.

The witness withdrew.

Mr. PHILIP VINCENT examined.

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10,384. (*Chairman.*) I believe you are surgeon to several mines in the neighbourhood?—Yes.

10,385. Do you know the number of men at the several mines of which you have charge?—I cannot tell exactly, but I am surgeon to rather more than 30 mines.

10,386. Have you more men on the sick list in winter than in summer?—I have more about the spring and the autumn generally.

10,387. Can you state anything like the number of miners in the course of the year who come under your care, not from accidents?—No; I am not in the habit of keeping a list of miners.

10,388. You do not keep any register of the cases? —No.

10,389. Have you ever had a post mortem examination of a miner?—Yes.

10,390. How long have you acted as a mine surgeon?—I have been brought up to it from my birth, and my father before me. I have been with him from the first.

10,391. Have you had more than one post mortem examination of a miner?—Yes, several; but not more than one for the miners' disease; it is a very rare thing that we can get one here at all.

10,392. Will you describe to the Commissioners what you observed on the occasion of the post mortem examination for the miners' disease?—On making the post mortem examination I found that the lungs were extensively diseased; indeed there were deposits in the lung of a substance which on taking it between my fingers presented the appearance of very fine powder made into small lumps, and in this powder there was a gritty substance which had the appearance of fine gravel; it looked very much like it. I did not analyse it, because I was satisfied in my own mind what it was, and I found several of the deposits in the lung.

10,393. (*Mr. Holland.*) In the air cells?—Yes. It appeared to me in one or two places where these deposits took place that there was pus forming around this, and there was a slight inflammatory action around, which had all the appearance as if this foreign deposit had been the means of producing some inflammatory action, and then of sending the miner into consumption. That was one case in particular, which was a very interesting one. An assistant of mine took notes of it, but he left me, and unfortunately took away the notes. He went to Australia, and what has become of them I do not know.

10,394. What was the age of that miner?—About 45.

10,395. (*Chairman.*) Had he been under your charge for any considerable time?—For some time.

10,396. How long had he been off work at the time when he died?—I think that he had not worked for nearly eight months.

10,397. (*Mr. Holland.*) How long do you think that he had been ill?—He had been ill for some time, complaining.

10,398. For several years?—Not several years, but for some very considerable length of time; he had been complaining about a year and a half or two years.

10,399. (*Chairman.*) Have you had much experience in treating miners' disease?—Yes, I have had a great number of cases.

10,400. (*Mr. Holland.*) In the case which you have mentioned was there any contraction or thickening of the bronchial tubes?—There was thickening.

10,401. Did it amount to contraction?—Yes.

10,402. Was the deposit general over the lungs?— Chiefly on the upper part of the lungs.

10,403. Was there any distinct tubercular deposit? —No.

10,404. Do you think that there is a distinct difference between miners' consumption and phthisis? —Yes, certainly; there is not the slightest doubt about it. I think that very often where a person is at all subject to phthisis, and where it is hereditary, when he works underground it is sooner or later called into action. We very often find that, and we very often find that if the miners get bronchitis, it throws them into this miners' affection.

10,405. Does the miners' disease generally begin with bronchitis or something like it?—Yes, very commonly. There is one case where I told the man to come here this morning, where it has commenced with bronchitis, and it is a very good case indeed.

10,406. Is it a well-marked case of miners' consumption?—Yes. I do not think that his lungs are extensively diseased at present, but if he continues to work undergronnd he will most decidedly go into that disease.

10,407. Have you practised in any other district than this?—I have been house surgeon in an hospital in London.

10,408. As a medical practitioner?—No. I was for some time assistant under Dr. Walsh at the University, and there I have seen some cases.

10,409. Do you think that the miners are less liable or as much liable to true phthisis as other workmen?— Certainly; in Cornwall we get an immense quantity of true phthisis.

10,410. As much among miners as among others, in your opinion?—I should think so.

10,411. The proportion of deaths from lung diseases

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is rather less among young men in Cornwall than in other parts of the country?—Yes. The Cornish miner does not suffer for some time; he is a healthy, strong young man, and you could not pick stronger men for a regiment of soldiers, but by working under ground they very quickly take on old age. I have remarked numbers of young men in this town who have become old men very quickly.

10,412. At about what age?—From 30 to 40. We always calculate that a miner is 10 years older than an agriculturist.

10,413. You think that that is a correct observation?—A very correct observation.

10,414. (*Mr. St. Aubyn.*) At what time of life?—Between 30 and 40 is the time when they begin to show signs of age.

10,415. (*Mr. Holland.*) Till then are they very healthy men?—Generally very healthy men. They are a class of fine developed young men.

10,416. In the miners' complaint do you observe that there is more difficulty of breathing early in the disease than in phthisis?—Yes; and we find that they expectorate a lot of black stuff, mucus, and which has all the appearance as if they had been inhaling some carbonaceous matter, as you very often see a person in the London fogs in the November month.

10,417. They have been inhaling carbonaceous matter, have they not?—Yes.

10,418. Is that what makes it black?—Yes.

10,419. If they have been some time out of the mine, do they cease to spit up black stuff?—Yes, invariably. Directly we get a man who is at all affected with anything in the shape of miners' disease, I always recommend him to get a place on the surface.

10,420. Does he then soon lose the black spit?—He very soon loses that, and recovers, and lasts for years, if he does not go back again under ground. We find a very great difference in the different mines where they work. If they work in granite mines we find that they are more prone to the disease in the cold granite mines than they are in the common killas.

10,421. Is it possible that that may be because there is more blasting in granite mines than in killas?—No; I think it is because there is more cold air. Very often, after working hard, they sit down to take some refreshment, and sit on a cold stone, and the draught going through, just to cool them as they take it, is the very thing which does the mischief.

10,422. Do you think that the bronchitis is often the consequence of repeated slight colds?—I think so, and that it arises from the irritation of swallowing the dust and the powder smoke and the candle smoke. When I speak of the air, of course the air underground is made up partly of candle smoke; the candles produce a great deal of smoke. Then there is the powder smoke after blasting which they inhale.

10,423. Some of the men have complained that the candle smoke is very irritating to them; have you any remarks to make upon that?—In miners' houses, where I have found some of the candles being burnt, it is certainly very irritating; it produces almost a smother in the room.

10,424. Have you noticed that hæmoptysis is more rare in miners' consumption than in common consumption?—Very much more so. We do not get hæmoptysis to anything like the extent in miners' consumption that we do in the ordinary cases of phthisis.

10,425. The sound of large cavities in the lungs is very rare, I am told?—Yes.

10,426. Is not the progress of miners' consumption very much slower than of phthisis?—Yes; they go on sometimes two or three years and sometimes longer.

10,427. Is the evidence of positive disease in the upper part of the chest as distinct in miners' consumption as it is in other consumption?—It is not generally quite so distinct, I think, as in ordinary phthisis.

10,428. In phthisis it is very much more frequent in the upper lobe?—Yes.

10,429. Is hectic decidedly more rare in miners' consumption than in common consumption?—You very seldom get it in the miners' consumption.

10,430. Is diarrhœa prevalent in miners' consumption?—They do not suffer a great deal from that.

10,131. Whereas they very often have it in the other consumption?—Yes.

10,432. Is there pain?—There is very little pain.

10,433. Decidedly less frequently than in the other consumption?—Yes.

10,434. You feel no doubt at all that miners' consumption is a distinct thing from phthisis?—I am sure of it.

10,435. And that is the common opinion of all well educated practitioners?—I believe so; I have never heard but one opinion.

10,436. It has been stated that a large proportion of miners' children die from mere debility within the first year of their existence, and it is added, "No one "who has not seen these miserable specimens of "humanity can have the slightest idea of their "diseased appearance, small, thin, and shrivelled, "with scarcely strength to cry. It seems sometimes "almost a crime to attempt to prolong their exis-"tence." Is that a correct description?—Certainly not; I do not think that there is a healthier lot of children in this country. Looking at the district which I take, which is very large, I do not think there is a more healthy lot of children in the world.

10,437. Is it not grossly incorrect?—Certainly, it is perfectly absurd.

10,438. It goes on, "This appearance can be ac-"counted for by no other cause than the debilitated "constitutions of the parents being entailed on the "children"?—I do not think that at all.

10,439. Are not a great proportion of miners' children born before their father's health is impaired?—Yes.

10,440. They marry early?—They marry very early.

10,441. And you said they do not generally become diseased till 30 or 35?—No. Many of them marry at 16 years of age.

10,442. If it were in consequence of the debilitated constitution of the parents, the younger children would have it, and the elder children not?—Yes. It strikes me very forcibly that the disease from which the miners suffer is not generally communicated to their children.

10,443. Do you mean you think it is a local and not a constitutional disease?—Certainly, and it does not affect the children.

10,444. Is it not a fact that the children af miners, say of this district, are remarkably free from scrofulous complaint?—They are very free from scrofula.

10,445. Can you compare them with the children of any other district which you know? Is there any difference in the healthfulness of agricultural children and of mining children?—I think not the slightest difference; if anything I think the miners' children are rather more healthy than the agriculturists' children.

10,446. Is there any extra difficulty in rearing miners' infants?—Not the slightest, you can rear them very easily.

10,447. If there be a large proportion of deaths of children in any district it must be because there are a greater number born?—Very often, when they get their infants bad, they will not send for a medical man, and they say, "Let the will of the Almighty work its "way." That is very common. They say, "An "infant of this size, a medical man cannot do much "for;" that is very common indeed. But I believe that our children are as healthy if not healthier than in any part of the West of England. You see them in Wendron parish, going about without any stockings or shoes, and the picture of health; they live in the wildest places.

10,448. (*Mr. Kendall.*) Have you ever been underground at all?—Never, but once.

10,449. You cannot speak from experience of the coldness of the water in the granite and killas mines?

—Only from tasting it. In the granite mines it is brilliant, sparkling, and icy cold, whereas the killas water is quite dirty.

10,450. With regard to the smoke in an end of a level, do you think that the miners injure themselves by rushing too rapidly to clear their holes?—In some mines I have heard they will not allow them to go in until the smoke is properly cleared; but if the agent is not close by they very often rush in for their own benefit, especially if they are tributers, so that they may raise as much ore as possible.

10,451. Their working in that air must be very injurious?—Certainly it is.

10,452. Taking the miners' houses and the agriculturists' houses, speaking of labourers, which do you think are the most comfortable?—The miners, decidedly.

10,453. Cleaner?—Much cleaner.

10,454. And much more comfortable?—Yes.

10,455. Who lives best; the miner or the agriculturist?—The miner is rather improvident about it; it is rather a feast and a fast with him. One day he will have his beefsteaks or his good living, and the next day he will have his porridge, and they live upon broth, as they call it, for some days afterwards, and they only throw in a bone or perhaps a little bit of pork to make the porridge; but the agriculturist generally gets his regular allowance from the farmer, and so it is regulated much better than it is with the miner.

10,456. But taking the whole run of the month, I suppose the miner tastes much more solid food?—Yes.

10,457. He has much more beef than the agriculturist?—Yes, a great deal more beef.

10,458. But he will have his Sunday dinner every fortnight?—He will have his Sunday dinner on the Saturday, especially on the pay day.

10,459. Whenever he can enjoy it, and has time, he will live well, even though at the expense of living badly for the res ofthe week?—Yes. I have known many a miner who has gone and sat down and drank his gallon or two of beer in an evening, and then they will not touch it again for the next month perhaps. I have said to them over and over again, "If you will "only just take your pint of beer a day for your "dinner, and be content with that, instead of taking so "much on your pay day, you will be a very much "better man at the end of 10 years than you will "if you live as at present."

10,460. Talking of the pay day, do they spend much of their money at the public-house?—Yes. I know one publican who does an immense deal in that way.

10,461. He prepares a large quantity of small change in order to accommodate the miners?—Yes; he gets a lot of silver.

10,462. According to the present mode of pay, the men having a large quantity of notes, I suppose they cannot divide their money without having some mode of change?—They very often go to the bank, and change their notes. The miners' bank make it, I believe, a point to change their own notes, so that if the men wish to do it, they can.

10,463. There are available means without going to the shop?—Yes.

10,464. If they go to the public-house, are they expected to drink anything out of a 5*l.* note?—Yes.

10,465. How much?—I cannot say; it depends upon the pair. A certain pair go to a public-house, and they will sit down there, and perhaps they cannot pay all this time, and they come next pay day, and pay then. A pair of men very often at the public-houses are looked upon just the same as I should look upon a patient. The publican says, "Such and such a pair come here," and they generally take a pretty good quantity. One could not go to a public-house, and get his note changed, unless he drank something.

10,466. (*Mr. Holland.*) Do you attribute any of the ill-health of the miners to the irregularity of their diet, of which you have spoken?—I think so. I think that if they lived regularly they would be very much better.

10,467. (*Mr. St. Aubyn.*) You have said, and I have heard it said before by two or three medical witnesses, that when you detect the first symptoms of the miners' complaint, if you can get them to take some occupation above ground they recover?—Yes.

10,468. And the expression used is that "they go on for years." Do you mean to say that when you take the thing in time you can make them as good and as strong as if they had never had the disease at all?—No; but it can be arrested in a measure, and very likely, if they worked upon the surface, they would live to a great age.

10,469. Supposing that you were examining for an insurance office, and that you had a man who had had the miners' disease to a small extent, and had come up, and had been working above ground a certain number of years, and was to all appearance well, should you consider his as good a life as if he never had been underground?—Certainly not.

10,470. Even if he never worked underground again?—No; I should be afraid of a deposit lodging about the lung, which sooner or later might develop itself.

10,471. Then it comes to this, that if a man ever is attacked by the symptoms of the miners' disease his must always be an uncertain life for the rest of his days, even if he leaves off his occupation?—Yes, I think so.

10,472. (*Chairman.*) You say that the air is made up from the candle smoke and the smoke of powder; do you know any other ingredient?—There is a certain damp sometimes in some mines, of which they complain.

10,473. What do you mean by damp?—It is a sort of heavy atmosphere; some gaseous matter. Very often the miners say, that although there is a draught going through a mine there is a very awkward damp which arises; they tell me so. I cannot say any further than that.

10,474. To your knowledge, there is no other ingredient injurious to health in that air?—Not to my knowledge.

10,475. I think you answered to Mr. Holland that you could not say that a man lived well who for many days was without meat, and yet ate a great quantity at other times?—No; regular living is certainly the best for any man. They always have a better dinner on Saturday or Sunday than on other days. On other days they feed badly; you cannot call it fasting. Their pay-day is only once a month, when the men feed too well; then they make up their other meals with porridge or pilchards, or something of that sort.

10,476. On the other days do you think that they have sufficient food, considering the work which they have to do in the mines?—I think it would be better if they had more beef or more meat.

10,477. (*Mr. Holland.*) If they distributed their earnings better through the month they would be healthier men?—Yes.

10,478. (*Chairman.*) Do you think that a man with a large family could do that upon his earnings?—Yes. When my father came here to practise there were only 700 inhabitants in this town; we are now 9,000, and the houses are chiefly built by the miners themselves; they are owners of their own houses, so that if their gettings were such as not to allow them sufficient meat they could not build their houses.

10,479. Do you know how much a house costs?—The price is generally from 50*l.* to 60*l.*

10,480. Is that built out of their own earnings, or do they borrow money?—Sometimes it is built by the lord, and the lord sells them the house, and I think they pay for it by instalments; but you will very often find that they pay it out of their own money.

10,481. So that the fact of a man having a house does not show that the money represents his regular earnings?—No.

10,482. We have been informed that the houses are built on the occasion of the men getting a good pitch?

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—It used to be the case, but it is very seldom the case now. You now scarcely ever hear of a start among the miners.

10,483. (*Mr. Holland.*) Why?—I think that the agents are pretty wide awake now.

10,484. (*Chairman.*) Therefore, although a man may have a house of his own, it does not follow that he has such an amount of wages by the week as to allow him to live well or equal to the work which he has to do?—No, it does not follow.

10,485. When a miner is off work from illness, and is in your hands, what means of support has he?—Sometimes they get into clubs, but not into mine clubs; the mine clubs do not grant it. In many mines, if the clubs are pretty well off, they are very kind to them; they are so in many mines with which I am concerned. But if the club is in debt they cannot afford to do much.

10,486. In that case, what is the men's resource for obtaining nourishment?—They generally have what they call miners' clubs.

10,487. (*Mr. Holland.*) Provident clubs?—Provident clubs.

10,488. (*Chairman.*) But I suppose that in your experience there are many who do not belong to such clubs?—Yes; many have not a bed in their house; but I have noticed that they are chiefly men who have been in the habit of drinking a great deal, and spending their money as they get it.

10,489. Many, I suppose, would have a better chance of recovery if there were any means of getting better food?—Yes.

10,490. And many, I suppose, require to be assisted?—Yes.

10,491. Do they apply to the union?—Yes; I am surgeon to the union as well, so that I know about them.

10,492. Are there many miners who are not permanently on the club who get assistance from the union?—No; very few. They do not like the union very well. Their names are published on every quarterly list, and a miner does not like to see his name up, although some would, I think, be everlastingly on the union.

10,493. But if a man was only off for a temporary illness he would rather not apply to the union?—In many cases.

10,494. (*Mr. Kendall.*) You know what the miners' wages are upon the average here, generally speaking?—They vary in some mines; in some of the mines I know them. I think I can tell you pretty well.

10,495. From your knowledge of their earnings, do you think that a miner earns money enough to give him that food which his hard labour requires each day, provided that he well regulates that money?—I should think so. If they got half as much again I do not think they would live a bit better than at present.

10,496. Your idea is that a miner is an improvident man?—I think, generally speaking, he is rather an improvident man.

10,497. That though he will now and then build his house out of certain gettings, yet amongst them there are a great many very improvident men.?—Certainly.

10,498. Taking a miner's wages, and taking into consideration the hard work which he has, if he regulated the expenditure of that money, and did not one day feast and the other day fast, he would make quite enough to supply him, even if he had a family, with what he wants?—I think so. Many miners work out of corps, and if they are badly off they might get work, but they will not do a couple of hours' work in the course of the day for you in your garden or your field.

10,499. Out of the 24 hours they never work more than 8?—Very seldom.

10,500. So that they have 16 hours for sleep and play or rest?—Yes.

10,501. You can very seldom get them to give any part of that time to extra labour?—Not one in three hundred will do it.

10,502. (*Chairman.*) You have stated that the men work for eight hours; does that include the time of their going to work, the time of going down, the time of coming up, and the time of changing and going home?—Yes; it includes the whole of it. They are generally expected to go down, for instance, at 2 o'clock; then from their candles they can tell what time it is, and when they should be up again.

10,503. But a man must take so much time to go to his work, and so much time to come back?—The time from his house to the mine is not calculated.

10,504. He is only eight hours underground?—He is only eight hours underground.

10,505. (*Mr. Kendall.*) Are their residences generally near the mines, or not?—I am sorry to say that a large number of them now are from four to five miles away from some of the mines.

10,506. (*Chairman.*) I suppose that in consequence of their building their own houses they very often live at a distance from the mine?—When they take a mine at a distance from their house, they can get a bit of land, where they can keep a cow or two, which is a very important thing where they have a family. If they were to come to live in the town, the houses would be very much more expensive, and they would have no land.

10,507.—Therefore you cannot say that they have all the rest of the time for play or extra work beyond the eight hours that they are below?—No, not in those cases.

10,508. Do you think that an average rate of wages is any real criterion of what each individual man earns, considering that many of these men are tributers, earning *5l.* or *6l.*?—I am not, of course, the agent of a mine, but I should think that a tutwork man gets from *2l.* 10*s.* to *3l.* a month regularly. We generally find that the tutwork men are the men on the whole who save most money, and their families are on the whole better off; they get more regular earnings; but a tributer will go on sometimes for three, four, and five months, and then he will leave the mine, perhaps in debt.

10,509. So that you think that a tutwork man earning from *50s.* to *3l.* is better off?—I think so, but I am not prepared to state that as a fact.

10,510. (*Mr. St. Aubyn.*) Should you say that the majority of those men who build and occupy their own houses here were tutwork men or tributers?—I should say that the majority of them were tutwork men. I have known a case where tributors, even since I have been in practice, took up as much as *900l.* in two months; but that is the only case that I have ever known here. My father, when he was alive, knew a great number of those cases, but you do not hear of them now.

10,511. Should you say that as a class the tutwork men or the tributers were of the most provident habits?—The tutwork men.

10,512. (*Mr. Holland.*) Is it your experience that there is a great deal of dyspepsia among the miners?—The miners' disease generally commences with a sinking in the stomach; they complain of that. Palpitation of the heart is another symptom of which they complain.

10,513. Do you think that that is symptomatic?—I think it is symptomatic with the stomach; there are many cases of that sort now.

10,514. Is there much disease of the heart, accompanied by distinct physical signs?—No, I should not say that there is.

10,515. Is acute rheumatism common?—Yes, we see a good many cases of it.

10,516. Is there a good deal of disease of the heart, following acute rheumatism?—No.

10,517. Do you think that the climbing of the ladders has much effect in producing disease of the heart?—I should very much doubt it.

10,518. Have you noticed any remarkable peculiarity in the miner's heart?—They have generally large hearts, but not often marked by any disease. I believe

that in miners who begin young the heart grows in proportion to the work which it has to perform, and thereby escapes disease until the lungs become affected.

CHARLES FOX, Esq., examined.

10,519. (*Chairman.*) You have for a long time taken an interest in miners, and are likewise connected with mines?—Yes.

10,520. Will you be kind enough to mention to the Commission any points to which you think they should turn their attention, particularly with reference to the sanitary condition of the mines?—As I have often stated in public and in private, we are entirely deficient in any statistics on the subject. We do not know the extent of the evil, either as it regards accidents, or disease, or death amongst the miners. It is only here and there that you glean some statistics on the point, and by the labour of individuals. We have no record, as far as I know, of the accidents which occur, whether fatal or otherwise, nor any account to be depended upon of the mortality amongst the miners as a class—no safe record. Great pains have been taken in the different parishes, but after all it is like groping in the dark to a certain extent. I regret that our medical men have kept no accessible record of the cases in the mines which have been specially under their care. We go to the union house, and there we see a record of all the cases which are under the care of the medical man; how many weeks a man has been ill, and what the nature of his disease was; and, although he does not keep any record of the medicines, he tells you when he orders extra diet; but we have nothing analagous to that in our mines, and I should conceive that there would be no practical difficulty in having such a record kept. I have gone further, and urgently recommended that a register should be kept of every person employed in the mines, both as to their ages, and the circumstances under which they were living, especially if at a distance from the mines. At such a place as Camborne this applies in part only, as the residences of the population are in the midst of the mines. Sometimes the miners have to go a distance of three, and four, and even five miles, although that is much less the case now than it formerly was. I do not know whether, amongst the inquiries of the Commissioners, they have obtained any evidence of miners as to their suffering from the length of a core and eight hours shift or not. I think it would be an advantage to the miners if there was a medical inspection, more or less periodically, of those working underground, in order that the commencement of disease might be detected before it becomes illness. It might be thought needless, but I think that that system has told eminently well in the military service.

10,521. Do you consider that the subject of ventilation is important to inquire into?—That, I think, is a main point.

10,522. Could you give the Commissioners any suggestions as to how they should obtain information upon that point?—It can only be ascertained by inspection and examination.

10,523. Have you ever made any inquiries as to the state of the air in the mines?—I have experienced it myself in places, especially where in a level the stuff has been heaped up, but not by analysis, except as it has been reported to our Polytechnic Society.

10,524. (*Mr. Holland.*) Are you referring to specimens of the air taken from close ends?—Yes; my idea is that where men are working for six hours, where the air is bad, there are cases where it would be better to make a shift, and make it only four. But after all that must be left to the local agent; it is a mere general expression of opinion on my part.

10,525. (*Chairman*) Have you ever seen any means tried, or have you known of any being tried, effectually to get rid of the poor air in close ends?—Yes; there are many mines in which the miners could not work at all without the air machines.

10,526. Do you think that they effectually get rid of the poor air?—Yes; in some instances they do it effectually, and in others they only do it partially.

10,527. It has been stated in evidence over and over again, that sometimes one shaft is a downcast and another is an upcast, and that that depends upon the wind. Have you ever obtained any information, or had any experiments made, in order to ascertain whether the air in a mine is not constantly travelling through the different levels, and without coming up?—No; but I have no doubt that it is often the case.

10,528. (*Mr. Holland.*) That is, that it circulates in the mine, and not through it?—Yes; the great difficulty is as to the powder smoke. Then, with regard to the expenditure of muscular power, before the man-engine was introduced, I found in the Consolidated mines, after multiplying the number of men by the depth from the surface of each level, and reducing the whole to unity, that it amounted to an ascent many times as great as that of the Himalayas.

10,529. Do you consider the man-engine of great importance and utility to the miners?—It saves their muscular labour, and the hurried action of the heart and lungs.

10,530. Is there any other point upon which you can give the Commission any information?—I think not.

10,531. (*Mr Holland.*) Have you had any reason for altering the calculation that you made when the man-engine was first proposed as to the average loss of labour in climbing the ladders?—I think it was rather made by the committee than by myself. I was on the committee. I do not remember what it was.

10,532. (*Mr. St. Aubyn.*) Can you furnish the Commission with any statistical information as to the number of men who were receiving allowances from the club in any mine, before the introduction of the man-engine, as compared with the subsequent period?—No; I should like very much to obtain it, and I have tried to get it, but in vain.

10,533. I believe that you offered a premium for a machine?—Yes; I offered a premium for a man-engine. I said it was to be on certain commercial conditions, namely, that every man must be lifted 100 fathoms at a penny per 100 fathoms, including the tallow and the expense of working the engine, and 10 per cent. on its original cost for wear and tear; and the committee at once decided, on the models that were produced, that they came within my conditions. Then, with regard to striking with the borer, and most often in a narrow space, a hammer is lifted which sometimes weighs 10 lbs. and sometimes 12 lbs. 6 or 7 times in a minute, and that is injurious to the heart.

10,534. In some districts do not the men work single handed, driving the borer with one hand?—Not to my own knowledge; but I do not doubt its being done.

10,535. Have you had any experience with regard to blasting the holes, and the accidents caused by it?—No; only that certainly many of them might be avoided, there is no doubt about that.

10,536. You think that if proper precautions were taken by the managers and agents those accidents might be diminished?—I do not think that the managers and agents can do much more than they have done; it is to be done by the men themselves. I think that the major part of the accidents arise from the miners going too suddenly to a hole, thinking that the fuze has gone off.

10,537. Where there has been perhaps an imperfect fuze?—I do not know anything about that.

10,538. (*Mr. Holland.*) With respect to tamping; do not you think that it would be a great advantage to substitute a bronze for an iron tamping tool?—Yes, that has always been acknowledged; that was Sir Humphrey Davy's introduction; that would be a very valuable precaution, and it would avoid many of those accidents which arise.

10,539. Will you be so good as to describe the

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tamping wedge?—There is a wedge with a sharp edge, the cylindrical end resting upon the powder in this way (*describing the same by a sketch*); the effect is that this wedge is driven up, and immediately expands the fork of a cleft stick above it; that has been done successfully in many places; but the miners do not like the trouble of it; the cost of it is very trifling.

10,540. (*Chairman.*) Could that be applied to a cartridge?—Yes.

(*For a sketch of this invention refer to the Transaction of the Polytechnic Society.*)

10,541. Do you suppose that two pieces of ore or two pieces of the country striking together would produce fire that would ignite powder?—Yes, they may, under certain circumstances, if you find a very hard metallic surface.

10,542. Would you recommend gun cotton to be used?—I wish that it may be tried, where abundant powder smoke accumulates; it might be made as wanted or preserved in a glassy envelope (invented in Germany, as I am told).

The witness withdrew.

MR. THOMAS HUTCHINSON examined.

Mr. T. Hutchinson.

10,543. (*Chairman.*) You have, I believe, charge of a good many mines?—Yes.

10,544. Has your attention been directed particularly to the miners' disease?—It has been directed to the illness of miners.

10,545. Have you ever had an opportunity of making post mortem examinations?—Not in any case of miners' affections; not in disease of the lungs.

10,546. Do you keep any record of the cases that come before you?—I am Registrar of Births and Deaths, and I have a record in that way, of which I keep a copy to some extent.

10,547. But do you keep a record of the actual cases that come under your notice?—I have, of some.

10,548. You do not keep a record of all the cases?—No.

10,549. I suppose that a great many of the patients just come to you and go again?—Yes. If there have been any particularly interesting cases, bearing upon this subject, I have lately kept notes of them.

10,550. Are there any cases the particulars of which you would like to furnish to the Commission?—I have done so already, so far as I have been able to do so. I have no additional cases, beyond those to which the Commissioners have already had access.

10,551. (*Mr. Holland.*) I believe you are clearly of opinion that miners' consumption is distinct from common consumption?—That which passes under the name of miners' consumption is certainly not tubercular phthisis, at least a great number of cases that are registered for phthisis are not tubercular phthisis at all, but they are a combination of various complaints, bronchitis, emphysema, and disease of the heart, but they are registered under the head of phthisis, as it is a short term, and easily recorded. I expect that is the reason.

10,552. Is the absence of large cavities in miners' consumption a fact established?—I do not know that it could be thoroughly well established without post mortem examinations being made, but my general opinion is that there are not such large cavities.

10,553. The presence of which you can detect by the ear?—You do occasionally meet with cavities, when you find that there is a metallic tinkling, and such sounds are demonstrative of a cavity, but I think that the cavities are smaller than in tubercular phthisis.

10,554. Is hectic a symptom rather rare in miners' consumption?—I think it is less common in the fatal diseases among miners than in ordinary consumption.

10,555. Have they much spitting of blood?—Yes, but that is less frequent than in phthisis.

10,556. If persons who are seriously ill with miners' consumption can change their employment, and work on the surface, is the disease suspended?—I think that in a very early stage, when they have simply bronchitis, it would be relieved, but I do not think it would be in an advanced stage, or in the secondary stage, but in a very early stage it might be, when they first begin to complain.

10,557. The Commissioners have been informed that in an advanced stage of the disease a man may continue to work, and may live a long time?—A man could not work in an advanced stage of the disease.

10,558. When a man is unmistakeably ill from miners' consumption, and he can change his employment, is there not a fair chance of his living a good long while?—I do not know that.

10,559. Have you noticed that in miners' consumption the upper part of the chest is not more diseased than the rest?—I think that in diseases of the lungs, from which the miners frequently suffer, it is more often at the lower than at the upper part.

10,560. Do you think you can rely upon that?—Yes, quite so.

10,561. That is just the reverse of phthisis, is it not?—Yes.

10,562. Do you think that the powder smoke is a serious cause of irritation to the miners?—Yes; I think there is no doubt of it.

10,563. Are the miners very liable to catch cold?—I think they are, being more exposed to changes of temperature, to which they are liable from the nature of their occupation.

10,564. It has been suggested that disease is very frequently produced by a succession of colds, not any of them amounting to actual illness, but from a constant irritation of the air passages; do you agree in that opinion?—I do not think that that one cause is sufficient to account for it, as I believe that there are many; there is the powder smoke, the dust, the frequent colds, the climbing, and other violent exercise.

10,565. Do you think the dust is a frequent cause of injury to them?—Yes, in many cases; the dust and the powder-smoke, and the frequent colds which they catch; indeed there are many causes; it is not any single cause.

10,566. Have you observed that the miners are particularly subject to dyspepsia?—Yes, I think they are.

10,567. Is the water-brash common among them?—Yes, and I think that is more from their diet than from anything else; from the pasties, and the indigestible food which they eat.

10,568. They say that their appetites are temporarily destroyed when working in hot air; do you think that is so?—Yes, I think there is no doubt of it. I frequently find them complain of loss of appetite when working in hot places.

10,569. Will not that produce weakness of digestion afterwards?—Yes, no doubt of it; but I think it is as much attributable to their food.

10,570. What fault have you to find with their food?—They take hoggan down with them, and that is very heavy food; it is a solid mass of flour, mixed with water, and baked without any leavening at all.

10,571. It is like a lump of heavy pie crust, but even heavier?—Yes.

10,572. Why do they prefer that?—I think because it is more convenient to carry underground.

10,573. Do you think that miners are more liable to rheumatism than other labourers?—No, I think not.

10,574. Have you noticed that they suffer from distinct heart disease, frequently?—Yes; it is very common.

10,575. In what form?—Dilatation.

10,576. Hypertrophy?—Yes; valvular disease is not so common.

10,577. Is rheumatic disease of the heart rare amongst miners?—It is not common.

10,578. Have you noticed symptoms of dilatation of the heart without valvular disease?—Yes, very frequently; it is very common.

10,579. Do you attribute the disease of the heart chiefly to climbing?—Yes; I think it is chiefly attributable to over exertion in all their labour as well as in climbing, for instance, in beating the borer.

20,580. To which do you think it is most ascribable?—It is difficult to say, but they both contribute.

10,581. Have you seen any great difference in the frequency of dilatation of the heart among those miners who climb up by ladders and those who come up by the man-engine?—I do not think there has been sufficient time yet to verify that; the man-engine has not been introduced sufficiently long here to test it.

10,582. The children of miners have been described as being born very weakly, and hardly fit to rear; do you agree in that?—No.

10,583. Is not the contrary of it the truth?—Yes; I think that they are naturally very strong.

10,584. Is there any unusual difficulty in rearing the infants of miners?—Not at all. There is an ignorance amongst parents as to the proper food to give them.

10,585. Do they begin to fail after they are weaned?—Yes. When theydo fail, I think it is then. When the children are older they get on better; but there is an ignorance of domestic economy among them. I think it is more from want of proper food after weaning than any other cause.

10,586. Are you sure that at birth the children of miners are quite as healthy as any other children?—Yes.

10,587. And remarkably healthy?—Yes.

10,588. Have you noticed scrofulous disease frequently, or is there an absence of it?—There is quite as great a freedom from scrofulous disease here as in any other neighbourhood, and perhaps more so.

10,589. Are not scrofulous diseases and glands in the neck very rare?—They are very rare; very uncommon.

10,590. Are not marasmus and tabes mesenterica very rare?—Yes.

10,591. (*Chairman.*) Have you any suggestions to make by which the causes from which miners suffer by working underground might be modified?—If the climbing up the ladders could be done away with it would be very advantageous; they evidently suffer from climbing, from want of ventilation, from the powder-smoke, and the dust. If the levels could be made wide, these and the edds better ventilated, and the climbing done away with, the condition of the miners would be much improved.

10,592. Do you think that they suffer from breathing a particularly bad air, or from a want of oxygen?—I think it is a want of oxygen, as far as I know.

10,593. Might there not be an excess of carbonic acid gas?—Yes, there might be, and it would produce the same effect.

10,594. Supposing there is an excess of carbonic acid gas beyond what was the product of combustion, would not that produce many of the effects described by the miners who suffer from working underground? Yes.

10,595. (*Mr. Holland.*) It has been stated in evidence that where candles burn freely the miners may suffer much from cold damp, without a deficiency of oxygen; have you heard of that?—Yes; I have heard many miners say that they suffer from cold damp where the candles burn freely.

10,596. (*Chairman.*) If there is an excess of carbonic acid gas, the test by the candle not burning could not be relied upon?—Not entirely, I think.

10,597. You are aware that the test to which they all resort is the burning of a candle?—Yes; no other test is used.

10,598. (*Mr. Holland.*) In the case of cold damp, that test would fail them?—Yes. The miners act wrongly as to one thing; if they do not feel sick, and they can eat their food, they keep on working, alhough they may have bronchitis, which they very often have; and they will go on for a month, or two months very often, with cough and wheezing, and considerable difficulty of breathing, indicative of serious chest affections, provided they do not feel weak and ill, or suffer pain.

10,599. Are their stomachs often very much affected?—Very frequently.

10,600. Might that arise from inhaling carbonic acid gas?—Yes; no doubt of it.

10,601. Some of the miners have stated that the first effect which they have experienced has been a weakness in the calves of the legs and shaking in the limbs, before the candle indicated anything?—I have not heard them describe a shaking of the limbs, but they all complain of weakness in the legs.

10,602. Do you think that is caused by poor air, or by cold damp, or by both?—It is difficult to say; perhaps by both. I find that in the last 531 deaths in Camborne, 45 are registered as from phthisis, 30 of those occurred among tin and copper miners, and 15 were the wifes and widows of copper miners.

10,603. (*Mr. Holland.*) There being twice as many among the males as among the females of the same?—Yes; the total number of deaths amongst tin and copper miners in the 531 was, from all causes, 55, and the deaths from phthisis amongst those were 30.

The witness withdrew.

JAMES JAGO, Esq., M.D., Oxon, examined.

10,604. (*Chairman*). You reside at Truro?—Yes.

10,605. You are, I believe, physician to the Infirmary, and also to the Truro Dispensary?—Yes.

10,606. In the course of your practice, have you had many cases of miners suffering from any ailments, other than accidents, brought under your notice?—In a certain stage of disease, many among the in-patients of the infirmary also; I see a good many who come as out-patients to the infirmary; and I may say especially to the dispensary, from certain parts.

10,607. When you say from certain parts, do you mean that they come in an advanced stage of disease?—When they think that they do not get cured at the mine, they often come as out-patients, if they live near enough, to one of these institutions.

10,608 Have you ever attended at a consultation with any of the mine doctors?—I have frequently had consultations with them; but, generally speaking, the working miner is not very well able to pay for consultations. I have had consultations in the cases of men who have retired from the mines, having acquired a little capital; but I do not go out into the country to attend consultations in the case of ordinary miners: they cannot afford it. They sometimes consult me at my own house by the wish of the mine doctor.

10,609. Mr. Vincent has stated that there was a case that you had watched with him, or to which he had called you in?—I have seen many cases with him, and possibly a case of a working miner, but I cannot call such a case to mind.

10,610. Have you seen enough of these cases to enable you to give a decided opinion as to the nature of the complaint called miners' disease?—I do not altogether recognize it so positively as I have seen it characterized. There is such a thing as miners' disease, in contra-distinction to consumption; and I mean to maintain that there is a peculiar affection of the bronchial tubes connected with bronchitis and sometimes emphysema, by which the miner becomes worn out, and becomes so weak that he ceases to come to the institutions which I belong to, to consult me, and I therefore really hardly know what then becomes of him. At the same time, I do see consumption in miners of all ages—actual consumption; but still there is such a

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thing as a very weakening complaint of the nature of bronchitis. I do not think that it is always of that nature. I believe that many miners have inflammatory affections of the chest, although I rarely see an acute pneumonia and pleuritis case. Sometime ago, I had a case in Truro, in an acute stage. The man now lives here, and his name is Collins. That man, when he came under my care, was suffering from pericarditis.

10,611. (*Mr. Holland.*) Was it rheumatic?—No; there was no rheumatism connected with it whatever. On the subsidence of that attack of pericarditis, he had an attack of pleurisy on the left side; but he left the infirmary at the end of two months, well enough to go to work again after another two months' rest, and he worked for two months underground as well as he ever did in his life. Then he got some other acute affection, and came to the infirmary under Dr. Barham. I did not examine him: but he has consulted me again lately, and he is now in such a state that he has short breath, and he is perfectly unfit for mine work. A little while ago, he was very angry with me on account of a suggestion that I made—I thought that he might do some very light work aboveground. This man is in a state of what many might call miners' consumption. I mentioned it to Mr. Hutchinson, his mine doctor, as a case of the kind; it was a case of inflammatory disease. I have often examined miners who have had an impediment in their breathing; and I have often examined miners who have had the remains of pleurisy about them. I mean that on one side or the other they have had an attack of pleurisy. I attribute some of their failing health to these attacks.

10,612. Have you had an opportunity of making post mortem examinations in the cases of miners' consumption?—Never. I asked Mr. Hutchinson, about a year ago, for an opportunity. I said that I would come to this town at any time on purpose, and he promised to bear it mind.

10,613. Is it not most desirable for post mortem examinations to be made, to ascertain the exact nature of the disease?—Yes; and I think it is quite easy to obtain them by anybody living in the neighbourhood of the mines. I do not believe in the prejudices of the people, for I find that a medical man can persuade the relatives, if he likes, to allow post mortem examinations to be made.

10,614. Are they not made because surgeons have not time for them, or that they do not think them worth inquiring into?—Mine surgeons have little spare time, whilst many of them are prepossessed with the notion that miners have a repugnance to post mortems.

10,615. I believe you are not specially a miner's doctor?—No; but I have seen in the Truro Dispensary—from St. Agnes and Chacewater particularly, owing to the fact of some subscribers to the dispensary living there—a great many sick miners. I see them with various complaints; some with bronchitis, occasionally with black sputa, sometimes with other chest diseases. I have a young miner, aged 22, now under my care, who came from this neighbourhood, and that is a case of mitral valve disease of the heart; he suffers from want of breath.

10,616. Do you think that that was produced by working underground?—I do not know. He was put to work underground very early.

10,617. Do you think that going to work early underground would predispose to such disease?—I have no evidence to show that it would, but I should be very suspicious that it might.

10,618. (*Chairman.*) From your observations in the examination of miners, should you say that their illness was the effect of working in impure or poisonous air?—Looking at the anæmic and pasty colour of the miner, which is very peculiar, and other facts as to his breathing, and I have seen them come to me excessively weak, when I have been unable to detect any special cause to account for their want of breath and general weakness, excepting the mere absence of the red colour in their features; the unfavourable condition under which they work alone seem to me sufficient to account for the great deterioration in their strength, and very likely for their gradual decay, bringing on premature old age, and I think a loss of their vital power or force.

10,619. Do you mean by unfavourable conditions a want of light or air that is not vitiated?—I should say there was a want of both. I cannot discriminate between them; both combined might produce the effect; bronchitis might be produced by other causes.

10,620. I suppose a sudden change of temperature is bad?—Yes; going from one state of things to another.

10,621. Or ascending a great height by the ladders, and then having to go some distance to a changing house?—I think that quick cooling after such exertion might be one of the causes. I have observed, however, in the Truro Dispensary that we have a great number of shoemakers. I do not know the number afflicted with bronchitis. I always conclude, if I see a shoemaker enter the dispensary, that he has bronchitis. Why he should have it, unless there is anything about the wax that he uses to irritate the lungs, I do not know, but it is a fact; that a liability to bronchitis is not peculiar to miners. I should say that the shoemakers about Truro are more affected by bronchitis, although they do not die from it, than the miners.

10,622. Do you think it arises from the position in which the shoemaker works?—It may be so, but it is most striking, the number of that class who suffer from bronchitis; some of them are quite asthmatical with it.

10,623. Have you made any post mortem examinations of shoemakers?—No. The bargees on the river at Truro are very subject to bronchitis—from exposure, I should suppose.

10,624. What size is the infirmary at Truro?—I think we make up 64 beds.

10,625. Is the infirmary large enough for its district, do you think?—It is not large enough, since the railways have been opened. We are always full of late.

10,626. What number of cubical feet of space is allowed in proportion to the number of beds?—I cannot answer that question, although the space has been measured. The infirmary is not altogether well built.

10,627. (*Mr. Holland.*) Is the infirmary small in proportion to the number of its inmates?—The beds are too much crowded, to please me, while the old wards are not high enough.

10,628. I suppose there is no doubt that miners are specially liable to lung disease?—I have no doubt that they are. I always examine a miner's lungs, and expect to find some mischief there; if not consumption, something else, with which they seem to drag on for years.

10,629. Have you seen many miners suffering from distinct tubercular consumption?—I have seen a great many young miners, and several older ones so suffering.

10,630. Have you seen many miners with lung disease that was not tuberculous?—Yes.

10,631. A large proportion?—Yes.

10,632. Do you think it likely, from the miner's mode of life, that they will suffer from an unusual amount of bronchitis?—I think it is likely that they will.

10,633. You do not know that they do, from your own knowledge?—I am inclined to say that they do suffer from bronchitis more than the average of the labouring people. Special classes appear to me to suffer than they more, but they more than the average.

10,634. It has been stated in evidence that a very large proportion of the miners die from lung disease, which is called consumption, and includes all sorts of lingering disease, with cough and expectoration. Can you give any evidence as to what that disease generally is?—I instanced the case of Collins, to give you an idea of what kind of case might be registered as such a case. All such cases I think are so registered. There are a great many cases of pleurisy among miners,

and a great many cases of pneumonia, and a great many cases of bronchitis occur; emphysema and disease of the heart also occur, but not so frequently as many persons say they do. All these cases are attended with difficulty of breathing.

10,635. There are a great number of complications?—Yes.

10,636. Can you say whether a large proportion of these cases are bronchitis?—I should say that more or less bronchitis would be present, but perhaps at times I might consider emphysema to be the leading complaint. In certain of these cases I have been able to detect a considerable amount of emphysema in the lung.

10,637. A thickening of the lining membrane of the bronchial tubes has been mentioned as a very frequent circumstance; does that correspond with your observation?—I have never had an opportunity of examining the bronchial tubes. Still I find miners with black mucous expectoration, which may arise, for what I know, from what they breathe in the mines—carbonaceous matter, which had adhered to the lining membrane.

10,638. Do you think that that may arise from the smoke?—I suspect that such cases do occur, among others. I think that the lungs get irritated by breathing, very likely, dusty matter in the mines and the gunpowder smoke, and that these irritate the bronchial tubes, and, among other things, tend thus to damage the miner's health. These, combined, with the anæmic state they get into, from the peculiar conditions under which they breathe, certainly weaken the miner, and make him at last worth little as a man of work; but I have rarely had an opportunity of following these men to ascertain whether they die soon from such declining health.

10,639. Have you seen any cases of miners who have returned from abroad affected in any way?—I have seen men from Cuba and Columbia in South America; perhaps I have seen a dozen cases; and those men are remarkable for the extreme paleness of their complexions, having more the appearance of anæmic women than anything you commonly see in men. I have examined very carefully, as my own patients, at least seven or eight of these men, and I never could make up my mind that I could discover any organic disease whatever, except in one, and in that case I was not clear that he might not have had some enlargement of the spleen. This man laboured so much from want of breath that latterly he was scarcely able to crawl half a mile at a time. They may remain for years in very good condition, and not lose flesh. Their appetite remains good, and they rarely complain of anything, except palpitation of the heart and want of breath, with perhaps, like anæmic women, pain in the pit of the stomach after eating. They are without disease either in the heart or in the lungs. There is occasionally an anæmic bruit in the heart, but only occasionally. They are just for all the world like an anæmic patient. I have taken pains to inquire about these things, and I am satisfied that nobody coming home from Cuba or Columbia ever contracts this disease who has not worked underground. I have found such cases amenable to treatment, they being always benefited by iron, but very difficult to cure. I believe I may have turned out some three or four of them able to go to work again; but the majority of them cease to attend, when they get a little more colour in their faces from taking iron, and relapse into anæmics. I have also found that all the preparations of iron do not appear to act alike, the most successful being the sesqui-chloride of iron. In one instance I had a man from Cuba under my care for months; and he was troubled, in addition to the symptoms mentioned, with extreme constipation. I could do nothing with him until I added chlorate of potash to the sesqui-chloride of iron, when he at once commenced to have regular evacuations, and became rapidly well, and went to work, driving an engine.

10,640. (*Chairman.*) Did you ever examine their blood?—Yes, I have examined the blood of these patients.

10,641. Did you find any peculiar symptoms in the blood?—It is some years ago, and I thought that there was something peculiar in the form of the globules of the blood; but having made some examinations of the blood of perfectly healthy patients afterwards in different temperatures and degrees of dilution, I doubted whether I had seen anything from which I could draw a conclusion.

10,642. Do you think that the disease contracted by men working underground here has any resemblance to that which miners suffer from abroad?—I believe that the disease in question is peculiar to such climates; and could not be produced anywhere else.

10,643. (*Mr Holland.*) It is not an aggravation of the Cornish disease?—No.

10,644. Are the Cornish miners often anæmic?—Yes, they are, but nothing like in the same degree that the other men were to whom I have referred, and their faces have a muddier hue.

10,645. Is it likely that breathing air deficient in oxygen would alone be enough to excite bronchitis?—I have no knowledge of the fact.

10,646. (*Chairman.*) Would a person from breathing an impure atmosphere, the tone of the whole system being lowered, be more liable to bronchitis?—I could imagine that a man working in air insufficiently supplied with oxygen, might strain his lungs and make them emphysematous, and possibly irritate the lining membrane into inflammation.

10,647. (*Mr. Holland.*) If there is an excess of bronchial disease among the miners, and we know that they are exposed to violent alternations of temperature, and to breathing the irritating fumes of powder smoke and dust, would you not rather attribute it to those causes, than to a deficiency of oxygen or an excess of carbonic acid?—If there be an excess of bronchial disease I should be disposed to say so.

10,648. To what do you attribute the excess of emphysema among the miners, which you believe to exist?—I always theorize with reluctance; but with that proviso which you have put in the previous question, I should attribute so much excess as I may have admitted to their working in air insufficiently supplied with oxygen, and their thereby straining the lungs more than other persons would; and there is also this, that when they do get attacked with bronchitis the effect of the strain in coughing might have a tendency to produce emphysema, and in that way this would also be a consequence of bronchitis.

10,649. Do you think that climbing the ladders would account for emphysema fairly?—I have no knowledge that sailors become emphysematous from climbing ladders.

10,650. Have you frequently witnessed men just after they have come up a footway?—I have not often done so. I have not been present to see them at all in any medical capacity.

The witness then withdrew.

Mr. JOHN PERMEWAN examined.

10,651. (*Chairman.*) I believe you have charge of several mines in conjunction with Mr. Hitchins?—Yes.

10,652. Have you frequently had opportunities of observing cases of miners who have come to you suffering from ill-health?—Yes.

10,653. I believe you have had several cases lately?—Yes; we are constantly seeing them.

10,654. Are you of opinion that the complaints from which miners usually suffer present any special characteristics as compared with other persons?—I think they do. I think they suffer from a distinct disease; that is, distinct from phthisis.

10,655. In your experience, have you made any post-mortem examinations?—I have never had an opportunity of doing so. I cannot do it.

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10,656. Do you only judge from the symptoms ?—Only from an examination of the physical signs.

10,657. Have you formed any opinion as to the pathological condition of the patients ?—Yes. I think, in describing a case of miner's disease, that we have an opportunity of seeing it at the beginning. Very frequently a man comes complaining first of symptoms of indigestion and dyspepsia; that is the first symptom that we find, with headache and loss of appetite, and vomiting frequently ; throwing up his food. He also complains of pain over the epigastrium, and in a very short time he complains of his breath being short, and the heart beats irregularly ; there is palpitation. I think I might say that for the first three weeks or two months there is no cough ; but after that they have a short hacking cough, without any expectoration.

10,658. (*Mr. Holland.*) How long does that condition last ?—That is at various times ; it may go on ; it all depends upon the character of the man's work. If he is still working in the same place it will be for a very short time before expectoration will take place ; if he goes out of the place where he has been working, and is properly treated, and gets rest, he will get better in that stage.

10,659. (*Chairman.*) Have you ever known a case in which where a man has been shifted from the particular end in which he was working to another level a good effect has been produced ?—Yes, decidedly.

10,660. (*Mr. Holland.*) From changing to another level ?—Yes, there has been a decided change at once. We ask the miners how long they have been working at such a place ; they say three months perhaps, and then we say that they ought to get out of it, and they say, "We expect to hole in a fortnight." After that time, they go into purer air, they get on very well indeed, and it passes off entirely if they get into purer air. We find that these dead or poor places are generally in a winze or in a shaft.

10,661. Is the effect equally good, whether they change their place of work or not, provided the air be improved ?—Yes, I think so ; there is no doubt about it.

10,662. (*Chairman.*) Do you ever advise men to leave mining work altogether, and to go to the surface ?—Yes ; frequently that is our recommendation, if we see that they are able to do so. They ask us whether we think they had better do so, and we always recommend it, if possible.

10,663. Do the men who come to you in that state spit up a good deal of black sputa ?—Yes ; that is the first character of the expectoration ; it is frothy stuff, mixed up with black particles ; what it may be we cannot exactly say.

10,664. How long after leaving his work would a man continue to spit up that black stuff ?—I have known it for years, and I think I could point out to you two or three people now. I know one in particular, and I know that he has not worked underground for 10 or 15 years, and he has every characteristic symptom of the old miner ; he spits up now black expectoration. His name is John Cock.

10,665. (*Chairman.*) Suppose that he returned again to work in poor air, what would be the effect upon him ?—After a short time he would have an attack of pneumonia ; it would be a sort of chronic case of pneumonia after a little while. You will find that that is generally the case. I think that the lungs get partially solid, more particularly in the lower part.

10,666. (*Mr. Holland.*) With puerile breathing ?—Yes.

10,667. With little or no mucus rattle ?—No ; very little ; but if he is badly treated as to diet you will find that it will break down, and a small cavity will form. I have known very large cavities formed in cases of that sort.

10,668. From the breaking down of the substance of the lung ?—Yes. He may then go on, if he has good living.

10,669. (*Chairman.*) Even in that stage a man may continue to live for sometime ?—Yes, for years. I may say for three or four years.

10,670. (*Mr. Holland.*) After the formation of a distinct cavity ?—Yes ; I think I could point out 20 men to you. I think it becomes then just as the sputa in a common case of consumption. After a time I see very little difference.

10,671. Is it mixed with blood ?—Very rarely with blood, unless it is a very large cavity indeed ; if it is large it may as well open into a blood vessel from that cause as in the case of consumption, but we very rarely have large attacks of hæmorrhage in miners' disease ; it is sometimes tinted, and very frequently a man will come and say, "I spat up so much blood this morning." We inquire how much, and it may amount to a teaspoonful or a tablespoonful ; that is very frequent indeed, but there is very seldom any large amount of blood as the disease goes on.

10,672. (*Chairman.*) A man in that state working on the surface and eating good food may live on for years ?—Yes.

10,673. (*Mr. Holland.*) Is the blood mingled with pus ?—Yes ; they will spit up distinct corpuscles of blood and pus, but rarely any lung tissue.

10,674. The sputa is not generally offensive ?—No. I do not know whether abscess of the lung is more common here than it is elsewhere, but I think for the last 12 months we have had as many as 20 cases of pure abscess of the lung ; not altogether in cases of miners.

10,675. (*Chairman.*) Is there any way of accounting for the disease from which miners peculiarly suffer ?—I think that a great deal of it arises from their climbing, and that another cause is the impure air that they breathe ; that I am quite certain of. I do not think that the alterations of temperature have so much to do with it. In the Gwennap district we do not find that the miners, where the mines are very deep and very hot, are more subject to miners' disease than others. I do not think that they are so much. I think you will find in the Illogan and Redruth parishes, comparing the population, a greater proportion of miners' disease than in Gwennap parish.

10,676. (*Mr. Holland.*) Have you met with many cases of pure bronchitis ?—Very seldom.

10,677. Do you consider that the miners' complaint is chiefly bronchitis ?—No, it is not ; it is generally pneumonia. The lung gets solid ; you meet with solid patches of lung here and there, in parts.

10,678. Is bronchitis mixed with pneumonia common ?—Yes, that is a common disease, but we seldom meet with bronchitis.

10,679. Do you rarely find the upper part of the lung much diseased ?—Very rarely the upper part of the lung in the early stage of the disease.

10,680. Is emphysema of frequent occurrence ?—It occurs occasionally, but not very marked. I do not think it is more marked among the miners than in any other classes of labourers.

10,681. Is mucus rattle in the bronchial tubes a frequent permanent symptom ?—No, I think not.

10,682. Do you attribute much of the miners' complaint to the irritation caused by the dust ?—Not a great deal.

10,683. Or the powder smoke ?—I have no theory as to that.

10,684. Has the irritation caused by the powder smoke appeared to be an exciting cause frequently ?—Not very marked.

10,685. Is a thickening of the lining membrane of the bronchial tubes of frequent occurrence ?—In the second stage of the disease, but not in the early stage. I think that that is to be accounted for by the effort made in coughing, and by the great effort that the act of respiration produces.

The witness withdrew.

Adjourned to Helston To-morrow at half-past 11 o'clock.

HELSTON.

Friday, 8th August 1862.

PRESENT:

The Right Honourable Lord KINNAIRD, K.T.
JOHN ST. AUBYN, Esq., M.P.
RICHARD DAVEY, Esq., M.P.
P. H. HOLLAND, Esq.

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

Captain JOSEPH VIVIAN examined.

10,686. (*Chairman.*) You have charge of Huel Fortune?—Yes.

10,687. Have you charge of any other mines?—Not at present.

10,688. You have sent in to the secretary a list of the men in your employment?—Yes.

10,689. Can you tell us about the number of men under ground and above ground?—We have altogether 520, out of which there are about 270 under ground.

10,690. What kind of mineral does your mine produce?—Tin.

10,691-2. Entirely?—Occasionally stones of copper.

10,693-4. What is the deepest level at which you are working now?—95 fathoms from the adit; 120 fathoms from the surface.

10,695. How do the men ascend and descend?—By ladders.

10,696. Have you any skips or kibbles?—We have skips and kibbles both.

10,697. Do you find the skip more economical for working than the kibble?—Yes, in deep levels, not at shallow depths.

10,698. Do the men ever attempt to come up in the skip?—Never; we never allow that.

10,699. They never do it?—No, they never attempt to do it; a man would be immed ately discharged if that were the case.

10,700. Is it worked with a chain?—With a wire rope.

10,701. Do you think that it would not be safe for the men?—I should not recommend it; I should not like to try it myself.

10,702. Have you ever seen a skip used for taking men up and down?—No, I have heard of them; our ladders are very good indeed, and it is on a flat underlie, that makes it more easy; it is about 4½ feet in a fathom.

10,703. For working an inclined plane I suppose the skip is best?—Certainly, that is where we work the skip.

10,704. Are there any close ends which you are working now?—None; our mine is very well ventilated.

10,705-6. Have you ever tried the greatest heat?—No; the mine generally is very cold.

10,707. Is it in granite or in killas?—It is in killas, close to the granite.

10,708. In your opinion, is there any difference in the heat or air of a mine whether it is in granite or in killas?—A considerable difference; it is colder in granite.

10,709. Is there naturally less air in a killas than in a granite mine?—I really cannot say; I do not know that there is much difference.

10710. Have you ever seen a case of what is called cold damp in a granite mine?—It has never come under my notice in this country; it has in the Brazils.

10,711. I suppose that the smoke is not long in getting out?—A very short time indeed.

10,712. How long should you say after blasting?—I should think that in the worst parts in the mine the men can resume their work in 20 minutes.

10,713. (*Mr. Holland.*) What is the ordinary time?—It passes away immediately an explosion takes place in our best places.

10,714-5. In 5 minutes?—In less.

10,716. (*Chairman.*) Have the men a fixed allowance of candles with you?—Yes, 2 lbs. a week.

10,717. What do they pay for them?—8*d.* a lb.

10,718. How much a lb. do they pay for powder?—8*d.*

10,719. Do you charge for the barber?—We do.

10,720. How much?—3*d.* a month.

10,721. How many doctors are appointed?—Two.

10,722. How are they appointed?—By the committee.

10,723. What deduction is made for club money?—6*d.* for club and 6*d.* for the doctor.

10,724-5. Is the club for visible accident only?—Yes.

10,726. (*Mr. Holland.*) Is there no allowance for sickness?—No.

10,727. (*Chairman.*) Is the account of the club money kept separate?—It is regularly kept in the mine by the purser.

10,728. Is it laid before the committee?—Never since I have had the management of the mine; but I have been there only about eight months; it has not been laid before the committee in my presence.

10,729. Is it kept as the purser's private account, or is it kept as part of the adventurer's account?—A part of the adventurer's account.

10,730. Have you as manager, or have the men who pay to the club, any means of knowing how the club account stands?—I suppose that the men could ascertain at any time by applying to the purser; that has been the case in all other mines with which I have been connected.

10,731. How many boilers have you?—Seven.

10,732. Have you any fixed period for cleaning them out?—It depends on the nature of the water which we have to feed the boilers; in some places it is necessary to do it oftener than others, but the longest period that we allow any of them to stand over is six months, but that is when the water is perfectly clear; in some cases it is required once in three months.

10,733. During the last eight months you have not had any explosions?—No.

10,734. You have had the management of mines abroad, have you not?—I have never had the management of mines abroad.

10,735. But you have visited mines abroad?—Yes, I was in the Brazils about five years.

10,736. Were you working there?—Yes, in Gongo mine.

10,737. Did you suffer at all from working there?—No; I have been working under ground 30 years.

10,738. In other parts of Cornwall?—In the neighbourhood of Camborne principally, North Roskear.

10,739. Did you ever know a man suffer from working under ground?—No.

10,740. You never met with any man who suffered?—Not any one.

10,741. Then you do not think that the men do suffer from working under ground?—None that ever came under my experience.

10,742. Have you ever been in the Gwennap district?—Never to work.

10,743. What is the hottest level in which you ever worked?—I really cannot tell you. I do not remember the heat ever being taken.

10,744. Have you ever worked ra close end?—Tolerably close, but I never fel any inconvenience from working there.

10,745. How long did you work in a close end?—If it is what is called tolerably close it would be about six hours, but we generally worked eight.

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10,746. But if it was close you would work a shorter time ?—Certainly, according to the place. In some places the men have been obliged to be relieved every four hours.

10,747. But they have never suffered from that ?—No.

10,748. You said that you met with cold damp abroad ?—In the Brazils there was a little, but nothing to injure.

10,749. Do you know what the cold damp arose from ?—I think that it was in consequence of using so much new timber; that was supposed to be the reason.

10,750. (*Mr. Holland.*) You have said that the men are not allowed to ride down skips; is that because you think it dangerous ?—I consider it so.

10,751. Or would they interrupt the work ?—They would not interrupt the work in the slightest degree.

10,752. As you think it dangerous you have an objection ?—Yes.

10,753. If it could be shown to be safe your objection would be removed ?—Certainly; but then our ladder being so very easy it is scarcely worth while, and besides that the mine is shallow.

REFORM CLUB PALL MALL

The witness withdrew.

Captain WILLIAM CHAPPELL examined.

Capt. W. Chappell.

10,754. (*Chairman.*) Of what mine have you charge ?—Huel Sithney and Carnmeal United mines.

10,755. Have you charge of more than one ?—Yes, I have charge of Sithney Huel Metal.

10,756. Are those tin mines ?—Yes.

10,757. Have you sent any statement to the secretary of the number of men employed under ground ?—I have.

10,758. What is the deepest level in Sithney and Carnmeal which you are working ?—60 fathoms under adit; the adit is 16 fathoms from the surface.

10,759. Do the men ascend and descend by ladders ?—Yes.

10,760. What is the incline of the ladder generally ?—About three feet in a fathom.

10,761. Have you any hot levels or close ends ?—No, we have the mine well ventilated; with four shafts from surface within about 200 fathoms; two of them are down to the 50 fathoms level, and one to the 20, and the others to the 60.

10,762. What is the lowest level in the other mine ?—130 fathoms; that would be Sithney Huel Metal.

10,763. Do the men ascend and descend there by ladder ?—Yes. We have 10-inch staves; the former plan was 12-inch; we now find the other much easier; and the last few years we have taken out all the old ones, and put in what we call 10-inch staves; the men travel a great deal easier.

10,764. Do the men prefer it ?—Yes.

10,765. Did they not object to the change at first ?—No, they approved of it; it was a little tedious in going down the first time because the step was so much shorter.

10,766. Have you any hot levels or close ends in that mine ?—No; we ventilate it by sinking winzes about every 15 or 20 fathoms.

10,767. How far would you drive an end from a winze ?—They should not be driven more than from 20 to 25 fathoms. If we have a course of tin there is no fear of the winzes going down fast enough, but whether we have tin or not the distance should not exceed the above extent.

10,768. When there is no tin and you are driving a level before a winze is sunk is not the air close ?—Not for 20 or 25 fathoms, we do not find then any of it so as to injure anyone.

10,769. Have you ever found that the candles would not burn either in driving a level or in sinking a winze ?—Yes, I have seen that in winzes, and rather in rises, rising up against a winze; but I think that the great fault in that is that you get an inferior candle.

10,770. Do you think that an inferior candle will go out sooner in poor air than a good candle ?—Much so, and it creates a bad air. There is a great deal of arsenic mixed up in order to harden the inferior tallow, and there you find that that takes great effect on the men.

10,771. What kind of candles do you use, are they patent candles ?—No, we buy our candles at Bristol, and we only allow the men 1½ lbs. in place of 2 lbs., and they really prefer it to 2 lbs.; they cost a little more, perhaps they cost about 3d. a dozen more; then we save ½ lb. on each man, so that the adventurers save by it about five sixths per cent. in the consumption. I think that there is a great fault in the inferior kind of candles.

10,772. What do the men pay for those candles ?—They pay according to the price of them; they pay now about 7½*d.* or 8*d.* a lb.

10,773. What can you get them at wholesale ?—We get them now at about 6*s.* 6*d.* or 7*s.*, and sometimes in the winter we have had to pay as much as 8*s.* Then we never charge a rise; when we commence the year we carry it out for the year.

10,774. Do you alter the price every year to the men ?—About once a year, at Christmas time, in fixing it it may be higher or lower.

10,775. You only alter it if the price of the candles should be lower or higher ?—Yes.

10,776. You fix it every year according to the price ?—Yes. we take in a large stock of candles, which, perhaps, last six, eight, or nine months. If we buy them very cheap we let the men have them at a price accordingly, but if we pay a long price for them, and it falls in a few months afterwards, they must continue to pay that price out.

10,777. In fact the men pay according to the price when the candles are purchased ?—Yes.

10,778. Are you at all particular as to the kind of powder which you use ?—Yes, I am very particular about it. I use a very fine grained powder; it is from 15 to 20 per cent. stronger than the large powder, and makes a great deal less smoke.

10,779. Are your men satisfied that that powder is as good or better for blasting than the large sized powder ?—Yes, they are at present, but it was a long while before we could bring them to it, because the fine powder requires a little more work with it. If they have a wet hole they must put so much more clay in it. It takes about ten minutes longer, that is to say, to get the hole dry so that the powder shall not stick about the hole. It is that which causes extra smoke. When dry it explodes at once and soon passes away.

10,780. Do you think that a more complete explosion takes place with the smaller grained powder than with the larger grained powder ?—Much more.

10,781. Do you ever use cartridges ?—We use them where it is very wet.

10,782. You never use them in dry ground ?—No, they are not required there, but in wet ground I think they are a very essential thing.

10,783. Have you ever seen paper cartridges made by the men, and inserted in the holes ?—Yes, they make them, we supply them with paper.

10,784. Would not that save the powder hanging about the hole ?—Yes, that is where they save a great amount of work. In dry ground they do not require it, but in wet ground I think that either paper or cartridges are very beneficial.

10,785. But even in dry ground, if it saves the powder, and saves the chance of accident, would not a paper cartridge be of advantage ?—No, I think not in any way. In dry ground less powder will do.

10,786. Have you ever had any accident from blasting ?—We have had only one.

10,787. Could you ascertain what that arose from ?—It arose from putting in too large a cartridge in a

small hole. The cartridge was what they call No. 4, and was put into a hole No. 3; it was entirely the men's own fault. I caution them every day, as regularly as can be. In 10 or 11 years we have only had one accident.

10,788. How did that accident happen; did it break the cartridge?—No; in forcing it with the swabbing stick it exploded. The cartridge was so tight that after it got in a certain distance there was a certain amount of air, and it exploded and threw out its burthen, and one of the stones broke a man's hip and the other part went about a man's face; he came up, and I washed him, and his face was full of powder.

10,789. Showing that it had not all exploded?—Yes, because there was no tamping on the hole.

10,790. Then do you think that the mere pressure of the powder with an oak stick would cause an explosion?—Yes, when struck with the mallet, the cartridge being too large for the hole. If it had been only powder it would not have gone off. I think that in nine cases out of ten the accidents happen by the men forcing larger cartridges in holes than they are calculated for. In this instance the ground was exceedingly hard.

10,791. You are quite sure that the man did not use an iron tamping rod to force it in?—No; I took them to task the moment they came up. After I had washed and dressed the men, they told me, and I can reasonably believe them, that it was only wood.

10,792. What priced ground was it?—8*l.* 10*s.* a fathom. We set for the month, and I believe that it was harder when that happened; perhaps if we had been going to set then we should have given a little larger price.

10,793. Was it on the lode?—Yes. We have a rule that if we find the men tamping a hole with the tamping bar we spale each of them half a crown.

10,794. Have you any way of enforcing those rules beyond the spaling?—No; we hang out our rules every setting day, and the men see them, and if they do not like to take under those rules they leave.

10,795. I suppose that the rules are occasionally infringed?—In some instances I suppose they are.

10,796. How many boilers have you?—Two.

10,797. Do you cleanse them out?—We cleanse them out every 12 weeks.

10,798. When a new mine is started are not second-hand boilers sometimes used?—Yes.

10,799. Do you consider that that is quite safe without a very careful examination of them?—No, I do not myself. If they have been in very bad water I think that they ought to be looked very closely into; there are some exceptions where second-hand boilers would do.

10,800. Do you consider that the responsibility with reference to the boilers should rest with the captains and managers?—I think that it should rest principally with the engineers.

10,801. Should you as a manager inquire whether a boiler which was purchased by the adventurers of a mine of which you had charge was in a proper state?—Yes.

10,802. You consider it very important that a boiler before it is put up should be thoroughly tested?—Yes.

10,803. In your experience have you ever had to reject a boiler on account of its not being perfect?—Yes. Every boiler, either new or second-hand, should be properly tested by hydraulic pressure at the foundry by the agents of the mine or on the mine before it is put in use.

10,804. While the boilers are at work should you consider that at certain periods they should be tested?—In the cleansing of them, the person who is employed to test them after they are cleansed can examine them then without any pressure very well, and can see whether they have been eaten away. If there has been bad water, then they must be repaired before you use them.

10,805. Do you think that that would be a sufficient test to prevent boiler explosions?—Yes, if they are properly looked after.

10,806. Is it the business of the manager or captain to see that the boiler is in a proper condition?—It is the business of all, but that is more the engineer's department.

10,807. Have you a special engineer for the mine, besides the stoker?—Every mine has an engineer.

10808. How often does the engineer inspect the boiler?—He comes about once a week.

10,809. But he can only test it when it is cleansed?—Yes.

10,810. Is notice sent to him before it is cleansed, so that he may be there when it is cleansed?—No. I do not think that that is a rule.

10,811. (*Mr. Holland.*) Is the engineer in the habit of going into the boiler himself?—No.

10,812. He trusts to the engineman?—Yes, the agents go in.

10,813. Regularly?—Yes.

10,814. (*Chairman.*) And it is their duty thoroughly to examine it?—Yes.

10,815. I suppose that you have heard of boiler explosions taking place?—Yes.

10,816. Do you consider it dangerous for the men to change in the boiler house?—Yes, in the case of old ones.

10,817. Do you know what the men pay for club money?—They pay 6*d.* a month.

10,818. And how much for doctor?—For doctor they pay 6*d.*; that is, round here.

10,819. Is there a separate account kept of the club money?—Yes.

10,820. Do you consider that the club money belongs to the men or to the adventurers?—To the men.

13,821. Have the men any means of knowing the state of that account?—Yes, at any time, if they ask. There is a debtor and creditor account kept regularly.

10,822. You think that that money should not be applied to the other purposes of the mine?—To no other purposes.

10,823. (*Mr. Holland.*) What pressure of steam do you work your boilers at?—Ours now is only working at 25 lbs. to the inch.

10,824. What are the boilers tested for when they are new?—60 lbs.

10,825. Are they never tested again for strength?—Not afterwards; you must depend upon the wear, and upon the state of the water, and examine them as you cleanse them out.

10,826. You never work them nearly up to their bursting pressure, do you?—No, not any that I have been connected with. I have never known any work within 25 or 26 lbs. of that.

10,827. When the plates were half eaten through you got new plates?—Yes, we should take out the old and replace them with new.

10,828. Is that as soon as you see corrosion of the plates?—Yes, as soon as we see corrosion of the plates and the wear we are compelled to do it, because they leak water, and when they leak water they leak steam.

10,829. Do you wait for leakage?—No; but if we did not replace them we should have these leakages, which would be a great expense.

10,830. Is it customary to test boilers to something like double their working pressure?—Yes.

16,831. You have said that you believe that the shot which you have mentioned went off from cramming in too large a cartridge with the swabbing stick?—Yes.

10,832. Do you think that possible?—I really think that it is correct from what the men told me, after I had them up before they really knew what their hurt was; in fact I questioned them when they were down in the level.

10,833. Have you seen the cartridge ignited in a blast hole by the pressure of the stick?—Yes, when struck with the mallet. I have seen that in the bottom of a shaft sinking in ground at 18*l.* a fathom.

10,834. You speak with perfect confidence of the

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correctness of that?—I saw that in Sithney Huel Metal about nine years ago.

10,835. Would it be possible to do that with a cartridge?—This was with a cartridge.

10,836. Could you show that experiment with a cartridge?—It could be done under ground, not on the surface

10,837. Could you light a fuse between two stones alone?—No.

10,838. You told us that the candles sometimes burnt dimly in the rises?—Yes, where there is poor air and inferior candles.

10,839. Have you noticed that bad candles go out in poor air sooner than good candles?—Yes.

10,840. Is there also much more smoke?—Yes, an inferior candle will not burn in poor air so well as a better quality one.

10,841. You also said that you saved half a pound a week per man in candles by using better ones?—Yes.

10,842. It is cheaper?—It is cheaper in the end.

10,843. 1½ lb. of good candles cost less than 2 lbs. of bad?—Yes.

10,844. So that they really are cheaper?—Yes.

10,845. You said you prefer fine-grained powder to large-grained powder, because it is from 5 to 20 per cent. stronger?—Yes, and it makes less smoke.

10,846. How much dearer is it?—It is the same price.

10,847. Then it is cheaper?—Yes.

10,848. Then it is a mere prejudice to use large-grained powder?—I have seen it as large round as my little finger. I suppose that the merchants get a little more profit out of the large powder than out of the other, but I do not know.

10,849. It is manufactured purposely for blasting?—It may answer better in wet ground; the very large powder does so.

10,850. Is it not better to dry the hole thoroughly, and to use the stronger and therefore cheaper powder?—Yes, that is what we do.

10,851. There is a prejudice or an opinion that slow-burning powder is better for blasting than quick-burning powder; is that wrong too?—It may answer in very shallow mines and easy ground. You do not find the ground so stiff nor hard in shallow mines as you do in deep mines. When you get down 150 or 200 fathoms you then mostly find the rock a little harder than you do up 30, 40, or 50 fathoms from the surface. We have tried both powders, but our men prefer the fine.

10,852. Do you think that the powder smoke is very annoying or injurious to the men; do they complain much of it?—No, they do not complain; the only thing in which I think it hurts them is where they have very poor air, where the mines are not ventilated for the powder smoke to pass away.

10,853. Then they do complain of it?—Yes.

10,854. Then the powder smoke hangs about a long time?—Yes.

10,855. And then they complain of it?—Yes.

10,856. Do they complain that it takes up their time, or that it injures or annoys them?—In a poor-air mine it takes up their time, because they cannot go back to the holes.

10,857. That is what they complain of, perhaps?—Yes.

10,858. But do they complain that it injures them?—No, they never complain that it injures them at all.

10,859. You have stated that when the hole was not well dried the powder made much more smoke?—Yes, because it sticks about the outside of the hole more.

10,860. That is then another reason why they should use fine powder, and be compelled to dry the hole perfectly?—Yes.

10,861. (*Mr. St. Aubyn.*) Do you use a man-engine in your mine?—No.

10,862. Have you had any experience of it in other mines?—I have seen them, but never have been connected with them.

10,863. What depth are you?—60 fathoms. We do not require a man-engine.

10,864. From what you have seen of it you would not think that in mines of a less depth than 100 fathoms the introduction of the man-engine was advisable?—I should not.

10,865. Have you had any experience of the skip for drawing men?—No, only for drawing stuff up; that is the same kind of thing. But the skip for the stuff comes up one part of the shaft, and the men the other.

10,866. Have you ever compared the relative advantages of the skip and the kibble for drawing stuff?—I have. In some instances the kibble will do much better; it is according to what kind of shaft they have.

10,867. According to the under-lie?—Yes.

10,868. What amount of under lie do you think would make it desirable to use the skip?—If you had a flat under-lie you should use a skip by all means.

10,869. How much under-lie in a fathom?—From 3½ feet to 4 feet in a fathom. If the under-lie is 4 feet in a fathom by all means have a skip.

10,870. If the under-lie was more than from 3½ feet to 4 feet in a fathom you would use the kibble?—No.

10,871. Why?—I should use the skip, because there would be less friction. The skip, however, except it is very well put in, is liable to get frequently off the road.

10,872. I understand you to say, that unless your skip is very well put in it is liable to get off the guides?—Yes.

10,873. Is there any reason why it should not be well put in?—If your shaft is not commenced and sunk at a proper size and angle the first time, you cannot alter it afterwards. If you go and sink your shaft 50, 60, or 100 fathoms, you would not think of putting in your skip. You may have your shaft sunk zig-zag, or not quite large enough, and you would have to do the best you could to put your road in and to come down where the road is perfect.

10,874. Do you know that the skip has been used where there are angles, and that by the use of proper shafts at those angles it has answered very well?—I am not aware that where there are many angles it has answered well.

10,875. With regard to drawing men, have you ever been at South Frances?—I have been there, but have not been under-ground there.

10,876. Have you seen the skip there?—No; I do not think that they had a skip there then. It is five or six years since I was over there.

10,877. (*Mr. Davey.*) You have stated that you accounted for much of the impure air under-ground from arsenic being present in the candles; how do you detect that?—From the colour of them and the smell, the smell principally.

10,878. Do you usually find arsenic in candles?—Yes.

10,879. In whose candles?—In some of the Cornish candles.

10,880. The only mode which you have of detecting arsenic is by the smell?—Yes, the smell is very strong. We now have Bristol candles in our mines, and they are more like the candles which you burn in a house.

10,881. You have also stated that when a boiler is cleansed, by looking over it, and detecting any hole or anything of that sort, you prevent explosion. How do you account for explosions generally?—In some instances it is owing to the engineman being asleep; I suppose there is no doubt of that; and in some instances it is owing to the boilers being perhaps worked too long.

10,882. Do you think that a boiler would explode if the water was at a proper gauge?—I do not think that it would except there was a much higher pressure on it than it really would bear.

10,883. Have you ever found an instance where the engineman had put an extra weight upon the safety valve?—No, I have never found it with any that I have ever been connected with yet.

10,884 Might not that be a cause of explosion?—Yes, that would be a very likely way.

10,885. With respect to the small powder, is it as fine as sporting powder?—Not quite so fine as that.

10,886. How do you know that it is 15 or 20 per cent. stronger than the large-grained powder?—We have weighed it off and tested it with the large powder in the same end several times.

10,887. Then you have put a less quantity of the fine-grained powder than of the other?—Yes, the fine-grained powder will go down; you can press it all down and make it all firm in the bottom of the hole, but with the larged-sized powder such as the size of your finger there is a great deal of space between which contains no powder at all.

10,888. (*Mr. Holland.*) Are accidents frequent in putting in the first tamping?—No, not with clean powder; they are very common in putting in the last.

10,889. Are there many accidents from picking out the tamping?—No; they arise principally from boring it out.

10,890. Can you suggest any mode of preventing those?—The only thing that we have, and we find it very beneficial, is what we call a pricker, which is three-eighths iron, and the end turned, so as to loosen it, and then a scraper goes in and brings it out.

10,891. Is not that dangerous;—No, I never find any accident in picking out the hole with a picker, but where they bore it out, that is where an accident occurs; but I do not think that much of that is done now; men are cautioned against it I think by most agents.

10,892. You think that picking out is safe, but that boring out is very dangerous?—Yes.

The witness withdrew.

Mr. JAMES WEARNE examined.

10,893. (*Chairman.*) I believe that you are surgeon to different mines in the neighbourhood of Helston?—Yes, six or seven.

10,894. Have you been for some time surgeon to those mines?—Yes, for the last 30 years; not sole surgeon to all those mines. I have been surgeon of many mines in this neighbourhood for 30 years, but I do not know any one mine that I have been surgeon of for 30 years.

10,895. During your experience as surgeon have any men come under your notice affected with what is called miners' disease?—I do not know what miners' disease is.

10,896. Affected with consumption?—Knowing of course that I was coming before you to-day I looked about among my patients to see whether I could find a case of consumption, and I am not sure that I could find one.

10,897. Are your patients affected with any illness specially applicable to miners?—I think that that would depend in a great measure upon the depth at which the men were working.

10,898. Is there any peculiar illness to which miners are subject?—Not one that I know of.

10,899. Do you think that there is any one disease not peculiar to miners but which prevails amongst any number of miners?—Yes, I should say bronchitis; they suffer from chronic bronchitis.

10,900. Is there any other disease?—I do not know that there is.

10,901. Have you observed the case of any miner in an early stage of the disease, and watched its progress till he has died?—I am obliged to do so.

10,902. In those cases it is bronchitis?—I think so; you may have a little dilatation of the air cells, for instance, and it may run into asthma; but I think that since we have become better acquainted with the stethescope, and the proper examination of the chest, we have not so many or are not likely to have so many cases reported as consumption.

10,903. In your opinion what is the state of the disease when it first shows itself in any miner working under ground?—I should think that it was congestion of the mucous membrane.

10,904. (*Mr. Holland.*) You mean congestion of the lining membrane of the bronchial tubes?—Yes.

10,905. (*Chairman.*) What is the next stage after a man has been affected which the disease assumes?—You would get inflammatory action, and you would get a very large discharge in some instances—great expectoration; in others you would not; and you might get ulceration, and you would get the air cells and air tubes closed up, and you get dilatation of the bronchial tubes, which of course would render a man less able to labour. You would then in the end of the matter get the heart disordered, and have, more especially, perhaps, dilatation.

10,906. What is the nature of the expectoration in the earlier stage?—Generally a yellowish mucus.

10,907. Does that increase as the disease goes on?—It is not always that the form of the disease is exactly alike in every case; you may have cases of chronic bronchitis with very little expectoration.

10,908. But where it proceeds so as at last to endanger life or to prevent the man working, does the expectoration ever show anything peculiar?—Nothing tubercular. They spit up a great deal of powder smoke, as we call it. I have seen the same thing in blacksmiths when they have been working at the smithies and so on; but it is very remarkable for how very long a time a miner will spit up this black stuff after leaving a mine, and after having been ill for months.

10,909. How long, in your experience, have you ever seen it?—I cannot speak exactly. I should say three or four months after he has been laid up ill, and has retired from his employment. I do not say that it is generally the case, but I have seen it.

10,910. (*Mr. Holland.*) That is about the limit, is it not?—That is, as well as I can recollect. I cannot give any limit to it. I could not say, for instance, that I had seen it after the men had been away 12 months or 6 months. I think that within six months you may see it.

10,911. (*Chairman.*) When men have come to you so affected have you seen them quite recover if they have got back to work in the same mine?—You sometimes see them recover, and frequently.

10,912. Would you recommend a man to go back to the same work or not to go back to the same work?—That would depend upon his age. I am constantly making little arrangements for a miner, and using my influence for him as far as it will go to get a little work at the surface if he is 50 years of age, and if he has a bad cough, or I advise him to get some other occupation.

10,913. But if a young man was so affected you would not do so?—I do not say much to the young men upon the subject; indeed they are not so often affected.

10,914. At what age should you say that they are generally affected?—I should say about 45; from 45 to 50 you find them beginning to fail in that way very much.

10,915. How do they describe to you their feelings on being first affected?—Very generally that they want to bring something up. I very often scold them because they are constantly trying to expectorate, and I say, "Why are you bothering yourself in that way; "wait till you can bring something up, and do not kill "yourself by trying to do it." They sometimes use very great exertions to bring up something that is not inclined to come away.

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10,916. (*Mr. Holland.*) They feel as if there were something ?—Yes.

10,917. (*Chairman.*) You think that it aggravates the disease ?—I am sorry to see the men doing it, when I know that there is nothing to come away.

10,918. Do they feel any pain at the pit of the stomach and loss of appetite ?—Not particularly.

10,919. They have not complained to you of that ?—Not particularly. In this neighbourhood we are differently circumstanced from what they are in many parts of the county ; our mines are shallow, and I fancy that the air is better, that the water is colder, and the men's stomachs do not give way as they do in deeper and hotter mines.

10,920. Can men so affected climb the ladders ?—They do climb the ladders.

10,921. Does that aggravate the disorder ?—Of course a man cannot climb so well, and of course if a man is coming up from a deep mine it aggravates the man's complaint. I must be clear in this, because it is my duty to say that I have very often said to a man, "You have got a family." "Yes." "You must go "to work all the sooner. I wish you had not any "family." I go to another man and I say, "Have "you any family ?" "No." "Then you must take "a holiday, a week or ten days, or a fortnight."

10,922. Do you think that a holiday is important for recovery ?—I think so, very frequently

10,923. And would that tend to complete recovery ?—I do not think that it tends to perfect recovery. It might tend to it if a man was put under very favourable circumstances at once, but a man is very much relieved by his holiday. When once affected, I do not think they ever become perfectly sound again, or not frequently.

10,924. But by working on the surface they may live a long time ?—Yes, and do very well.

10,925. But if a man so affected went down to work again, what would be the period of his existence ?—I cannot state. It would depend upon how far the disease had gone ; but I am giving you my practice towards the men. I am always very anxious when once they have thorough chronic bronchitis to prevent their going under ground at all.

10,926. Then it is your opinion that the disease from which they suffer is chronic bronchitis ?—Yes, and the consequences which would result from chronic bronchitis.

10,927. (*Mr. Holland.*) What do you think that it commences with ? Do you think that it begins with irritation of the bronchial membrane ?—Yes.

10,928. Followed shortly by thickening or congestion of that membrane ?—Yes.

10,929. Is chronic bronchitis an early disorder ?—I think that you would get common bronchitis, and that when the miner had worked on with the same symptoms you would get chronic bronchitis. You would get larger expectoration, which you would not have so much at first.

10,930. Does the effort to expectorate without being able to do so often continue a long time ?—I do not know that it does very long.

10,931. A month or two ?—Yes, I dare say that it does, but I have never had an opportunity of watching as to its duration. I fancy that after a man has been labouring under disease of the lungs for a considerable time it rather disappears when he begins to have a free expectoration. The membrane also possibly gets thinner, I think, after there has been very free expectoration from it ; but the bronchial cells would get dilated, for instance.

10,932. And the bronchial tubes would be contracted ?—Yes.

10,933. You have spoken of the heart being disordered ; do you think that that is a consequence of the lung disease, or independent of it ?—I think that it is a consequence of it.

10,934. You think that it is in consequence of an impeded passage of blood from pulmonary circulation ?—I think so ; that the heart participates in the disordered state of the lung, the lung not performing its functions well.

10,935. That it throws a heavy labour upon the heart ?—Yes.

10,936. Have you noticed whether the right side of the heart is more dilated than the left ?—We have never had a post-mortem examination, but I do not think that the left side is much affected. I think that the right side is more affected. I think that the left ventricle is the soundest. I have thought it less disturbed, but I have never had a post-mortem examination at all.

10,937. Have you seen pneumonia as an early symptom ?—I do not see pneumonia amongst them very frequently, unless it is in the younger and stronger men.

10,938. But not as an earlier symptom in the older men ?—I see pneumonia very seldom amongst miners. If I expected a case of pneumonia I should expect it in the young men rather than in the old ones.

10,939. Are these mines dusty ?—I was never down but two or three times in my life.

10,940. Do the men complain much of dust in them ?—They complain of powder smoke sometimes. In our neighbourhood it is generally very wet.

10,941. They are all killas mines here, are they not ?—No, we have granite mines.

10,942. Have you noticed any difference in the men working in granite or in killas mines as to this disease ?—Our killas mines are very few. I do not know that we have more than two or three in the neighbourhood, and they are very small mines.

10,943. What do you think is the cause of the irritation of the bronchial membrane ?—I think that the smoke and dust would be the most likely causes, the carbon and particles from blasting, and so on.

10,944 Mechanical irritation ?—Yes.

10,945. Do you think that that is more likely than chemical irritation ?—I do not think that there is any chemical action in the case.

10,946. Do you attribute much to the alternations of temperature ?—Yes ; I am bound to admit from general experience that they must make a difference. I have been down in Dolcoath between 200 and 300 fathoms, when it has been almost impossible to live there ; but in this locality I do not think that there is anything of the sort.

10,947. You say that the men here break up in health at about 45 or 50. We have been told earlier ages in the middle of the county ?—That is very likely, but I do not think that our men give way much sooner than that. I am speaking in a general way as the result of practice.

10,948. Have you noticed any great improvement in the health of the miners during the 30 years that you have practised here ? Do they break up later in life than they did ?—I think that they do. I think that our men are better rather than worse.

10,949. They keep their health later in life ?—Yes. I think that they live better and are clothed better. I think that the men are better in health.

10,950. They continue in health later in life ?—Yes.

10,951. Is that a very strong impression ?—Most decided in this neighbourhood. In Breage, for instance, and those neighbourhoods, I think that our men are better men at 50 than they used to be. I do not know that the cause is to be attributed to any improvement in mining. I think that there are other reasons for it.

10,952. To what do you attribute that improvement ?—To better clothing, better living, and better habitations.

10,953. Are dries more commonly provided for the men ?—Yes, certainly. I remember the time when there were no dries.

10,954. Do you attribute much importance to that ?—I think that it makes the men more comfortable.

10,955 Does it shield them much from catching cold in coming from their work ?—Of course it would be imprudent to put men into cold clothes coming from the mine in a state of heat ; but sometimes the dry is

very hot, and I do not know that that is not very bad.

10,956. They get dry clothes on?—Yes. I do not know that the dry hurts them; if so, I would tell the adventurers at any time.

10,957. Are they in the habit now of taking down food into the mine more than they did?—I do not know.

10,958. Are they more careful to keep out of powder smoke than they were?—I do not know.

10,959. Are you clear that the black spit is carbon?—I think so. I have never examined it chemically, but it has all the appearance of carbonaceous matter.

10,960. Do you feel sure that it is not any secretion of the lungs?—It is decidedly not.

10,961. It cannot be bronchial secretion?—No; besides that, it is very profuse.

10,962. Where you found a case of black stuff continuing for many years, should you attribute that to work in the mine?—I do not know that I should.

10,963. You only know that it is black?—I know that it is black, and that that is carbon; that it is not an animal product.

10,964. If you heard of a doctor, who said that he had a patient who spat up black stuff for ten years, after having worked in a mine, would you believe it?—I would not believe it.

10,965. It might be from a smoky chimney?—A smoky chimney, I think, would not be sufficient to produce it.

10,966. (*Chairman.*) There are a great many agriculturists in this parish?—Yes, and the neighbourhood is principally agricultural.

10,967. Do you observe any difference between the state of health of the miners and the agriculturists?—The miner has generally less fat about him—less flesh about him, so to speak; but he is generally more muscular.

10,968. (*Mr. St. Aubyn.*) He is in a better condition?—In one sense he is.

10,969. (*Chairman.*) Is he in a better condition to resist disease?—No.

10,970. (*Mr. Holland.*) Which life would you recommend to an insurance office?—The agriculturist. I think it is a duty, if a man is a miner, to state that fact in giving a certificate.

10,971. (*Chairman.*) Which of the two lives best?—I think that the miner lives just as well as the agricultural labourer.

10,972. But not better?—But not better. I think that he takes more animal food than the agriculturist, but not more food altogether. As a class, the miners are more irregular than the agriculturists.

10,973. You have stated that you think it unwholesome after coming up to go into some of the dries when they are hot; is there much dust in the dry?—I think that it must be a little dusty, because as the clothes dry the dust gets into the air.

10,974. Therefore it would be better if the clothes were dried in another place?—Yes; and if there was a warm place for the men.

10,975. You think it advisable to have a warm place for the men?—Yes, of a certain temperature; but not, generally speaking, the same as that of the dry.

10,976. And you think that that should be in all the footways?—Yes. I presume that whenever a man is made uncomfortable by change of temperature, or any other cause, it is likely to injure him. I think that the miners would prefer it; and it is always the interest of the adventurers to make the men healthy and comfortable, and to keep them up.

10,977. You would not recommend their changing in the boiler-house?—No, that is very hot, and we have seen very melancholy accidents happen; a boiler bursts and the men are blown to pieces; you could not recommend it officially.

10,978. (*Mr. Holland.*) Do you speak of the blowing up of the boilers as a real practical danger?—Yes.

10,979. Is it so frequent as that?—It is not very frequent, but I do not think that any person would be justified in recommending the miners to change in the boiler-house; the boilers are sometimes becoming weak. There was a case at Marazion the other day where a boiler was known to be weak, and it exploded, and I think killed two men. That is not the only case which I have known, and that is the reason why I should recommend the Commissioners to avoid looking upon that as a proper place for the men to dry their clothes in or to go in at all.

10,980. You have stated that fewer cases are reported as consumption since the use of the stethescope?—Yes; I do not mean that there would be less of the disease, but it would now be called bronchitis properly, instead of consumption improperly; that the correct distinction would be made between bronchitis and consumption.

10,981. But is there less of the disease bronchitis than there was 30 years ago?—Yes, I think that there is less disease altogether among the miners.

The witness withdrew.

Mr. THOMAS GILL examined.

10,982. (*Chairman.*) Of what mine have you the management?—Of Great Wheal Vor United.

10,983. Is it a tin or a copper mine?—Tin.

10,984. I believe it is only in a part of the mine?—It is in the south part of the mine.

10,985. It was formerly, was it not, one of the largest and deepest mines in the county?—Yes.

10,986. What is the greatest depth at which you are working now?—At about 162 fathoms.

10,987. Can you state the number of men who are employed under ground?—There are 129 men and 10 boys.

10,988. What is the total number of persons employed?—358.

10,989. How do the miners go up and down?—They ascend and descend by ladders.

10,990. What is the distance between the staves of the ladders?—10 inches.

10,991. Are there are any hot levels in the mine?—No, our mine is not very hot at present.

10,992. Are you driving any close ends?—No, only one that we shall ventilate now in the course of a week; we have a rise going up that will communicate at the 152 fathom level to the 142 fathom level in 10 days we expect.

10,993. What is the deepest level at which the miners are working at the present time?—162 at the bottom.

10,994. Where this work is going on that you have just alluded to is at the 152 fathom level?—Yes.

10,995. How is the air at the 152 fathom level?—The air is not bad there.

10,996. Have you tried it at all?—No; we have put in a machine because the air was a little close.

10,997. How did you judge whether the air was close or not?—By the burning of the candle.

10,998. Did not the candle burn well?—No; and the end being very wet we have a great deal more trouble where the air is a little weak in the wet ends than in the dry ones, in keeping the flame of the candle upright.

10,999. Is there a machine at work there now?—Yes.

11,000. What kind of machine is it?—A fan machine.

11,001. Is it worked by a boy?—Yes.

11,002. Where is it placed?—It is placed back within 3 or 4 fathoms of the shaft.

11,003. How near are the pipes taken to the end of the level?—To within 14 or 15 feet.

11,004. Do you mean from the bottom of the rise?—No, it is in close to the end at which they are driving west.

11,005. You are driving a rise?—Yes, they are rising at the back of the same level.

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11,006. How far is the rise from the end of the level ?—I should suppose about 14 fathoms.

11,007. Is the air in the rise close ?—No, we have a branch of the pipes going up into the rise.

11,008. And going to within 14 or 15 feet of the end of the level ?—Yes.

11,009. Where is the fan placed; is it near a winze or a shaft ?—It is near a shaft.

11,010. How far has the air to be driven ?—To about 20 fathoms, that is the greatest distance; it is a very short distance for a fan machine, for our air is not very bad; not where we placed the machine to force the air at first.

11,011. In putting in a rise or sinking a winze is the air close ?—Yes, it depends upon how far it is off from any ventilation or from any current.

11,012. What should you say the distance would be ?—I have seen bad air at about eight or nine fathoms to the east or west of a current of air that was passing up and down; sometimes you might drive 100 fathoms, and the air would not be so bad as at nine or ten fathoms; it depends principally upon the strata, and how the damp forms.

11,013. And whether you are working in killas or in granite ?—Yes.

11,014. In what kind of strata is bad air more likely to be produced ?—I think in granite principally; I think that the foul air in granite does injure the miners more than in any other kind of strata that I have seen.

11,015. Another term has been used for the cold air that is found in granite, namely, cold damp. Is that what you would understand by cold air ?—Yes.

11,016. Is that in your opinion different from poor air ?—No; oftentimes the air does cause this cold damp in the levels.

11,017. In a level where there was cold damp, if there were many men working in it the evil would be aggravated ?—No.

11,018. On a Monday morning, when the men return to their labour, is it found that the cold damp is worse ?—Not in the ordinary way of working, I think, because in going down to an old mine we oftentimes find a greater chill in an old mine that has been left idle for some time than what we do in going down a mine of some magnitude that has been in course of working a few days before; there is a great difference; you find a chill and a cold dampness in an old mine more so than in a mine that is in the regular course of working.

11,019. Do you think that that cold dampness is more injurious than what is termed poor air in close ends ?—We miners generally consider it so.

11,020. What effect has the cold dampness upon the candles ?—It does not take much effect; it is only just upon the system.

11,021. You cannot judge of it by the candles ?—No.

11,022. Have you ever observed in sinking a winze in any mine the cold dampness of the air so bad that the men could not work in it ?—Yes, I have seen cold damp many times so that we have been obliged to throw down furs to try to break it, and have many times thrown down powder and set fire to the powder before we got it away, and burnt hot lime; I have seen places before now where a candle has been just cooled out four or five feet above the back of a level; there has been a current of air at one place, and you could pass along very well, and damp has formed there, and I have put a candle to it, and it has quenched it just the same as if it had been dipped in water; the damp would form just in the back of the level above us. That was near Devonport, and that was the only mine in which I ever saw it.

11,023. Could you detect the cold damp by the eye ?—Yes, we could when we came to examine it afterwards.

11,024. What appearance had it ?—It had a lightish colour, more so than the air in the level, because it is generally a smoke or a steam that is passing through the levels.

11,025. Do you think that the cold damp is generally a steam or a smoke that is passing through the levels ?—No, I say that it generally looks whiter.

11,026. What effect was produced by throwing powder down upon it and igniting it ?—It did not take any effect upon it, not the least; I have seen the damp form in a winze in a bottom level just the same as you would see a fog at a certain distance.

11,027. Did you expel it by the expedient you resorted to ?—No.

11,028. Could a miner have gone down to work in the place at the time ?—No.

11,029. Would the fan machine drive it out ?—Yes, very soon.

11,030. Is the part of the mine in which you are now working open to all the old openings, or in communication with them ?—No, it is quite distinct from the old mine; this is a side lode, and we are nearly half a mile to the south of the old mine.

11,031. Does the timber decay where you are now working ?—Not very fast, not so fast as in other mines.

11,032. I suppose that in a dry mine the timber is more likely to decay than in a wet mine ?—Any decay of the timber depends a great deal upon the strata too.

11,033. Does timber decay more in granite than in killas ?—Yes, I think it does; but then, if there is water constantly pouring over the timber, either in granite or in killas, it will preserve it a great deal longer.

11,034. Particularly if that is copper water ?—Yes, that will preserve the timber for a considerable time.

11,035. How many under ground captains are there in your mine ?—Two.

11,036. In the end that you are now driving, have you ever observed how long the powder smoke will remain before the men can go to work ?—Sometimes it might lie there for 10 or 15 minutes, sometimes three or four minutes; it depends upon the wind at the surface, and how the current of air is running through the mine; that makes a considerable difference; it is just the same as the draught of a chimney.

11,037. Where you are now driving is it the fact that in 10 or 15 minutes you get rid of the powder-smoke ?—Yes; we have been driving in a mine, but if the smoke would leave it in about 10 minutes any man could go in to work.

11,038. How many shafts are there in the mine ?—Two.

11,039. Is one a downcast and the other an upcast shaft ?—Sometimes; it depends upon how the wind changes.

11,040. Does one shaft suddenly change from a downcast to an upcast ?—Yes, very suddenly; perhaps it will change in two minutes after the wind changes, and oftentimes we are obliged to raise the shaft to draw a current when the shafts are at an equal level.

11,041. By making one shaft higher above the surface than the other you would create an upcast current ?—Yes, down the one that is the highest.

11,042. Could that be done so as to make it always an upcast ?—Yes, I think so; I do not know, I do not think it would make much difference to the mine, an upcast or a downcast; as long as you have a current of air passing through the mine it is sure to clear the mine of the smoke or the foul air by driving it to the lower shaft as well as to the higher one; you must go to a great expense always to bring the current of air to the highest shaft, and I do not see the advantage of it.

11,043. Would it be desirable to have one shaft always an upcast and the other always a downcast ?—No, I do not think it would; that is what I said before, because I think it is as well for the current of air to go down through the high shaft and come up the down one as to go the other way.

11,044. As there is frequently a change the air cannot be constantly taken out of the mine ?—Yes, if the current of air should be running east now it will clear the mine as well as if it turned and ran west.

11,045. But, supposing it turned round and went north, it would then take back all the smoke and the air to the east shaft ?—No ; if it is once taken out of the levels and brought back near a shaft it is at the surface, perhaps, in two minutes; it is discharged there.

11,046. But, supposing the point of discharge is changed from one shaft to the other, or from one end of a level to the other, then it must be taken back again the way it came, in order to escape ?—I do not think that that signifies but very trifling.

11,047. Suppose there was no wind, and it was a muggy day, would there then be any ventilation at all ?—Yes, there would be then ; but in some mines which I have seen, which have not been well ventilated, I have seen them obliged to stop for some days until the wind should rise a little again.

11,048. Have you known of mines where they have been obliged to stop altogether for that reason ?—For a day or two as the shafts have been nearly at a level, but by raising one shaft a little higher than the other of course the draught does run.

11,049. In the case where the working was stopped, did it occur when the air went sometimes up one shaft and sometimes down the other ?—That I cannot say, not at present. I know that the two shafts of the mine are shallow, and the two shafts were just of equal height.

11,050. Were any means taken to remedy that defect ?—Yes, one shaft was raised a little higher, a few feet higher, than the other.

11,051. Did that answer the purpose ?—Yes, it did.

11,052. Then the upcast always afterwards went up one way ?—Not until we got one formed in a rise of the ground ; we sunk a deeper shaft, one with a higher top to it.

11,053. Did you ever find the highest shaft act as a downcast ?—Yes, I have ; and we have one of the kind now that does very often.

11,054. Then the raising of the one shaft is not a complete remedy ?—But then it causes a better circulation, a great deal, of the air under ground.

11,055. Have any accidents occurred in your mine from blasting ?—No ; we have not had any accidents from blasting, not since I have been in Wheal Vor ; no more than that a man some time ago set fire to two blasts, and one ignited, and he thought the other, what the miners term, missed ; but he thought the hole ought to have exploded, and just as he got on upon the hole the hole exploded and gave him several scars in the hands, and lodged a stone in his chest.

11,056. He returned to the hole against orders ?—Yes. The doctors extracted the stone, but he had a hole cut right through ; he was obliged to lie by far six weeks, but I think he is working now.

11,057. Are there any means that you can recommend for the purpose of preventing accidents by blasting, and which are not at present adopted ?—I do not think that there are. When an accident takes place in blasting I think it is through carelessness, or that the miners have not had proper experience in blasting.

11,058. Do you think that an accident is more likely to happen to a young miner than to another of more experience ?—Very much more likely.

11,059. Why have you not in your mine a man-engine or any improved means of taking the men up and down ?—Our mine is a young mine yet ; we have only got it down to 162 fathoms, and that is no great depth.

11,060. Is it not a great depth for the men to climb ?—No.

11,061. To what depth would the shaft be carried before you would recommend some improved means for raising the men up ?—I should say about 150 or 160 fathoms, if you have a convenient shaft to put it in. We are sinking a sumpt, and we shall have it down to 132 fathoms in the course of two or three months more. We were thinking to increase the area of the old shaft down so far as the 132 to bring up the men.

11,062. How would you bring them up ?—Just the same as the man-engines that have been set up in Cornwall. We can apply stages on the same rod.

11,063. Do you think that that is a preferable mode to the skip ?—Certainly.

11,064. (*Mr. Holland.*) On what rod would you apply the stages ?—The rod that we have working in the shaft.

11,065. The pump rod ?—Yes.

11,066. (*Chairman.*) Why do you not think the skip an available mode of bringing the men up ?—I think it is more dangerous than coming up by the rod.

11,067. Have you ever seen a skip used for bringing up the men ?—No, I never saw it used ; but our men, at the time we were working the old mine at Wheal Vor, used to come up in the skip sometimes, as many as five together in the skip.

11,068. (*Mr. Holland.*) Did any accidents arise from its use ?—Not one in the skip for drawing stones. I came up in it from the 284 one day.

11,069. (*Chairman.*) Was the skip drawn by a chain or a wire rope at Wheal Vor ?—It was drawn up by a hempen rope.

11,070. What was the breadth of the rope ?—It was seven inches wide and a chain attached to the end.

11,071. Were the men allowed to come up in that way ?—No.

11,072. Was it a double skip or a single one ?—It was a double one. I sent down three men there one night after they came up, so as to try to prevent them coming up that way.

11,073. You thought it too dangerous ?—Yes.

11,074. Should you be inclined to recommend your adventurers to go to the expense of a man-engine ?—No, not at present.

11,075. Why would you not do so now ?—We shall have dry rods ; we shall not use them for pumping, but take up the water by the new shaft ; we shall take out all the pumping from the rods we have now in shaft down as far as the 132, then we can apply stages to the present rod.

11,076. What would be the cost of doing that ?—I cannot say ; I have not gone into the calculation.

11,077. Having the rods, it would not be so expensive ?—No, nor near it. We have no other shaft where we could apply it.

11,078. Do you use any kind of patent candles ?—No ; we use the ordinary candles that are going in the country.

11,079. What quantity do you allow to each man ?—2 lbs. a week.

11,080. What do the miners pay for the candles ?—I think it is 8*d.* a pound.

11,081. Have you ever examined the candles to see whether there was any arsenic in them ?—Yes, many times, but I could never detect it.

11,082. What do you think of the noxious smell which arises from the candles, or is there any noxious smell from them ?—I do not think there is much in ours, but there has been in some candles that I have had. I sent up to Bristol some time ago, and I got candles from different parts, and I tried them all, and I did not find any candle that would burn sweeter than our miners' candles that we get in the country.

11,083. Do you mean that they burn with less smoke ?—Yes ; there is less fume arises from them.

11,084. What do you charge the miners for powder ?—8*d.* a pound.

11,085. Is it small-grain or large-grain powder ?—I do not like the very large grain ; a grain about half the size of a pea, or something smaller than that. A mixed powder I generally take.

11,086. With regard to the club money, what do the miners pay to that ?—6*d.* a month.

11,087. What do they pay for the doctor ?—6*d.*

11,088. Is the club money applied only in cases of visible hurts ?—Yes.

11,089. And not for sickness ?—No.

11,090. Is there a separate account kept of the club money ?—Yes.

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11,091. Do you consider that the club money belongs to the miners or to the adventurers ?—I think it belongs to the men, although a great many men do pay the club money that is indebted to the mine ; they pay it as it were towards the club for a year, having been indebted to the mine.

11,092. Supposing that a mine was stopped, and you had to dispose of any balance of club money, what should you say would be the fair way of disposing of it ?—I should think that the money ought to be divided between the invalids on the mine.

11,093. (*Mr. Holland.*) Whatever the amount might be ?—Yes, because if the men should pay 6*d.* a month, and that should amount to more than what was drawn from the club, their pay should be raised at the time of a serious accident.

11,094. (*Chairman.*) Who would have to provide the money in case the club money was not sufficient ?—Then it would fall upon the adventurers ; but that is a thing that I took pretty good precaution about when I went to Wheal Vor, because our outgoing was more than the incoming, and that should be looked to soon.

11,095. Would you increase the contribution made by the men for club money in order to meet any deficiency, or should the adventurers meet it ?—The adventurers should advance it for a time, it if was a serious accident ; when eight or ten men meet with an accident. At the same time, if you should run down the club, the adventurers should stand by it, but then the men should make it good again afterwards ; it should not come upon the adventurers—not permanently.

11,096. Was it at the old mine or at the commencement of the present mine that you paid the tut-work men once a fortnight ?—That has not been since I have been there.

11,097. Are they always a month in hand now ?—Yes.

11,098. Do you pay subsist ?—No.

11,099. How many doctors are there employed ?—Two.

11,100. How many boilers are there at work now ?—There are seven working now.

11,101. Are there are fixed periods at which you inspect the boilers and clean them out ?—We generally clean them out about once in twelve or six weeks.

11,102. Do you clean them out as often as that ?—Yes.

11,103. Is the water that is used in them bad ?—No, not very bad.

11,104. Do the boilers require to be cleaned out as often as you state ?—Yes, every six weeks where the engine is working five or six strokes a minute.

11,105. It is necessary on account of the accumulation ?—Yes, of the crust inside ; and they are cleaned out so that it shall not get hard in the tubes. I have seen eight tons of stuff taken out of a boiler, the marks of the rivets and the tube being in the crust that has been taken out between the shell of the boiler and the tube.

11,106. Is any record kept of the periods at which your boilers are cleaned out ?—No, I do not think there is, but the books will show that, because we are obliged to pay for cleansing.

11,107. With whom does it rest, with you or the engineer, to say when the boilers shall be cleaned out ?—If the engineer says that such and such a boiler ought to be cleansed out, I tell him to do it at once.

11,108. Is it done on the report being made to you ?—Yes, he generally reports it to me, and it is his place to look after them.

11,109. Have you any means of ascertaining the quantity of water in a boiler otherwise than by the stopcocks ?—No.

11,110. Do you trust to the man who is in charge of the boilers to try those cocks ?—Yes.

11,111. When a new man comes on he must try them too, must he not ?—Yes, it is his place to do so ; and as soon as he takes charge to go through the boilers for himself at once.

11,112. Have you more than one safety valve to each boiler ?—There is only one.

11,113. Are you able to prevent the men from weighting those valves ?—No ; but I do not think the men would weight them ; it is never reported to me. We do not allow the men to change in the boiler-house.

11,114. But I mean the enginemen ?—I do not think that they do but very seldom.

11,115. Has an accident ever occurred with a boiler since you have had charge of this mine ?—Never.

11,116. Have you heard of accidents happening with boilers ?—Yes, many.

11,117. Do you think it is dangerous for the men to change in the boiler-house ?—I should not like to see a large number of men go to change there, for, should the boiler burst, it would be almost certain death to them.

11,118. In paying the men, what proportion is paid in notes, and what proportion in gold and silver ?—We generally pay away about 800*l.* or 850*l.* a month at the mine, and we draw out between 300*l.* and 400*l.* in cash.

11,119. If the men want change where do they go to get it ?—I cannot say where they go for it, but they do not require a great deal ; oftentimes the girls on the floors, if they want to change a sovereign, come back to the office, and the clerk changes it for them.

11,120. Would he change notes for them ?—We give them nearly one half in change, so that they can arrange with each other.

11,121. (*Mr. Holland.*) Is the strength of a boiler always tested when it is bought ?—I think the makers generally test the boilers.

11,122. Do not the purchasers test them ?—No.

11,123. Do they trust to the makers ?—Yes.

11,124. Who employ hydraulic pressure I suppose ?—Yes.

11,125. Are they ever tested again afterwards ?—Very seldom.

11,126. You trust entirely to the first examination ?—Yes.

11,127. If a boiler becomes weak it would be dangerous ?—Yes. I have seen them as thin a sixpence, so that you might take and pick right through them, but they never leaked during the time they were in. I have examined boiler flues many times when we have taken them out, and they have not been thicker than a sixpence.

11,128. Would it not be a great advantage to have the boilers examined properly at short intervals ?—I do not think it would be of great advantage.

11,129. The Commissioners have heard of many explosions taking place ?—They have oftentimes let the feed down.

11,130. That is the chief cause of the bursting, is it ?—Yes. Then the heat forces down the top of the tube, and then the pressure of the steam causes it to collapse.

11,131. A proper examination would disclose any neglect in feeding the boilers. Do you trust entirely to the carefulness of the men in feeding them ?—Yes.

11,132. Is there no feed valve ?—Yes, but then you must turn off the one as you require it.

11,133. Is there no self-acting apparatus to regulate the feed of the boilers, or do you trust entirely to the carefulness of the engine-man ?—It principally rests with him.

11,134. Have the boilers two safety valves, or only one ?—Only one.

11,135. And that valve is entirely under the control of the engine-man ?—Yes.

11,136. He may load it as much as he likes ?—He is not allowed to meddle with it ; but he could do it.

11,137. Would it not be prudent to have one valve out of his reach ?—I do not know. I think that if a man is not to be trusted over a safety valve he is not to be trusted with an engine.

11,138. How does the air pass through the mine ?

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—That depends upon the strength of the current. Sometimes it is a great deal stronger than at other times. Sometimes it might go through in half a minute.

11,139. In a large mine?—Yes; as soon as you have a reaction.

11,140. What length of time is the air going through the mine?—That I cannot say. It requires some consideration and some study to come at such a matter as that. I cannot enter into that at the present moment.

11,141. Do you consider that cold damp is decidedly different from poor air?—I cannot give a decided opinion on this subject.

11,142. Is cold damp in your opinion more liable to gather in the winzes or in the rises?—I do not think there is so much difference in that; it depends upon how long a level or a rise is kept idle.

11,143. In any case will it gather more in a winze or in a rise?—I do not think there is much difference, that is if there is no current there.

11,144. You have not noticed any?—No.

11,145. You stated, I think, that the decay of timber depends upon the strata in the mine; how can the strata affect the decay of timber?—Because in granite ground oftentimes what we call the dryrot gets in; in dry granite ground more than it does in killas.

11,146. Do you know what the reason of that is?—I do not consider that granite is so damp as the killas.

11,147. You stated that the air in a granite mine was not fouler than in a killas mine?—Yes. In a killas mine sometimes you meet with it. It depends upon how far you extend your levels. I believe from what I have seen you can extend a level to a greater distance in a killas mine than in a granite mine.

11,148. What is the reason of that difference?—That I cannot account for.

11,149. Is it likely to be because you blast more in granite than in killas?—No; in some killas mines you blast as much.

11,150. But you do not generally do so, do you?—Yes.

11,151. Do not you do more pick work in killas than in granite?—I do not think you do so much. Perhaps you may in some mines, but not in those I have been in.

The witness withdrew.

Captain JOHN BURGAN examined.

Capt. J. Burgan.

11,152. (*Chairman.*) Of what mine have you charge?—Treworlis, within a mile of this town, and East Wheal Lovel.

11,153. How many men and children are there employed in those mines altogether?—In one mine there are 70.

11,154. How many men and boys are employed under ground?—Forty-five.

11,155. Then at East Wheal Lovel, what is the number of men and boys employed there?—At present not beyond 40.

11,156. Altogether?—Yes; they are very much reduced there. We have altered our machinery and reduced our hands lately. We had 120 hands a little time ago.

11,157. How long have you had charge of the first of the two mines you have mentioned?—I have been with the present company two years and a half; from its commencement.

11,158. What is the deepest level at which you are driving now?—33 fathoms below the adit, and the adit is 7 fathoms.

11,159. Is it a tin or a copper mine?—There is tin and copper.

11,160. Had you had charge of any other mines before?—Yes.

11,161. In what part of the country?—In this county; Great Wheal Baddern in the parish adjoining Gwennap parish, and another, and Spearne Wheal Mine, near Falmouth.

11,162. Is there any special matter upon which you wish to give any information to the Commissioners?—I do not know but very little about your subject of inquiry, and I do not know that I have anything very special that I wish to speak of.

11,163. Are there any hot levels in the mine where you are working?—No.

11,164. How far are you driving from any winze or shaft at present?—The greatest distance that we are driving is 15 or 16 fathoms from a shaft.

11,165. Is the air at all close there?—It is a little close at the bottom of the level, slightly so. We have a winze now in course of sinking from the level above, and upon the bottom level it is only very slightly close, nothing that any one would complain of.

11,166. Do the candles burn there freely?—Yes.

11,167. How long does the powder smoke hang about?—From 20 minutes to half an hour.

11,168. Are you rising also?—Yes, and sinking to communicate between the two levels.

11,169. Is the closest place in the rise or in the winze?—In the rise.

11,170. How many men have you working in both places?—There are two at a time in each place; that is in the rise and the winze. In the end before the rise there are six men, and there also eight men sinking a shaft again below.

11,171. What do you charge the men for candles?—We charge them 7*d.* per pound.

11,172. What do you charge for the powder?—I think it is 8*d.* a pound.

11,173. What do the men contribute for club money and to the doctor?—They contribute 6*d.* each.

11,174. Is there a separate account kept of the club money?—Yes; entirely so.

11,175. Are the receipts in the shape of club money sufficient to meet the accidents that occur?—We have had no accidents in either of the two mines I have now spoken of. We have been working just six years.

11,176. Do you know what the amount of the club money is?—I do not know; it is a regular company's account; it is not a purser's account nor a club account exactly; it is entirely a company's account, and everything is carried to the credit of the company, as any other matter of business. There will be no difficulty whatever.

11,177. Should the mine stop, would the company then divide it?—Yes, and if it was not sufficient it would be provided without any deduction whatever from the miners. The whole of the money in our mine very nearly is in stock, as far as the club money goes, and that is why we have paid none.

11,178. Have there been any accidents with the boilers?—Not one. I think that there is nothing we ought to be more particular about than the safety of our men.

11,179. Do the men change their clothes in the boiler-house?—Yes.

11,180. Do you think that is a prudent thing?—No; I do not think it is.

11,181. Do you think it is a bad thing?—I think that they ought to have better means.

11,182. You would, I presume, recommend your adventurers to provide a changing-house?—Yes.

The witness withdrew.

Adjourned to St. Agnes, To-morrow at half-past 11 o'clock.

ST. AGNES.

Saturday, 9th August 1862.

PRESENT:

The Right Hon. Lord KINNAIRD, K.T.	RICHARD DAVEY, Esq. M.P.
NICHOLAS KENDALL, Esq., M.P.	P. H. HOLLAND, Esq., M.P.

The Right Hon. Lord KINNAIRD, K.T., in the Chair.

Captain JOHN HANCOCK and Mr. MICHAEL MORCOM examined.

ST. AGNES.

Capt. J. Hancock. Mr. M. Morcom

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11,183. *Chairman* (*To Capt. Hancock.*) Of what mine have you charge?—Polberro.

11,184. (*To Mr. Morcom.*) You are purser of Polberro mine?—Yes.

11,185. (*To Capt. Hancock.*) What does your mine produce, tin or copper?—Tin.

11,186. Have you sent in a list to the secretary of the men employed under ground?—No.

11,187. How many men do you employ under ground?—94 men and boys on tribute.

11,188. How many on tut-work?—23 men and boys on tut-work.

11,189. How many are there altogether, taking those on the surface?—The total number in the mine is 244. I have a list of the ages of the tut-work men and the tributors, with the average. (*The witness delivered in the same.*)

11,190. What is the deepest level at which you are working?—30 fathoms below adit—the adit is 60 fathoms—that makes 90 fathoms from the surface; the mine is deeper—that is the deepest part of our present working.

11,191. The mine was an old mine?—Yes.

11,192. And you are only working a part of it?—Yes.

11,193. There are several shafts I suppose?—There are eight steam whim shafts at present in use, and five through which the horse whims are drawing, making 13 working shafts.

11,194. Are the levels which you are now working all in communication with the old workings?—Yes, and there are old workings below also; the water is in the bottom part of the mine; we let the water rise to a certain level.

11,195. I suppose that the men ascend and descend by ladders?—Yes.

11,196. Do you know the distance which the steps are apart?—12 inches.

11,197. Do you think that the men prefer the 12 inches to the 10 inches?—We do not hear anything at all about that.

11,198. The ladders are all uniform?—Yes, one foot; we always make our ladders that distance between the staves.

11,199. Is the heat great in any of the levels?—No, it is pretty regular in our mine.

11,200. Have you ever tested what the heat is?—No.

11,201. What are you driving now; are you sinking any winze?—Yes, we are always driving ends and sinking winzes so as to be opening ground for the tributers, and to be proving ground.

11,202. What distance are you now driving from any winze or shaft?—Perhaps the furthest off is 60 fathoms from shaft; one end.

11,203. How far from a winze?—Perhaps 25 fathoms.

11,204. Are you sinking a winze at the end of that 25 fathoms?—No, we are now going to start a rise from the present end of 25 fathoms.

11,205. Is the air at all close at the end?—No, it is very good indeed, we have pipes to carry in to blow away the smoke from the men.

11,206. By means of a boy at the end?—No, there is a trap door, and there are air pipes.

11,207. From another level?—From a level above.

11,208. How long is the smoke getting away?—They can go into the end in five minutes after they have fired the hole.

11,209. So that by trap doors you conduct a current from other levels down to the point where you are working?—Yes, by a trap door and pipes.

11,210. Do you use any other means for forcing in air?—Yes, we blow a machine occasionally, if we find it necessary, but that is very seldom, we have so many shafts that it is not required.

11,211. By a proper management of trap doors and pipes you can conduct the air to any part of the mine?—Yes, we have very good air indeed throughout our mine.

11,212. Have you ever seen anything of the cold damp?—No, not in this mine.

11,213. Have you ever yourself worked in or been connected with a granite mine?—Yes, I have had a great deal to do with granite mines.

11,214. Do you think that they are more subject to cold damp than the killas?—Yes.

11,215. Have you seen cold damp?—Yes, the cold damp in the granite more especially than in the killas, and of course the men complain more of it in a general way.

11,216. How do you judge of cold damp?—After perspiring pretty much and sitting, we find that we get very cold, and our clothes clammy and wet and cold, the men feel very uncomfortable in it, more so than if working in killas.

11,217. With regard to cold damp do you judge by the candles?—No, I never observed it make any difference in the candles.

11,218. Have you ever worked in a close end?—I have never worked in a close granite end, but I have had to do with it a good deal.

11,219. What is the effect upon the candles in a close end?—Of course you require to touch a candle up pretty often, and to put it on a certain angle, and to snuff it often.

11,220. But that is not the case in cold damp?—No, I have never seen any cold damp which would have that effect.

11,221. Have you ever seen when the men have not been working in any winze, or at any end, that the candle would go out?—Yes, many times; and I have kept the candle before me, and I have gone so far as that the candle has died out, and then I have kept back. When we find it like that we of course use means to put air in before the men go in.

11,222. Might not this have been equally the case if the men had been working there?—No.

11,223. If the men had not been working there how would you manage?—If you carry a good strong breeze of wind through pipes, or some other means you get rid of it. I have known places which have been communicated, say, for instance, an end, when we could not get into that end; and after communicating a winze with that end we could see the damp, it would affect the light in the winze as it was escaping through the place which was communicated

11,224. When you have connected a winze with a level where this bad air has been have you seen the effect of it?—Yes, upon the candle.

11,225. But have you been able to see anything in the shape of vapour?—No; I do not know that I ever discovered anything of that sort. I have seen it upon the bottom of a winze or close in an end, and we have seen it form like a mist, that we have seen repeatedly; and sometimes in dropping a candle down in a winze we have seen it like a smoke, and the fire is out of the candle in an instant.

11,226. Have you had any accidents from blasting lately?—We have had one.

11,227. Were you able to ascertain how it happened?—Yes, by tamping a hole.

11,228. What with?—With an iron tamping bar.

11,229. Was proper tamping put in?—I think it was a very careless job; it was a shallow hole, and there was very little powder in it. I believe that the hole was not more than a few inches deep, and I believe there was not more than an inch or two of powder, and the man did it pretty quickly and thoughtlessly; and the hole went off in tamping. The hole did not bring out the burthen.

11,230. Had the man put in the proper tamping?—They said that they had proper tamping; it was evidently carelessness.

11,231. It must have been occasioned I suppose by the iron tamping bar striking and creating a spark?—Yes, it must have been that.

11,232. Might it not also have been that there was some powder left on the edge in filling in?—I asked the men about the matter, and they said that they could not tell; only that it exploded in tamping.

11,233. Do you imagine that you could set the powder on fire by the mere force of tamping if there was any vacant air in between the tamping and the powder?—No, I think not.

11,234. If a hole explodes after the third or fourth tamping, how would you account for it?—I have never known an instance of that sort. I have known several holes explode in the first and second laying of the tamping, but never in the third or fourth.

11,235. In the second tamping it might arise from the tamping bar striking against the edge?—In my opinion it is from striking fire by careless tamping, before the powder is properly cleaned out.

11,236. Have you ever seen a cartridge used?—Yes, when they are rising frequently, but not in any other holes; that is for the purpose of putting the powder in properly; that is the only cartridge which we use.

11,237. Are the gettings in this district of St. Agnes less than in other districts?—No, we are paying more wages than they are in other districts.

11,238. (*Mr. Holland.*) What are the usual earnings per month?—The average wages of our tributers are more than 4*l.*

11,239. Net or gross?—Clear to them.

11,240. (*Chairman.*) Has the amount risen lately?—No, it has been like that for a good while, for perhaps the last four or five years.

(*Mr. Morcom.*) Yes, before that they were much lower.

11,241. (*Mr. Holland.*) (*To Captain Hancock.*) Why are they higher?—There is not competition sufficient in the labourers; there are few hands in the district, and nobody will come out here, except those who are born and bred here.

11,242. (*Chairman.*) Why will not hands come from a distance here?—I can hardly account for it any other than that the mode of working being so peculiar, many of the lodes being so flat that strangers require some time to get acquainted with it.

11,243. Have you house accommodation for them?—Very good accommodation.

11,244. Sufficient accommodation?—Yes, and the men are better off here I think than anywhere else. I have no doubt that they are.

(*Mr. Morcom.*) I suppose that one reason is that the miners in the south do not understand our mode of working.

(*Capt. Hancock.*) It is a peculiar principle.

11,245. (*Chairman.*) You say that there are more tribute men than tut-work men?—Yes.

11,246. How is the ground set to the tribute men?—So much in the pound.

11,247. On what principle is the mine worked?—The mine is worked principally on tribute.

11,248. From the peculiar character of your lodes you are obliged to have men experienced in the work?—Yes.

11,249. A stranger would not have the same advantage as a tributer here as one who is acquainted with the mine?—No. Of course a stranger now and then comes round and falls in with these men, and we hold them as well as we can.

11,250. (*Mr. Davey.*) Where you can get a stranger to join pairs?—Yes.

11,251. (*Mr. Morcom.*) But if he was on his own account he would never get on.

11,252. (*Chairman.*) (*To Capt. Hancock.*) How many boilers have you at work?—We have three to the drawing engine, and we have four boilers to our stamp engine, and we have two whims with two a in each, so that we have nine working boilers.

11,253. Do you clean them at any stated period?—Yes; we clean about an average of three every month out of the nine, you may say three of boiler eight; as one of the whims is not employed much.

11,254. (*Mr. Holland.*) So that they are cleaned about once in three months?—Yes.

11,255. (*Chairman.*) Is the water good?—It is very bad.

11,256. (*Mr. Holland.*) In what respect?—It is principally sulphuric acid.

11,257. (*Chairman.*) And it corrodes?—Yes, very badly.

11,258. And does the machinery suffer?—Yes; we use brass in most places where the water is acting powerfully upon it, where we can do it, and the gauge cocks are silver.

11,259. Is this water of the same character as that which you pump out of the mine?—Yes; that is the water which we have; we have no other water than what we pump out of the mine for every purpose, except rain water; we are careful to catch all we can as it is much better for the machinery. If we have an iron air-pump bucket rod 3½ or 4 inches, it will not stand more than a week or a fortnight.

11,260. What has been your experience of the effect of the water on a chain which had been in the lift of the pumps for five weeks?—The links were entirely separated and were reduced more than one half of their size. It was destroyed by the sulphuric acid.

11,261. Are you not afraid of your boilers exploding?—No, we are never concerned about it; we pay great attention to that. We must of course examine the cocks very often and pay great attention to it.

11,262. Have you ever had a boiler explosion?—No.

11,263. (*Mr. Holland.*) How long will a boiler last?—They are so repaired that one can hardly tell; but one new boiler will probably last about two years without repair.

11,264. What is your explanation of the boilers suffering so much less rapidly than the pumps?—Because the water is rapidly passing through the pumps. I have been 14 years in the mine, and some of the pumps are there now, whereas in some other places we have changed three or four pumps.

11,265. Is the chief action of the water upon the pumps contracting the bore?—Yes; it destroys the iron also. Sometimes some of the corrode will fall away and it will work a hole through the iron.

11,266. How long do the pump pipes last?—If there was no corrode about them probably they would last four or five years or three or four years, it depends upon the casting. We have perhaps changed some of our pumps twice in the year, and in another case it will last seven or eight years.

11,267. Do they last two of three years on an average?—Yes; more than that.

11,268. Would it not be a very important thing for you to be able to protect the pump?—Yes, but I can hardly tell how to do it to be of much benefit.

11,269. Have you noticed that the water injures the miners at all?—No; we do not hear of any complaint from the miners about it.

11,270. I notice in your return that almost all your

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tributers are below 40 ; only 19 out of 94 are above 40 ?—Yes.

11,271. What becomes of the men above 40 ?—A great many of them go away upon the burrows picking a little tin, and a great many of them have help from their friends and retire. There are a great many old men in the parish.

11,272. Do not a great many of them die ?—Yes, of course they die.

11,273. At what age do you look upon a miner in this district as an old man ?—I can hardly tell. A great many men in this district are between 60 and 70, (I mean not working but living here). I hardly know what has become of many of the old men.

11,273*a*. What becomes of them when they get above 40 ?—I do not know, it requires a little time to inquire into that matter. I do not know that any of our men die before they are pretty old.

11,274. Of the 23 tut-work men there are only 6 above 45 ; what becomes of the others ?—I do not know. I do not know how to explain it. I do not think that it is very easy to explain it, as we have had very few deaths below that age "45."

11,275-6. (*Mr. Davey.*) Have not a large number of them small cottages and tenements of their own ?—That is what I meant to say ; they fall back from mining and go upon the burrows, and so on.

11,277. In which they occupy their spare time ?—Yes ; a great many of them.

11,278. And I suppose that some of them get into small shops after they have made a little money ?—I can hardly tell about that. There are perhaps some, but not a very great many.

11,279. Formerly there was a reason why St. Agnes men did not get so much as at other places, because nine-tenths of them had little tenements where they used to work all their spare time, and consequently worked less time at the mine ?—Yes ; I have heard that ; but there are pretty many of those now in the district. They fall back from the mine and get their living in some other way. There are more old men here going about in other ways than in any place that I know.

11,280. (*Mr. Holland.*) Do they consider mine work unfit for a man above 40, and do they therefore leave it ?—No ; I do not know that they do.

11,281. Why do they leave the employment when they are above 40 ?—Many of those men have children, and they bring them up to work with them, and when they get into those pitches up here, it being a peculiar mine for working, they get more money than anywhere else, and they leave work sooner than anywhere else. They have their children, and so on, to help them, and they take their tenements and live upon these little places, and there is more independence here than in any other place that I have seen. They get as independent here as members of Parliament in a little while.

11,282. (*Chairman.*) I suppose that a man after a certain age does not particularly like climbing the ladders ?—After a certain age they would not do it. They seem to drop back in the way that I have stated. That is the only way that I know.

11,283. Within your certain knowledge are there a great many who get farms ?—Yes ; great numbers have fallen back in that way since I have been here, and there are numbers living about now.

11,284. Can they earn more in that way than by working in the mine ?—Not so much I suppose ; but then they do not require so much, and they have their children to help them.

11,285. Their children work in the mines ?—Yes; and the parents stay at home. I think that there are more old men living about here who were miners than at any place that I know of.

11,286. But they do not work in the mines here ?—No.

11,287. It is your opinion that they can get occupation out of the mine without any difficulty after they come to a certain age ?—Yes ; in the way that they do now.

11,288. Do they rent these small farms ?—Some of them take them perhaps when they are unable to work, and they build a little cottage and take in a few fields, and then they have that to fall back upon.

11,289. Would those men return themselves in the Census as miners or as farmers ?—I suppose as farmers. They would not return themselves as miners.

11,290. I have a return of the number of accidents which have happened in mines, and among others it says, "Killed by a fall from one level to another; "from the 50 fathoms level to the 150 ;" what does that mean ?—That is falling through the shaft from one level to another. If they fall away from the 20 fathom level they fall perhaps to the 30 or the 40 fathom level, and there they stop.

11,291. Is it in climbing mostly ?—Sometimes ; and sometimes perhaps they may be knocked away by the kibble in the shaft. Kibble fillers I think are more killed in that way on the average; they are more exposed than miners. We have been at Polberro 14 years, and I think that we have had four men killed, and two of them have been kibble fillers.

11,292. Do you use a kibble or a skip for drawing ?—Both.

11,293. Which do you find most economical for drawing ?—If we had good shafts we should prefer the skip, but our shafts are bad shafts generally speaking. They were not sunk by us ; they are perhaps hundreds of years old.

11,294. And you think that you could not apply the skip to them ?—No ; it would be too much expense in applying timber.

11,295. (*To Mr. Morcum.*) Do you use any particular kind of candles, patent candles ?—No, not patent candles, but the best that we can get in the county. We get ours from Penzance.

11,296. What are the men charged for the candles ?—We charge the men 9*d.* a pound for them.

11,297. How much a pound do you charge for powder ?—The same price.

11,298. Do you use the small grained or the large grained powder ?—The small grained generally.

11,299. Is it preferred by the men ?—It is by our miners because it is dry ground. There is very little water.

11,300. Is there a charge for the barber in your mine ?—No.

11,301. How much is charged for club and doctor ?—Sixpence a month for the club and sixpence for the doctor.

11,302. Do you keep a separate account of the club money ?—Yes ; quite distinct.

11,303. Is a statement of that account rendered to the adventurers with the other accounts ?—No ; not exactly to the adventurers, but to our managers in London.

11,304. The club money is for visible hurts, I presume ?—Yes.

11,305. Do you consider that as belonging to the men or to the adventurers ?—To the adventurers.

11,306. Have you a large sum at the credit of the club account ?—Yes. At the present moment we have somewhere about 700*l.*

11,307. And the adventurers, according to your opinion, would be entitled to apply that money to any purpose in the mine ?—Decidedly ; for this reason. Many years ago I was in Gwennap, and we had a great many accidents, and every now and then we had to charge to the cost book 50*l.* deficiency in the club, and therefore it must belong to the adventurers.

11,308. But I suppose that that was made up again ?—Never. That was done repeatedly.

11,309. That is not your case ?—No.

11,310. Therefore you have not so many accidents as they had at Gwennap ?—I never knew less accidents than we have at Polberro.

11,311. And therefore your fund accumulates ?—Yes.

11,312. Of course a large charge coming against

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the club shows that there must be a good many accidents?—Yes.

11,313. How many doctors have you?—Two.

11,314. Are they appointed by the adventurers?—Yes.

11,315. Have the men anything to say in the appointment of the doctors?—Yes; I think they have. We should not appoint a medical man if the men were opposed to it.

11,316. How would you ascertain that?—Soon after I came to Polberro there was an objection made by the men to having doctors from Redruth. They were old respectable medical men from Redruth, but the distance being so great, and there happening to be a medical man residing in the place who had nothing to do with our mine and who was a great favorite with the working men, they petitioned to have him appointed, and our managers in London agreed to it.

11,317. Is it desirable to have a medical man near to the men in case of accident?—Yes; we have both in the village, and they are very attentive.

11,318. I suppose that a doctor residing at a distance would be obliged to employ an assistant, or would the men have to go to him?—They would have to go to him. In fact they escape a great deal of the work by living at a distance; it falls on the medical man living on the spot.

11,319. Whether he is employed by the mine or not?—Yes; it is not worth their while to go five, six, or nine miles.

11,320. Do they, living at that distance, receive the 6*d.* per man?—They do in many cases. There is a great deal of interest in being appointed medical man to a mine.

11,321. Does a medical man get shares in a mine and canvass for the appointment?—Not to my knowledge. Sometimes the lord of the soil in granting a set will stipulate to have his own medical man; that is very often the case.

11,322. What proportion of notes and of change do you get from the bank when you pay your men on the pay-day?—In notes, perhaps one half. In paying the children I always take care to pay them in change, so that they may have the money and go to their homes as quickly as possible; but tributers may have to receive 10*l.*, and then they may as well have notes as otherwise.

11,323. In the case of the men how do they get the money changed?—I am afraid that in nine cases out ten they go to the publichouse.

11,324. (*Mr. Holland.*) You have stated that there is a considerable excess in the proceeds of the club?—Yes.

11,325. Then more has been charged to the men than in proportion to the risk which they have incurred?—Yes.

11,326. Is that quite just?—Yes; I should say quite, for this reason, I consider that the adventurers are really that out of pocket; the adventurers pay it. In employing the men you do not really deduct the doctor and club out of their money. They must have a certain sum to take home to maintain their families and we should screw them a little tighter so as to save the amount of the club money.

11,327. Is there any complaint of it by the men?—None at all. In fact I have not heard a single complaint by our men; they do not know the state of the club at all. If we had to pay them double what we keep back from them they would get the money.

11,328. You said that you had two doctors; have the men a free choice of which doctor they will go to?—Yes.

11,329. Does the doctor who has most patients get most pay?—No; one doctor takes one month and the other doctor another to attend to any new patients who may come on. They go on with the old patients. If any of the men prefer one or the other they go to him although it is not his month.

11,330. And do the doctors divide the payment equally between them?—Yes.

11,331. Would it not be an improvement if the doctor who had the most patients had the most pay?—No; I should not fall in with that myself.

11,332. What do you think would be the objection to that?—In the first place there would be a difficulty in getting at a correct statement how it stood you need keep a clerk to keep the accounts.

11,333. What other objections to it are there besides its complicating the accounts?—I am afraid that if it was left to the men entirely there would be some canvassing.

11,334. Do you fear unfair rivalry between the doctors?—I have noticed in different districts that wherever there is a drinking good for-nothing doctor he is sure to be popular with the lower orders, if he will go to the publichouse and take his pot of ale with them. Of course they cannot judge whether he is a clever man or not.

11,335. (*Chairman*). Are there any such characters as that among doctors?—Yes, I have known them.

11,336. (*Mr. Holland*). Does any other objection occur to you?—No. I wish to give an explanation with respect to what has become of the old men. In the first place, I suppose that three fourths of the working men in this parish have money accumulated in the savings bank, they are continually paying into the savings bank; there is very little drunkenness here, less than in any place that I know, and they put a great deal of money into the savings bank. There are not so many families as appears by the list of names. There is a father who has perhaps two or three sons working with him; a great many of them in this neighbourhood have little leasehold places, and they have money in the savings bank; they have saved up money to buy perhaps a cow or two, and when they get up about 40 years of age, they purchase a horse and pick up their living in many ways and cease to be miners.

The witnesses withdrew.

Captain JAMES NICHOLAS examined.

Capt. J. Nicholas.

11,337. (*Chairman*). Of what mine have you charge?—Huel Kitty (St. Agnes).

11,338. Any other?—No.

11,339. Have you a list of the number of men?—I have. (*The witness delivered in the same.*)

11,340. Is your mine tin or copper?—Tin and copper, principally tin.

11,341. How many men and boys are employed underground?—119.

11,342. How many altogether are employed, including those on the surface?—I do not know.

11,343. Are the men chiefly on tribute or tut-work who are employed in your mine?—There are 41 men on tut-work, and 23 boys; 46 men on tribute, and 6 boys.

11,344. Do the men ascend by ladders?—Yes.

11,345. Do the ladders follow the lode?—We descend perpendicularly until we reach the lode, and then we walk down over it, it being so flat.

11,346. What is the deepest level at which you are working now?—The 100 fathom level under adit, the adit being 45 fathoms.

11,347. How many men are working on that level?—8 men and 2 boys at the 100 fathom level.

11,348. At what level are most men working?—At the 54 fathom level, west of Holgate's shaft.

11,349. How many men are working there?—30 men and boys.

11,350. Are you sinking a winze or putting up a rise?—We are putting up a rise at the back of the 54 fathom level to communicate with the 44 fathoms level.

11,351. Are you sinking a winze or putting up a rise at any other place?—We are putting up a rise at the 100 fathom level.

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11,352. At the 100 fathom level how far are they from any winze or shaft?—25 fathoms from a winze, we are putting up a rise at that point.

11,353. Is the air close at all there?—The air is not close, but the smoke does not go away quick enough, and we shall not be long before we get a communication.

11,354. How long is the smoke getting away?—From a quarter to half an hour very likely.

11,355. How long do you think you shall be before you get a communication with the other level?—About two months.

11,356. (*Mr. Kendall.*) How many men work in that end?—Six men in the end, and two men and two boys in the rise.

11,357. (*Chairman.*) Have you any night cores?—Not in the rise, but we have in the end.

11,358. In the 50 fathom level, what are you at work at, are you sinking?—We are driving both east and west from a cross cut, it is what we may term a new lode, and we are driving east and west, and also putting up a rise on the back of that level.

11,359. How far is that rise from a winze or shaft?—About 10 fathoms from ventilation.

11,360. I suppose that in all those ends a candle would burn perfectly?—Very well.

11,361. Although there are a great number of men working in a small space?—Yes, more than there are anywhere else.

11,362. And you do not find the air at all bad there?—The air is not bad, but the smoke lies a little.

11,363. That is the only inconvenience which the men experience there?—Yes.

11,364. Have you any artificial mode of ventilation?—Yes, an air machine.

11,365. Where is that applied now?—At the 54 fathom level; at the same place as we are now speaking of we have an air machine 14 inches wide by 7 inches high within, and from the end of the large pipe we have two split pipes, one in the western level and another in the rise, and also one to send air into the eastern level.

11,366. Is that kept working during the whole three cores?—Yes.

11,367. By hand?—Yes.

11,368. Have you three boys employed?—We have two boys in the one core, when there are more tributors there, and one boy in each of the other two cores, making four boys.

11,369. Then the two boys take it alternately?—They keep it going the whole time during which the men are at work.

11,370. Has there ever been any accident since you have been at Huel Kitty?—Two.

11,371. Arising from what?—A piece of ground turned out from the side of a level and fell on a man's foot, and he became jaw-locked. In the other case, a little boy came in contact with the rods of the engine shaft; he was coming up.

11,372. Have you had any boiler explosions?—None.

11,373. What do the men pay for candles?—8*d.* per pound.

11,374. And what for powder?—8*d.*

11,375. And for club money and doctor 6*d.* each?—Yes.

11,376. Is a separate account kept of the club money?—Yes.

11,377. Do you know the amount of the credit of the club money?—I do not.

11,378. Is there a charge for the barber?—There is a barber there for the first month; we have not charged yet, but we are thinking of doing so.

11,379. Is the water bad for the boilers?—It is bad, but not so bad as it is in some mines; a boiler stands about 10 years.

11,380. How often do you clean them out?—About once in six months.

11,381. Whose business is it to examine the boilers?—That belongs to the engineer.

11,382. The captains have nothing to do with the boilers?—No.

11,383. In cleaning out the boilers, is there much sediment, or are they corroded by the water?—There is a sediment, and that of course comes from the corroding which eats out from the boilers.

11,384. How do you ascertain the quantity of water?—By stop cocks.

11,385. Have you more than one safety valve to your boiler?—Only one.

11,386. Is the strength of the boiler ever tested?—No, that is tested before it is brought into the mine.

11,387. But not afterwards?—But not afterwards.

11,388. I suppose that as a captain you pay great attention to the ladder ways and underground works, being in good order?—I pay great attention to everything belonging to the mine.

11,389. Does the timber rot at all in your mine?—In one level there is a little dry rot, but not much.

11,390. Is attention paid to the timber being removed from the levels?—No timber is removed from the levels.

11,391. When it rots and falls away what becomes of it?—If it is not worth anything we send it away to the surface and put in new timber instead. None is taken out so as to injure the levels.

11,392. Is attention paid to keeping the levels clear of decayed timber?—Yes; we have very little of that in the mine.

The witness withdrew.

Captain William Higgins, of Penhall's Mine, St. Agnes, examined.

Capt. W. Higgins.

11,393. (*Chairman.*) Are you captain of Penhall's mine?—Yes.

11,394. Have you a list of the men employed there?—Yes. (*The witness delivered in the same.*)

11,395. What is the deepest level at which you are now working?—40 fathoms under the adit.

11,396. Is the air quite good where all your men are working?—Very good all through our mine.

11,397. How many boilers have you?—Two.

11,398. How often are they cleaned out?—About once in nine months.

11,399. Do you find that the water very much corrodes the iron?—Not much; we get pretty good water.

11,400. What is the effect of the water on the iron?—We do not find it affects the iron much; when the water has been heated it affects it more.

11,401. Does it affect the pumps at all?—No.

11,402. Then the water is good?—The water is good as far as we have seen of it; we have now been working five years and we find it eats very little.

11,403. Have you ever worked yourself in a close end?—Yes.

11,404. In what mine?—In Huel Coates, and in Wood mine.

11,405. What is the closest end which you have ever worked in?—It was in Wood mine.

11,406. What was the effect which you felt there from working in close air?—It left an effect upon the chest and lungs; for four months after I gave up there I was not able to work.

11,407. What level was that?—20 fathoms under the adit.

11,408. How far from any winze were you working?—132 fathoms, I think.

11,409. Were you driving at that distance?—Yes.

11,410. Had you any means of ventilation?—Air sollars.

11,411. Do you think that that was sufficient ventilation?—No.

11,412. (*Mr. Kendall.*) Had you no fan?—No.

11,413. Did you entirely depend upon sollars at 132 fathoms distance ?—Yes.

11,414. How high were your sollars ?—About two feet.

11,415. Above or below ?—Below.

11,416. (*Chairman.*) Did you ever work where you had to throw lime in before you went in to work ?—No.

11,417. You have heard of that being done ?—Yes, many times.

11,418. How long were you working in the close end which you have just mentioned before you were obliged to give up ?—I worked in that place seven months.

11,419. How many others were working there ?—There were only two of us.

11,420. Did the other man suffer also ?—Yes, he only lived two years afterwards ; he was laid up at once.

11,421. (*Mr. Kendall.*) How long was it before you felt ill ?—It was two months before I felt it hurt me, but we were engaged at a pay to carry on, and we carried on for five months afterwards.

11,422. (*Chairman.*) What extra pay was given ?—I was then a boy about 16 years of age, and was allowed to get 3*l.* 10*s.* a month.

11,423. Did you ever complain ?—We complained of the air; we did not like to stay there, but were told that we should get along, for that they wanted to drive a cross cut to prove a lode a little further to see whether it would be productive or not, and that if so they would put down a shaft.

11,424. (*Mr. Kendall.*) How far from the surface were you working ?—About 50 fathoms.

11,425. And therefore they did not like to go to that expense till the lode was proved ?—No.

11,426. (*Chairman.*) You worked in the Gwennap mines for some time, did you not ?—Yes.

11,427. In your opinion, did you suffer from working there ?—No.

11,428. How long did you work there ?—About three years.

11,429. And you were never the worse for it ?—I was never the worse for it.

11,430. Do you think that you are now quite strong and well, or do you feel the effects of it ?—I feel the effects of it now if ever I take cold.

11,431. (*Mr. Kendall.*) You say that when you were working in this end, 132 fathoms from any shaft, you felt poorly at the end of two months ?—Yes.

11,432. And you knew that the air was doing you harm ?—Yes.

11,433. But still, as you were encouraged by this high pay, you went on ?—Yes.

11,434. (*Chairman.*) Why did you give up working in the Gwennap mines ?—I chose to have my work nearer by.

11,435. How long have you been employed as captain ?—18 months.

11,436. (*Mr. Holland.*) How old are you ?—40.

11,437. How long have you had anything the matter with your chest; ever since you were 16 ?—Yes.

11,438. Have you a tender chest now ?—Yes, a little when I have a cold.

The witness withdrew.

Captain John Prout Daw examined.

11,439. (*Chairman.*) Of what mine have you charge?—Tywarnhaile.

11,440. Any other mine ?—No.

11,441. What does your mine produce ?—Copper.

11,442. No tin ?—No tin.

11,443. How many men have you ?—We have 120 underground, we have 100 at the surface dressing, that is the dressing pair, and we have 18 men employed on the surface, carpenters, smiths, enginemen, &c.

11,444. Is your mine an old mine ?—An old mine.

11,445. What is the greatest depth of level at which you are now working ?—Ninety fathoms from the adit.

11,446. And the adit is how much ?—Forty-five fathoms.

11,447. Do the men ascend and descend by ladders ?—Yes.

11,448. How many levels are you working on now ?—We are working every level; that is to say, every ten fathoms.

11,449. What is the greatest number of men on any one level ?—About 30.

11,450. That is in different corps ?—Yes.

11,451. Do you work three corps ?—Our mine being chiefly worked on tribute the men work the greater part by day.

11,452. What is the proportion of tribute men to tut-work men ?—The number of our tut-work men is small ; we have only 24 tut-work men, and the others are on tribute.

11,453. Are the tut-work men driving a level or sinking a winze, or putting in a rise ?—One pair of nine men is dropping away and forking the water under the 90 fathoms. The other men are sinking a shaft, and six men are driving an end.

11,454. Is the air quite good in all those levels ?—Yes.

11,455. Have you seen where a candle would not burn in the mine ?—No.

11,456. Have you ever yourself worked in a level where a candle would not burn ?—No; although I have worked where it was poor air.

11,457. How do you know that it is poor air if the candle burns ?—We are obliged to turn it on one side. It will not burn upright.

11,458. That you call poor air ?—Yes.

11,459. If the candle went out what should you call it ?—We should call it very bad ; we should not like to stay there.

11,460. But there is no place in your mine where the candle has to be put on one side in working ?—No.

11,461. Have you any artificial means of ventilation ?—No.

11,462. How do you take the air into an end when they are driving an end or sinking a winze ?—It goes in naturally, our mine being well ventilated.

11,463. What sized levels do you carry ?—Our levels are about eight feet high and five feet wide on an average.

11,464. How far should you consider it safe in order to secure good air to carry a level from any winze or shaft ?—I think 50 fathoms.

11,465. Without any artificial means ?—Without any artificial means. That is in Tywarnhaile, although in some places you are obliged to put in timber. Timber is a thing which will eat up a great deal of air, and there you could not go so far. Where the ground is soft and you have to keep the levels abroad through timber you cannot go so far as where you are driving a high and wide level in hard ground.

11,466. Does the timber decay at all ?—No ; our water rather preserves it than decays it.

11,467. Then you have no decaying timber ?—We have no decaying timber in Tywarnhaile.

11,468. How long have you had charge of this mine ?—I have been in the mine now about ten months.

11,469. Have you had any accident during that time ?—No. In fact, since the mine has been in work by the present company, which is about three years, they have had no accidents of any serious nature.

11,470. What do the men pay for club money ?—6*d.* a month.

11,471. Is a separate account kept ?—Yes.

11,472. Have you seen that account ?—Yes.

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11,473. Do you know about how much is on the account now ?—I think that we have something like 40*l.* on the account now to the good of the club.

11,474. Have you any pensioners on the club ?—No; not having any accident and our mine being well ventilated we have scarcely any men home.

11,475. I suppose it is only for visible hurt ?—For visible hurt, except in cases of great distress, where we have the chance of giving a man anything which we might think proper from the club. That is a rule of the company.

11,476. Who would feel themselves at liberty to do that ?—The agents.

11,477. Do the men pay the barber ?—No.

11,478. How many doctors have you ?—We have three.

11,479. What are the men charged for candles ?—8*d.* a pound.

11,480. And how much for powder ?—8*d.*

11,481. Is the water good for your boilers ?—It is what we call pretty good for this county; not very good.

11,482. How often do you empty and examine the boilers ?—Every three months.

11,483. Does much corrosion go on ?—Not a great deal. We keep that department pretty well looked after.

11,484. Is it the business of the captains to see that the boilers are attended to ?—No; it is the duty of our working engineer.

11,485. Have you anything but stop cocks to ascertain the quantity of water ?—We have glasses which indicate the quantity of water in the boiler.

11,486. Do you think that a good thing ?—A very good improvement.

11,487. From a return which I have I see that several accidents happen in the mines, and that a great many persons are killed by a fall from one level to another; how does this happen ?—Sometimes through carelessness.

11,488. Where does a man fall; is it in the shaft ?—In the shaft, and sometimes in winzes sunk from one level to another. You may have ever so good a footway but you will sometimes find that men, and especially young men, race, and they will sometimes throw away one of the others, and sometimes they will take up too great loads and carry them from one level to the other, which they ought not to do. Our men have no reason to carry down anything; our skips are open to carrying anything which they require. Sometimes men fall from one level to another through winzes, and where there are very good ladder-ways.

11,489. There is no protection put at the mouth of the winze ?—We cannot put any protection at the mouth of the winze.

11,490. If a candle went out and a man had no means of lighting it, how would he get up from a low level ?—They have now generally matches.

11,491. But suppose that the matches got wet ?—If they were not well acquainted with the road their better way would be to stop where they were till some person came along; some person generally comes along every hour or so.

11,492. They would not be safe without a light ?—No.

11,493. (*Mr. Holland.*) Do you not sometimes go along the levels without a light ?—You may do so, but sometimes there are sinks and you get deceived by going in the dark.

11,494. I saw a man going along a level on his hands and knees without a light; is that a common thing ?—No.

11,495. (*Chairman.*) I suppose that a man would sooner go on his hand and knees than stay two hours ?—He would.

11,496. (*Mr. Holland.*) You said that there were no means of protecting the winzes which were left open; could not a grating be put over them without interrupting the ventilation ?—I think not. I think that that would injure the ventilation.

11,497. It would stop the ventilation very little; they are in coal pits ?—Our drivages and sinkages are rather small compared with what they are in coal pits.

11,498. A coal pit has a much greater current of air than you have ?—Then the gases are much stronger.

11,499. Is there any objection except the expense ?—The expense of it would be a mere trifle, because we could generally soller over a place which would take a man through.

11,500. I do not mean sollering, but I mean that a grating or a fence might be put round ?—When you go down a mine generally that winze is sollered over more than where the ladder is to take a man through. The expense of a few boards on the edge there would be nothing, so that it cannot be on account of the expense.

11,501. (*Mr. Kendall.*) In many places where the winzes are you ascend and descend by ladders; you could not put gratings over those without the trouble of removing them every time ?—No, you could not.

11,502. Is there any danger with ordinary care ?—No.

11,503. Might not a man go ten thousand times without any accident if he was moderately careful ?—Yes.

11,504. You often put a plank a few inches wide, and the men would fall if they slipped, but there is no danger of their falling ?—No.

11,505. If the light goes out they should wait till they get another light ?—Yes.

11,506. And if they run any risk it is their own fault, they should not do it ?—Just so.

11,507. But with ordinary and common care the winzes and shafts are not dangerous ?—Not with ordinary and common care.

11,508. Have you ever known an accident of that kind happen underground where common care was used ?—I do not know that I have; where accidents have happened, some I have seen have been through carelessness, and I have heard other men say that if they had used a little more care it would not have happened.

11,509. (*Mr. Holland.*) Did you ever know an accident either above ground or below except from carelessness ?—I do not know that ever I did.

11,510. (*Chairman.*) Besides winzes, when you find a bunch of ore do you not drive down ?—Yes; if we find a bunch of ore we drive on the level, and sink down after that; there are many sinks made by the tributers in stopeing away the ground, which would be equally dangerous with the winzes, and more so.

11,511. In an old mine there are many footways and shafts which are abandoned, are there not ?—Yes.

11,512. Are those always protected ?—We look after that very closely.

11,513. Do you think that that is generally done ?—I am sorry to say that it is not. I could point out many instances where it is not done.

11,514. And that of course causes great danger ?—Yes.

The witness withdrew.

Captain John Taylor examined.

Capt. J. Taylor.

11,515. (*Chairman.*) Of what mine have you charge ?—Wendron Consols.

11,516. What kind of ore does that mine produce ?—Tin.

11,517. You have sent in a list of the number of men employed underground ?—Yes.

11,518. Do you know generally how many persons you have altogether in your employ underground and above ?—About 360 I think.

11,519. What is the depth of your deepest level at which you are working ?—90 fathoms.

11,520. Have you charge of any other mines ?—No.

11,521. What means have the men of going up and down; is it by ladders?—All by ladders.

11,522. How many men have you driving any one level?—We have six men, that is the most in any one end. On a level we have as many as 12 men, namely six at each end, six east and six west in the same level.

11,523. Driving from the shaft east and west, that is to say, two at a time in each end, making four?—Yes.

11,524. How far is the end which you are driving from any winze or shaft?—The end in question where we have that number of men is no more than four fathoms east and four fathoms west, about that.

11,525. What is the furthest point from any winze or shaft at which you are now driving a level or sinking a winze?—The furthest end from any winze is no more than ten fathoms I should think.

11,526. In your mine how far from any winze or shaft would it be safe to drive a level for the sake of the air?—Generally speaking, without a machine or without a winze, we ought not to drive more than about 15 or 16 fathoms.

11,527. Have you any close end in your mine?—No, we have no bad air at all.

11,528. How do you judge of whether the air is bad or not?—We can easily tell, because the candle will tell you, and besides that a miner would feel it, if it was bad air at any time.

11,529. Have you no other means of testing the air except by the candle, or by the feelings of the men?—No.

11,530. In your mine have you any place where the candle is obliged to be put on one side to burn?—No place at all I believe in the mine.

11,531. What is the longest time that the smoke takes in clearing away from any one level or winze when you are sinking a winze?—Sometimes in some parts of our mine the smoke will remain to a certain extent for two hours, but it is smoke which does not injure—it is smoke which is cool because there is pretty good air; the smoke does not entirely go away, but it is cooled, it is not very thick.

11,532. In which level would that be the case now?—Our mine is in the moor principally; it is low, and the part in which the smoke stays the longest is called Hill's part of the mine—that is the deepest part of our mine; it is the 90 fathom part; but it will be all through the mine just a little mist for two hours. After blast in the morning it may remain for two hours before it entirely goes away.

11,533. (*Mr. Kendall.*) The surface of your shafts are all in a hollow?—Not all of them, but they are so at Hill's part of the mine; they are low in the valley.

11,534. (*Chairman.*) Out of which shaft does the smoke ultimately find its way?—You may see the smoke come out of two or three shafts, not any one in particular.

11,535. Does it always come up the same shaft or does it vary?—It varies.

11,536. According to the wind?—According to the wind; you will find a draught in the levels, sometimes it goes east and sometimes west, that is very often the case.

11,537. Does it generally change with the wind?—Yes.

11,538. If it is a muggy day, without much wind, I suppose it does not go up much?—Yes, it stays longer then than when there is a brisk air.

11,539. How long have you had charge of Wendron Consols mine?—About four years.

11,540. Have you had any accident?—We have never had a fatal accident since I have been there.

11,541. Have you had any other accident?—Nothing at all serious.

11,542. Have you had any accident by blasting?—Nothing at all by blasting; there was one man who was our pitman some three years ago who caught cold, and it was supposed that he died from the cold which he caught; but we have had no serious accident; we have had no death at all by accident since I have been there.

11,543. Is a separate account kept of the club money?—Yes.

11,544. Is it presented to the adventurers?—That is charged as the sick men may require it.

11,545. Is the club money for visible hurt?—Yes.

11,546. How much is charged to the men for it?—6*d.*

11,547. Is it only for visible hurt?—Only for visible hurt, except we are satisfied that a man has received an injury and cannot work; if we cannot see a wound; yet if we know that he has received an injury we allow him the money; for instance, if there is a sprain in the arm or the leg there may be no visible wound, but we allow him the money.

11,548. Have you any pensioners now receiving relief?—We have one.

11,549. Do you consider the club money as belonging to the adventurers or to the men?—We consider it as belonging to the adventurers.

11,550. What are the men charged for candles?—They are charged 9*d.* a pound.

11,551. And how much for powder?—8*d.* a pound.

11,552. Is there any charge for the barber?—The barber is charged and he receives his money monthly.

11,553. How much is charged for the barber?—I believe it is 2*d.*

11,554. Do the surface men pay the barber as well as the underground men?—Yes.

11,555. At what age do they begin to pay for the barber?—Those who receive 30*s.* a month; after that I think we charge the barber to them.

11,556. And if they work underground is it the same thing, or do all pay underground?—All those underground who receive men's wages pay for the barber, but no boys; those who are alike in partnership pay for the barber.

11,557. In your time you have never had an accident by explosion?—Not one.

11,558. Do you use any particular precautions?—We never allow our men to put any iron upon the powder or upon the cartridge; we compel them to settle the powder in with a wooden stick. Formerly they used to put in an iron bar, and in some places they had brass at the end of the bar to settle the powder, but neither of them is safe nor at all essential I think. We have put up papers in our mine not very long ago, stating that if they were known to use iron or anything but wood they should not receive any club money if an injury or accident occurred.

11,559. But they must use an iron for driving the tamping down?—Yes; it is of course safer then. After the powder has settled and the wadding is put upon the powder it is safe to use iron, it is essential. That is the precaution which we take.

11,560. Do you use cartridges otherwise than in wet places?—No; we always use the naked powder where the hole is not wet.

11,561. Supposing they neglected to swab away the powder at the edge of the hole, would not that be dangerous?—Yes. After the powder is put in the hole it should always be wetted with the swab stick.

11,562. If that were neglected might it create an accident?—Yes; and I believe that many accidents have occurred owing to the neglect of it.

11,563. Did you ever know or hear of any accident from driving the tamping down hard with an iron rod?—I think that there can be no danger of that. You may drive your tamping as hard as necessary and as hard as you please after the first laying of tamping has settled. The first thing that should be put in upon naked powder should be a little something very soft, and if the tamping is at all sparry it is very dangerous to settle that much.

11,564. Would it be dangerous to use an iron rod with sparry tamping?—Yes.

11,565. How would the powder ignite; would it be by the contact of the steel in the tamping with the rod

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or the country?—If the tamping is sparry it might cause ignition by rubbing against the side of the hole, or if you used iron it might strike fire. I think that if you even settled tamping with a wooden stick it might ignite by striking against the side of the hole.

11,566. (*Mr. Holland.*) But that by putting soft stuff it is safe?—You should never put a rough spar upon naked powder, no matter what you settle it with.

11,567. (*Chairman.*) What do you supply the men with as tamping?—In Wendron Consols we use mostly cartridges or tubes. Sometimes one and sometimes the other.

11,568. Do you mean paper tubes made by the men?—No; they are a sort of vellum cloth made water-proof. They are sent to us empty and the miners fill them; they put such a quantity of powder as may be required. Waddings with those are always sent. The wadding is generally made of cotton waste.

11,569. Supposing that the hole is small and that the cartridge is too large for the hole, do you think that by pressing down that cartridge into the hole you could ignite it?—Some have thought so, but I can hardly conceive how that is possible if you are settling your cartridge with wood. I do not think that that is likely to be the case.

11,570. For safety you would recommend cartridges and waste for tamping?—I have no objection at all if you have dry ground to the naked powder.

11,571. Do you not think that there is always a chance that the men may leave some along the edge?—They must never do that.

11,572. But is there not the risk of it?—There is no need of it. The men must use a swab stick and wipe the hole.

11,573. Are the men charged with the expense of the cartridge?—The mine has to provide them. The men are certainly charged, but then the mine must supply the men with them in the first place, and the men must get their living whatever materials they use.

11,574. Might the cost of them be an objection to their being generally used?—Any mine agent ought not to object to the use of anything beneficial to the miner or the mine, but in dry ground there is no need for using tubes or cartridges.

11,575. But you think that with tubes or cartridges in dry ground the chances of an accident are less?—I am sure that I could with safety charge 1,000 holes without any accident, without any tube or cartridge.

11,576. Would it be as safe for an inexperienced or young hand to charge a hole without a cartridge or tube as with a cartridge or tube?—I do not think that it would. With a greenhorn or a person who was just going to begin to do anything of the sort, of course it might be safer with a tube.

11,577. How many boilers have you in the mine?—Five boilers and three machines.

11,578. How often have you the boilers cleaned out?—Our boilers are cleaned out on an average about every two months.

11,579. Is the water good?—The water is very good.

11,580. So that there is not much accumulation in the boiler?—There is very little accumulation.

11,581. How do you test the quantity of water in the boiler?—By the cocks.

11,582. Have you any glass tube?—No.

11,583. Have you more than one safety valve to your boilers?—We have two.

11,584. Are they both in charge of the engine man?—Yes; we take care to have good careful engine men, and we have never had any accident.

11,585. You have heard of accidents?—Yes, of course.

11,586. Do they constantly occur?—They very often occur.

11,587. In your opinion what do those accidents arise from?—Very often from the want of feed being kept in the boiler.

11,588. (*Mr. Kendall.*) You have worked in a great many mines, have you yourself known of any accident?—I have worked in several mines during my time.

11,589. (*Chairman.*) Have you ever known of any accident?—We have all heard of accidents.

11,590. Can you name any mine at which you have heard of any boiler accident occurring?—Yes, I can name them of course—several; I can name one that took place not more than six months ago, I suppose, in our neighbourhood; it was an accident by a boiler explosion at the Wheal Lovel Mine; no one was killed; that was about six or seven months ago.

11,591. Do you know how that accident happened?—I cannot tell you how that happened, it is impossible to tell you that.

11,592. Have you worked up to your present position from that of a miner?—Yes.

11,593. You have worked in many mines; in any mine in which you have worked has there been a boiler explosion whilst you were there?—I think not, in neither one that I have worked in.

11,594. (*Mr. Holland.*) You were speaking about soft wads over the powder; is that, in your opinion, a very important precaution?—Yes, I think that that is very essential; unless you have a very good sort of tamping it is very essential to have a wadding if you have a tamping that is fiery or sparry.

11,595. What thickness of soft wadding is necessary?—About one inch.

11,596. Then, if I understand you, you put the ordinary tamping on that, and can safely ram that as tight as you like?—Yes.

11,597. If you have swabbed the hole well out you feel quite safe?—Quite safe.

11,598. Even although you tamped with an iron bar?—Yes.

11,599. Would it not be safer to use a copper or a bronze bar lest there should be any grain of powder left that might be ignited?—If you take care always to clear away the powder there is no danger.

11,600. As men are careless would it not be as well to have a second precaution, and to use a bronze bar lest an accident should occur?—It would do as well, there is not so much fire in a bronze bar as in an iron one. I have seen copper bars, as they term them, that would strike fire.

11,601. So as to ignite powder?—Yes.

11,602. Are you quite sure of that?—Yes. I do not know whether they use them now, but years ago they used to use them always in the parish of St. Just. I have not seen them in Illogan and Camborne.

11,603. You believe that a copper bar would strike fire so as to ignite powder?—I am quite sure of it.

11,604. The precaution that you rely upon is a soft wad put over the powder, and a good swabbing of the hole?—Yes.

11,605. Those are essential precautions?—Yes when you use naked powder.

11,606. (*Mr. Davey.*) You say that you have seen a copper rod strike fire; was the spark it produced a bright one, or of a pale blue colour?—It was the same fire as the borer would strike. I have tried it scores of times when we have had a new copper bar, as it is called.

11,607. Was the bar you speak of made of copper?—There was copper in it—that is, what the miners term copper—such as they used to have. I have seen a bar rubbed against the wall, and have seen fire come from it.

11,608. (*Mr. Kendall.*) There must have been a good deal of alloy in it?—Yes, no doubt.

The witness withdrew.

Mr. JOHN BRYANT WILKIN examined.

11,609. (*Chairman.*) Of what mine have you charge?—Wheal Basset and Grylls.

11,610. Have you charge of any other mine?—No.

11,611. About how many men are there employed at the mine?—We have 180 altogether.

11,612. What is the deepest level at which you are working?—We are now working at about 40 fathoms; that is the deepest level.

11,613. Have you ever seen men working in what is called poor air?—Yes, I have myself worked in it; and I have seen men working in it of course many times.

11,614. By what other means than that of the candle not burning well, can you ascertain whether the air is poor?—We feel it in the chest—a want of something—a faintness; we cannot work, and cannot make that effort that we could in good air; a person finds out that there is not anything to breathe.

11,615. Do the miners recover immediately on going into the fresh air?—I think not; not immediately, but of course if they got into better air, and exerted themselves, they would find that they had something to work upon.

11,616. Have you known men who have been working in poor air go to another level, and there work without feeling any effects from having worked in poor air before?—In a mine where I had the management, and where there was the worst air, the men, before going into good air, required medical treatment in order to prepare them; they were not fit to work in good air for a week or two; they were worse when they went to work in good air than while they continued in the bad air. For the first week or two, after going into the good air to work, they felt such a change that they required to have an emetic, and some other treatment.

11,617. Was it owing to any difference in the temperature?—It was not the temperature, it was the want of the air that they had been employed in, and then getting into good air to work; it had an effect upon their system, so that they did not feel well, and they were sickly about it.

11,618. But after working for a certain time in the good air, and being under medical treatment, they recovered themselves?—Yes.

11,619. Have you ever known any miners who suffered permanently from the effects of the bad air?—Yes, I have seen many laid aside by the bad air.

11,620. In what mines especially had those men worked?—There was one of those men that I speak of from Trumpet Consols.

11,621. Was he not able to work in the mine?—He wore out soon, and he is dead. The miners droop away when they get worn out, and catch cold, and die.

11,622. If a man was to leave off working underground, and was to come to work at grass, do you think he would then recover?—He would last many years longer.

11,623. If he were to go back to work in the mine after he had been affected in the way you have described, what would be the result?—If he kept at it until he was done up he would very soon succumb to it, but by giving in and going to some other employment he would save himself; if he were to drive a donkey cart and carry coals about. I saw one just now who had been an old miner, and I have known him for many years.

11,624. Did you ever suffer permanently from any ailment?—Not myself.

11,625. In the mine with which you are connected, are there any ends where the air is close?—Not that are really bad; they are close, as will naturally be the case.

11,626. How far is it safe to drive from any shaft or winze to put in a rise?—If a level is driven say 7 or 7½ feet high, and 4 feet wide we can get in 30 or 40 fathoms; more than that would be very close.

11,627. If you are following a lode, would it make any difference whether you had to sink downwards or incline upwards?—If we are following the lode, we can continue to a long distance sometimes, but, unless there is additional height, it would not be safe to go any further. I think that a great deal depends upon the size of the passage.

11,628. When the air gets very close, what machines do you put in?—I generally use a waterfall if I can get it.

11,629. Is that the best contrivance, do you think?—Yes; I think so. We are turning down the water at our mine at two different shafts to blow the air into the ends from the surface. The water cools it as well, and it is about as cheap a method as any; we let the water fall down a pipe in the shaft, and the bottom end of the pipe goes into a cistern, and then there is another pipe from that which is obliquely taken into the end.

11,630. How do you couple on the pipes?—We stick on a false pipe on the side of the other, and take the air out of the false one.

11,631. I suppose the end of the pipe is made to take on and off on account of the blasting?—No; we bring it in within a few fathoms; it answers the purpose. Not close up.

11,632. After you have put in a pipe, in how much shorter time is the powder smoke cleared out of a level?—I think it would get out in about half the time; if a pipe is well in, it will get out in a quarter of an hour; the closer the pipe is in the better.

11,633. You cannot take it quite close in, on account of the blasting?—No.

11,634. Have you ever tested the quantity of water or the quantity of air that you have sent down in that way?—No; we measure it by putting a candle against the pipe, and if it blows it out, or nearly so, we consider that a good test.

11,635. (*Mr. Holland.*) How much water does it consume?—It is just a small stream; two gallons a minute I should think would give a good circulation of air.

11,636. (*Chairman.*) How many boilers have you at work?—There are five working.

11,637. Is the water that is used good?—Very good at our mine.

11,638. How often do you clean out the boilers?—Once a year.

11,639. Do you consider that that is sufficiently often?—Quite often enough.

11,640. Have there been any accidents with the boilers?—Never.

11,641. (*Mr. Holland.*) What is the size of the pipe that blows the air into the mine?—We use different sizes; for the fall about eight inches within.

11,642. What is the size of the horizontal pipe?—About five inches within; there are two pipes, one going east and the other west from the perpendicular one.

The witness withdrew.

Mr. JOHN HENRY LAMBRICK examined.

11,643. (*Mr. Holland.*) You have, I believe, been in practice here as a surgeon for a long time?—About 12 years.

11,644. Have you seen a good deal of the miners' complaint,—that complaint from which they generally suffer?—Very frequently, and continually those cases fall into my hands.

11,645. Are you of opinion that there is a marked distinction between what is called miners' complaint and phthisis?—I think so.

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11,646. Have you any doubt about it ?—No ; it is a bronchial affection principally, and we call it miners' consumption. I think that it is decidedly a bronchial affection.

11,647. Have you often seen pneumonia mixed with it ?—Very often in its earlier stages.

11,648. What do you think is the first morbid condition ; bronchial ?—Yes, and then the substance of the lung is afterwards attacked.

11,649. Do you often find contraction of the bronchial tube some time before anything else takes place ?—Most decidedly, from repeated attacks of inflammation or irritation of the tube, from repeated attacks I think that the lining of the bronchial tube gets thickened, and the tube gets narrowed in its diameter.

11,650. Do you think that hectic fever is of rare occurrence in this complaint ?—In my experience it is.

11,651. Is spitting of blood of rare occurrence ?—Yes, decidedly.

11,652. Is sympathetic diarrhœa an unusual symptom ?—Yes.

11,653. There is less constitutional disturbance, is there not, than in phthisis ?—Yes, very much less ; indeed, we have just the same character of complaints here as elsewhere ; upon the whole I think that our miners are healthier than in many districts of Cornwall.

11,654. Do you attribute much of the bronchial irritation that the miners suffer to the dust ?—Yes, and to their exposure to cold when heated.

11,655. Do you also attribute it to alternations of temperature ?—Yes.

11,656. And to the powder smoke ?—Yes ; that is one element decidedly.

11,657. Do you consider alternations of temperature a very prominent cause ?—Most decidedly.

11,658. Do you think that the injurious effects produced by these various causes would be considerably diminished if the miners were to bathe when they ascend from a mine ?—Yes, unquestionably ; they would not then feel the difference in the temperature so much in a tepid bath.

11,659. Do you think that that could be managed with very little expense and trouble ?—Yes.

11,660. Do you think that the miners would cheerfully do it ?—Yes, I think so, if the advantages to themselves were pointed out. I think it would be a very reasonable thing; and I think it might with very little expense be put into practice.

The witness withdrew.

Adjourned to Tavistock on Tuesday next at half-past 10 o'clock.

TAVISTOCK.

Tuesday, 12th August 1862.

PRESENT :

The Right Honourable Lord Kinnaird, K.T.	John St. Aubyn, Esq., M.P.
Richard Davey, Esq., M.P.	P. H. Holland, Esq.
Nicholas Kendall, Esq., M.P.	

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

Captain James Phillips examined.

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11,661. (*Chairman.*) Of what mine have you charge ?—The Bedford United mine, near Tavistock; it is about three miles from here.

11,662. Have you charge of any other mine ?—No.

11,663. Is the Bedford United mine a tin or a copper mine ?—It is copper.

11,664. Does it produce copper only ?—Yes.

11,665. What is the nature of the country ?—It is killas.

11,666. Is it entirely killas ?—Yes.

11,667. How many men are there employed underground in your mine ?—About 121.

11,668. How many persons are employed above ground ?—Upon the dressing-floors there are about 60, and then we have four trammers, two kibble fillers, and two landers, engine-men, and four smiths.

11,669. What is the total number ?—I will supply that.

11,670. What is the youngest age at which you allow boys to go to work underground ? — The youngest is about 17 ; I should say from 16 to 17.

11,671. You do not allow boys of 10 years of age to go underground ?—Not so young as that. I do not know whether we have any from 15 to 16.

11,672. What is the deepest level at which you are now working ?—From the surface the deepest level is 148 fathoms.

11,673. How do the men ascend and descend the mine ?—By what we call footway ladders; 130 fathoms is the deepest level we are working at.

11,674. How many pairs of men are there employed in that level ?—At the 130 there are 16, that is the whole that are employed at the 130.

11,675. How many other levels are you working at ?—There is the 130, then the 115, and the 103 and the 90, those are our principal levels now ; the greatest number work at the 115, and above the 115.

11,676. What description of work are you doing in the 115, are you sinking a winze or driving on the level ?—We are driving, we are not sinking anywhere in the mine.

11,677. How far is it from any shaft or winze where you are driving ?—I suppose our length from where it is ventilated is somewhere about 40 fathoms, that is in the 115 ; the end in the 115 is about 40 fathoms from the nearest winze or shaft.

11,678. In what condition is the air at the end of the 115 fathom level ; do the candles burn freely ?—They burn very well. We have put in, until we have ventilated another winze, air-pipes to draw out the foul air from there, so that the end is ventilated very well.

11,679. Do the candles burn without being tilted on one side ?—Yes.

11,680. What machine is it that you use to draw out the foul air ?—It is a duck machine, and it is worked by the same rods as the water wheel, and it draws out the foul air instead of forcing air in.

11,681. You produce circulation by drawing out the air ?—Yes.

11,682. Is that machine applied to any other level ?—No, it is not in the mine.

11,683. In the 130 fathom level how far are you driving from any winze ?—I suppose we are about 20 fathoms from the shaft.

11,684. Is the air so good there that you have no

need to use any artificial means ?—We do not want anything there, the air is very good there.

11,685. Does the duck-engine answer for drawing out the bad air ?—Yes.

11,686. Do you approve of the plan of extracting the foul air in preference to forcing in fresh air ?—Yes; I have proved it in our mine a great many times, because in forcing in air you have a little fresh air along the end ; and if the foul air is so heavy that the fresh air has not strength enough to drive it out, by taking out the heavy smoke and the foul air, the fresh air goes in.

11,687. Where does the fresh air that takes the place of the foul air come from ?—We have ground stoped away about our shaft (the western shaft) in the mine, and there is a very great current of air from the surface down ; there is a down draught of fresh air from the surface.

11,688. And that is the air that takes the place of the foul air ?—Yes, it goes into the 115 fathom level as we take out the foul air.

11,689. According to your experience the powder smoke does not take so much time to clear away as if you forced in fresh air ?—No ; what we call the air pipes, when we shoot into these ends, drive out the powder smoke directly.

11,690. How long after the blasting is the smoke cleared away ?—I suppose in our 115 fathom level the men can go in and work comfortably in 10 minutes.

11,691. How long is it before the smoke is completely cleared away ?—It does not stay long, not when we have got the pipes all in good order.

11,692. How long do you think the smoke would remain without the use of those pipes ?—Sometimes it would stay a good while ; I dare say you could not calculate upon going in to work again under half an hour, or three quarters of an hour, and in some places an hour.

11,693. In point of economy does it answer to extract the foul air and the powder smoke, so as to get the men in to their work again quickly ?—Yes ; but we do not only convey these pipes into the furthest ends, we calculate to ventilate by winzes if it is necessary to drive away ; and, when there are several men in a level, to put in these pipes, and instead of sitting down for an hour, they sit down for only a quarter of an hour, and they are able to do more work.

11,694. You say that you ventilate by a winze ?—Yes.

11,695. Do you adopt any means for the purpose of conducting air into any special level from a winze ?—No ; no means more than the levels themselves ; when we have put through this winze it naturally draws a current of air from one level to the other.

11,696. Of what height and width are the levels that you drive ?—We set our levels to be carried 6 feet 6 inches high, and 3 feet 6 inches wide.

11,697. In your opinion is that sufficient to ensure a circulation of the air ?—Yes, that is sufficient for the levels to put in a tram road and air pipes, &c.

11,698. What precautions do you take to prevent the men leaving the deads to accumulate in a level ?—We have a sufficient number of trammers and haulers to keep the stuff clear from the mine, so that no man is injured in the mines.

11,699. Do you do that, or is that part of the contract with the man who takes a pitch ?—We set what we call the trammers to clear out all the stuff in the mine, and they do that every day.

11,700. Are those trammers paid by the adventurers, or are they paid by the men who take a piece of work ?—They have so much a month to keep all the stuff clear in the mine.

11,701. Are the wages paid to the trammers deducted in the bal bill ?—The tut-work men allow 10*s.* a fathom for tramming that stuff, and the tributors give a guinea for 100 kibbles ; but that has nothing to do with the trammers, only we deduct this from the tut-work men's wages.

11,702. (*Mr. Holland.*) You pay them what you think a proper sum, and deduct it from the tut-work men's wages ?—We give the trammers so much a month.

11,703. You fix the price paid to the trammers ?—Yes.

11,704. (*Chairman.*) Do you think that that is a better plan than leaving it to the tut-work men and tributemen ?—Yes, because there would be always grumbling ; we find that it works better ; we keep the trammers and keep the hauling machines.

11,705. Have you ever ascertained what was the greatest heat at the end of any of these levels ?—No, I have not; but ours is not a very hot mine.

11,706. Have you ever experienced in the mine any poor air or cold damp ?—We had a little at one place before we had ventilated it, in a shallow level, but nothing else ; that was at our 36 east.

11,707. Was it cold damp or poor air that was found there ?—Cold damp, the candle would burn, but it was cold damp ; but there is not so much working there. I did not know that for some time, but we found that the men complained a little bit of it, and we had it ventilated directly.

11,708. What did the men complain of ; what was their sensation ?—They complained of weakness and so on in their limbs, and they did not know what was the matter; then I considered that there was cold damp there, and from that time we ventilated the place, and it has been all right since.

11,709. Was this in the back or in the winze ?—They were driving an end and a little working in the back ; it did not continue for more than a month.

11,710. How long do you suppose the men had worked in that place before they complained ?—Not for more than a month.

11,711. Were any of them thrown out of work in consequence of it ?—No.

11,712. Can you describe the difference between cold damp and poor air ?—I can hardly explain it, I suppose that there is not sufficient air to bring out the cold air that has been there for some time, but I can hardly explain it ; we do not take so much notice of these things when the candle burns all right.

11,713. When the candles burn all right then you think there is nothing to be afraid of in the air ?—Yes.

11,714. Have you any means of ascertaining whether there is cold damp in a mine except by your sensations ?—No, I do not know that we have had any such thing in our mine more than in this one place for a month.

11,715. In that cold damp the candles burned well ?—Yes.

11,716. In poor air they would not burn well ?—No, not in very poor air.

11,717. Has any accident occured in your mine in the last tour or five years ?—No.

11,718. No accident from blasting ?—No, not for these four or five years ; we had one small accident to a man who was putting out a hole in blasting, but he did not stay from work more than about a month.

11,719. Do you use any particular precautions to prevent accidents from blasting ?—Nothing more than that we generally caution the men to be very careful.

11,720. Do you use cartridges in your mine ?—We use what we call the safety fuze.

11,721. Do you use any cartridges ?—Only when there is wet ground.

11,722. Do you supply the men with material for tamping ?—No, they get that themselves.

11,723. Where do they get it from ?—They generally take it from the upper levels, and carry it down to the deeper ones ; the upper levels are what we call fair killas.

11,724. I suppose the swab sticks are made of oak ?—They are made of wood.

11,725. Do they fill in with them ?—No, they gene-

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rally use what we call the swab sticks, and swab out the hole, and then they run in the powder, and use the swab stick again on the powder, but our men are ordered to take some hard clay to put in first upon the powder, that is what we use in the mine, for, otherwise, they would use many different things in the mine, but that is a hard substance to go down with the swab stick.

11,726. Where is the clay that you have just mentioned obtained from ?—We pay about 7*s.* a ton for it; we get it down here; I do not know where, exactly, but the barges bring it up.

11,727. Is any charge for that made in the bal bill ?—No, the miners get the clay free.

11,728. Do they use an iron tamping rod ?—Yes.

11,729. Do you allow to each man a certain quantity of candles per week ?—Yes, we allow each man 2 lbs. of candles a week.

11,730. What price do you charge them for the candles ?—We charge them 8*d.* a pound.

11,731. In your mine do you use the small grain powder, or large grain powder ?—We use the large grain powder.

11,732. Do you find that that is more useful for blasting ?—I think it is in wet ground, we can do better with it.

11,733. What charge do you make to the miners for powder ?—We charge them 7*d.* a pound.

11,734. What other deductions are made from the miners; for club money ?—Yes, they pay 1*s.* 6*d.* a month.

11,735. Is that for the club and the doctor ?—Yes, we have no club, nothing but hurt pay. If they receive a hurt they have 1*s.* a day. Should a man receive a hurt in our mine, he is cared for until he can go to work again.

11,736. Do they pay 9*d.* for the club, and 9*d.* for the doctor ?—Yes.

11,737. How much is put down to be deducted for club money ?—1*s.* 6*d.* a man.

11,738. That is for the club and the doctor ?—Yes; that sum is deducted out of a man's balance, for club and doctor.

11,739. Is any account kept of the club money separate from the doctor ?—None.

11,740. How is the doctor paid ?—He receives so much a man from every man in the mine, each man pays so much to the doctor.

11,741. How much does he pay ?—I think the doctor's pay is 9*d.* a man; we have no club in the mine the same as they have in other mines.

11,742. (*Mr. Kendall.*) You charge the men in all cases so much a month, and you believe it is 1*s.* 6*d.* a month for the doctor and the club ?—Yes; the doctor has so much a month, and there is so much for hurt pay. In most mines there is a doctor and club account, but there is no club at all in our mine; that sum is deducted from the men, but it is put in the same as cost, there is no money in hand.

11,743. (*Chairman.*) You say the doctor is paid so much per head from every man ?—Yes.

11,744. Not so much per month ?—No, he has so much a man.

11,745. Do you know what he receives per head from each man ?—I think it is 9*d.*, we have no money in hand in the mine the same as some have.

11,746. In paying the men what proportion of notes, and what proportion of silver and gold do you obtain from the bank on pay days ?—The paymaster, the manager, and purser of the mine, always brings cash, generally gold and silver and pence, hardly ever any notes, because it is more convenient for the men to change.

11,747. How many boilers have you at work ?—One, and that is for the steam engine.

11,748. How often is it necessary to clean out the boiler ?—About once in six months.

11,749. Have you had to stop the pumping while that has been done ?—There is no pumping, ours is waterwork, this is only a drawing machine; we pump by means of water power.

11,750. Have any of your men been out of work from illness or accident during the last three years ?—No.

11,751. Is one month's pay of the men always kept in hand ?—Yes.

11,752. What proportion of tribute men do you employ as compared with the tut-work men ?—There are about 70 employed on tutwork and about 50 on tribute work.

11,753. Do you draw with a kibble or a skip ?—We have two drawing shafts, and from the inclined plane we draw with a skip; at the other shaft we draw with the kibble.

11,754. Do the men ever come up in the skip ?—No.

11,755. Do you consider that it is cheaper to draw with the skip or the kibble ?—When you have the convenience I think that the skip is the cheapest; it gets up the most stuff in the same number of hours.

11,756. Is there any reason why it should not be applied in cases where kibbles are now used ?—No, I do not think there is.

11,757. (*Mr. Holland.*) Would the 115 fathom level be hot if there was no blowing engine used ?—No, not very hot; but our mine is not very hot at all, it is not the depth to be very hot.

11,758. How large is the duck engine that you employ ?—It is two feet square.

11,759. What length of stroke is it ?—Seven feet.

11,760. How many strokes a minute ?—Our wheel is going about four strokes a minute.

11,761. It has only one action, I suppose, and only draws when it lifts ?—No.

11,762. What number of men are working at the end which it ventilates ?—There are two pairs, 12 men. There are two working together at the end. They are not working more than four men together. There are 12 men, but they do not work more than four together. They work four in the forenoon, four in the afternoon, and four in the night. There are 12 on, but only four work together. I think that this drawing machine is about two feet square.

11,763. Do you find that the duck engine is enough to keep the miners well supplied with air?—Yes, there was very good air before it was put in; it was put in to draw out the powder smoke and so on.

11,764. (*Mr. St. Aubyn.*) What is the general condition of the men in your mine with regard to their health ?—Their health is very good.

11,765. How long has the mine been working ?—I have been there going on 21 years.

11,766. Are there many cases of what is called miners' complaint in that mine ?—No, we have not had any cases.

11,767. Is the mine well ventilated throughout ?—Yes, it is very well ventilated throughout, indeed it cannot be better.

11,768. How do the men come up to the surface, by footways ?—Yes, there is a very good footway for the mine.

11,769. What is the distance between the staves, 10 or 12 inches ?—12 inches; some are 10, but most of them are 12.

11,770. Have you ever known an instance of miners' complaint in that mine ?—No.

11,771. (*Mr. Kendall.*) You say you have been employed in this mine as agent for 21 years ?—Yes, I have been there for 21 years.

11,772. Did you before you became agent work as a common miner ?—I worked as a common miner before that.

11,773. How many years did you work as a common miner ?—I am now 60 years of age, and I have been working since I was 12 years of age.

11,774. You have been in the habit of going underground both as miner and as agent from that time to this ?—Yes.

11,775. Do you enjoy good health?—I believe very good.

11,776. Do you feel yourself very well ?—Yes. I

have been working underground all that time, and I have been underground every day.

11,777. Have you ever been in the doctor's hands?—No, not for anything particular, to say anything about.

11,778. Do you go underground now?—Yes, sometimes every day in the week, always three and four times in a week; the last week in a taking I go underground every day; but, I suppose, on an average four days a week.

11,779. You go underground on an average four days a week throughout the year?—Yes.

11,780. (*Mr. Holland.*) Have you ever worked in poor air?—Yes, when I was young a little; but I used to get out of it as well as I could. I did not like it very well.

11,781. (*Mr. St. Aubyn.*) Is your mine more healthy than other mines in the neighbourhood?—I do not know. There are many well ventilated mines, but some little ones are very badly ventilated that I have been in inspecting sometimes. We have three shafts from the surface, and a deep adit.

11,782. Is your mine in a better condition, generally speaking, than the mines in the neighbourhood?—I do not know. All I can say is that ours is very well.

11,783. (*Mr. Davey.*) What sized pipes do you work in the duck-engine at the 115 fathom level?—Four-inch pipes, I think.

11,784. Do you find that they are sufficiently large to draw the air from a distance of 40 fathoms?—Yes.

11,785. How close are they in to the end?—They are not within, I suppose, 10 or 15 fathoms of the end.

11,786. Do you find that you can withdraw the foul air that distance from the end?—Yes; you cannot get them right into the end. The men are working in the back, and if you do get them right into the end, they all knock them up.

11,787. In the shallow level to which you have referred, where there was cold damp, did you not discover it when you were inspecting the end?—No, I did not take any notice of it; it was not for long; the men complained a little bit of what we call cold damp.

11,788. But you did not discover it yourself?—Not at all, because I was not in the end long enough every day. I always go into these places every day, but I do not stop above ten minutes or a quarter of an hour, and then I go to other parts of the mine. I did not find it out myself.

The witness withdrew.

Captain Zacharias Williams examined.

11,789. (*Chairman.*) With what mine are you connected?—Huel Friendship.

11,790. Are you the principal agent there?—Yes.

11,791. What other mines have you charge of?—There is a little mine about two miles off; but there are but a few hands there working.

11,792. What is the mine called?—Devon Wheal Union; there are about ten or a dozen men there working.

11,793. What kind of ore does Wheal Friendship produce?—Yellow copper ore.

11,794. Is there any mundic in it?—Yes, and a small portion of lead, and occasionally some tin, but very little worth notice.

11,795. Is there a good quantity of mundic in the mine?—Yes, a great deal of mundic.

11,796. Is it in sufficient quantities to sell?—Yes; we have sold several hundred tons.

11,797. About how many men are employed underground?—On tut-work there are 54 men and 24 boys, making altogether 78. On tribute there are 30 men and 34 boys, making together 64.

11,798. Are these all employed underground?—Yes.

11,799. Do you know what number of people are employed above ground?—Fillers, landers, &c., 11; the total of all being 153.

11,800. Do you limit the age at which boys are permitted to go to work underground?—We generally calculate to take them in at from 13 to 14 years of age. If there should be at a particular time a certain one who is younger, the father always takes charge of him. We give him over to the charge of his father, and he must take all the consequences of anything that may happen.

11,801. You allow a father to take his son down into the mine at any age he pleases?—Yes, from 12 to 13.

11,802. But would you prevent a father taking his son down if the boy was younger than that?—We should object to it.

11,803. What is the deepest level in your mine at which you are working?—The 240-fathom level.

11,804. How do the miners ascend and descend?—By ladders.

11,805. What is the distance between the staves of the ladders?—12 inches.

11,806. At how many levels are you now working?—There is only one pair now working under the 190, in the western part of the mine; in the middle part of the mine there is another pair working under the 100, that has not yet communicated so far west as the deeper part.

11,807. The principal number of your men are working in the shallower levels?—The principal part of our men are working above the 100-fathom level; there are only six men working down at the 210, so deep as that, and they are about 10 fathoms under from any communication, no more than that; they have plenty of good air.

11,808. How far are they from a shaft or a winze?—They are from a winze about nine or ten feet; they have but just made a beginning to start off from a certain winze in the way of sinking. We are now driving a level to get over a piece of ground to communicate at the 220 further west.

11,809. The larger number of your men are working at the 90?—Yes.

11,810. How many pairs are working in one level?—There are 6 sinking a shaft; 18 men and boys at and above the 100 fathom level.

11,811. That is, the whole of a core?—Yes.

11,812. Are you at present driving any level, or sinking a winze, or putting in a rise beyond 10 fathoms from any communication?—Yes.

11,813. How far is it from any winze?—We are, I suppose, about 20 fathoms at the 100 fathom level to the east of any communication.

11,814. Where you are driving 20 fathoms from any communication, have you a good draught there?—There is as good a draught as there is here.

11,815. Where does it come from?—It comes through the level from one shaft to another; then we have, to make everything convenient, to put a trap door into this level, and we have pipes to carry a rush of air into this end, so that it is as comfortable to work in as it would be here as to the air.

11,816. How long is it before the powder smoke is cleared away?—Perhaps ten minutes or a quarter of an hour.

11,817. How long is it getting away altogether from that level?—It is but a trifle of time; there is as fine a draught as you would wish.

11,818. You introduce fresh air by means of pipes?—Yes, into this end.

11,819. Of what size are those pipes?—Four inches in diameter.

11,820. (*Mr. Kendall.*) How long has this mine been working?—I cannot say; I can tell you how long it has been under Messrs. Taylors, I believe

is rather above 60 years; it is one of the oldest mines in Devonshire.

11,821. (*Chairman.*) Are there very extensive workings in the mine?—Yes.

11,822. Is there a communication between all the old workings and the present workings?—No, not all; there is a leading level at the 100-fathom level, and that is connected with the general run, but it is not down so deep under the 100-fathom level; there is not any communication; as we go on west the mine goes down, it does not keep all down at the regular level of working.

11,823. Does the timber decay at all in your mine?—Yes, there is a decay of timber in places, but we do carefully attend to that, in securing it.

11,824. In the old part of the mine which communicates with the present workings, is the timber decayed at all?—No; the greatest decay of timber that we have is in the western part of the mine.

11,825. (*Mr. Kendall.*) What do you imagine the decay of the wood is owing to?—I cannot tell.

11,826. (*Chairman.*) Is there good ventilation in the part of the mine you have referred to?—It cannot be better.

11,827. I mean where the wood decays?—Yes.

11,828. Does the shaft in that part of the mine where the wood decays act as an upcast shaft?—No, it goes down; we have two inclined planes in the mine.

11,829. The draught is sometimes upcast and sometimes downcast?—Yes, it changes with the winds oftentimes.

11,830. When there is no wind and it is a very hot day above, I suppose there is not much draught either way?—Yes, there is plenty of draught then travelling from one shaft to the other.

11,831. But there is none from the surface, is there?—Yes, it must go down to come up.

11,832. Does the decay of the timber take place where a level or a shaft is damp?—Yes, more particularly; but it sometimes decays where it is dry.

11,833. (*Mr. Holland.*) Does it decay most where it is dry?—I do not think it does; it decays where it is as dry as it is here.

11,834. It will decay also where it is damp?—Yes; where it is damp it goes all to a mummy, so that you can squeeze it up in your hand.

11,835. (*Chairman.*) In the course of your experience have you ever found poor air or cold damp in your mine?—Yes, we have had poor air, and we have had what we call cold damp for a certain time, where we have had reason to have a long distance; sometimes driving for a communication, and some times we are driving crosscuts to make a trial, and it is not possible to get a communication unless you meet with something occasioned by sinking the shaft.

11,836. How far have you ever driven from a winze or a shaft in either exploring or making a communication?—I should think 150 fathoms; but you must please to understand that we never have done that without the convenience of forcing in air.

11,837. When you have driven 150 fathoms from a winze or a shaft you have forced air in?—Yes, we never calculate to go more than about 20 or 30 fathoms before we begin to do that.

11,838. Do you think that forcing in air is a better plan than extracting the foul air?—Yes, I do.

11,839. Does the powder smoke clear away quickly?—Yes.

11,840. Have you ever tried to exhaust the air as well as forcing it in?—No; we never made a trial of that.

11,841. When you have found the air beginning to get close, have you employed any means for forcing in air?—Yes.

11,842. How do you tell when an end is close?—It will tell for itself; there is a heaviness or a deadness to what there is where the air is lively and active.

11,843. Have you any means of ascertaining whether the air is close, except by the men complaining that they feel it, and are affected by it?—Yes, in a very close place a candle would not burn so freely.

11,844. When you find that you are obliged to incline the candle, do you immediately resort to some means of forcing in air?—We do it before; we do not allow it to come to that. We always keep in the mine conveniences for throwing air in before there is anything to complain of.

11,845. Have you ever known the men suffer from working in poor air?—I have heard of many; not in this mine.

11,846. Have any of the men under your charge suffered from it?—No; we have never had any occasion to see anything of the kind; we always make preparation as I tell you.

11,847. Have you ever seen men suffering from the consequences of working in bad air?—Yes, I have in Cornwall.

11,848. But not in Devonshire?—Never one in Devonshire.

11,849. (*Mr. Kendall.*) In what part of Cornwall have you seen men suffering from working in poor air?—About Gwennap, say 30 years ago.

11,850. (*Chairman.*) Have you worked as a miner in Cornwall?—Yes.

11,851. Have you ever worked in poor air?—I have worked in close places, but I never felt anything—never anything to feel any effects from it, but I have seen men afterwards who have been working in it.

11,852. What quantity of candles do you allow to your men per week?—About 1½ to 2 lbs. a week per man.

11,853. Are they patent candles?—No, the common candles.

11,854. What charge do you make to the men for the candles?—7*d.* a pound; some do charge 8*d.*

11,855. Do you use the fine or the large-grained powder?—We use some of both, but generally the large grain.

11,856. Which of the two do you prefer?—We like the middle sized generally the best.

11,857. What charge do you make for the powder?—The men do pay 50*s.* a hundredweight for the powder; that is 7*d.* a pound.

11,858. Do the miners contribute any club money?—Yes.

11,859. Is that to provide for visible hurts or for sickness?—Our club men pay 1*s.* 6*d.* a month; that is 7*d.* for the doctor and 9*d.* for the sick.

11,860. Does "sick" mean for visible hurts?—Yes, it is, should they be sick and hurt; but in addition to the fund they get 1*l.* sterling per month. If they are hurt they get 20*s.* a month; if sick they receive only 15*s.*; if they are hurt as well then they have 35*s.* a month. It is added together, the sick and the hurt pay.

11,861. Is there a separate account kept of the club money and of the doctor's money?—Yes.

11,862. As between the club and the doctor?—Yes.

11,863. There is a distinct and separate account kept of the club money?—Yes.

11,864. Is that account of the club money rendered to the adventurers?—No; that is always kept as the separate account of the men; that is all they can claim in a certain sense, but we have been for years, so that we have paid 3*l.*, and 4*l.*, or 5*l.* a month more than the sick money would provide. We have had so many men worn out—men lying on the club—that it would take more money than the monthly contributions of the men would provide.

11,865. How is that additional sum entered in your accounts?—It is stated in the accounts what it is for, as loss on the sick fund.

11,866. (*Mr. Kendall.*) Is it entered as a debt due from the club?—No; it is charged to the adventurers.

11,867. But still you keep a separate account?—Yes, of everything.

11,868. (*Chairman.*) How is that charge entered?—It is entered as sick pay.

11,869. Do you know from your own personal

knowledge how far the club fund has been insufficient to provide the allowances which you have been in the habit of making to the miners when sick, or when suffering from hurts?—No, not precisely so; but, perhaps, sometimes 3*l.*, sometimes 4*l.*, and sometimes 5*l.* a month it will run to; it depends upon the number of hands. There may be old men, and our men receive 15*s.* a month regularly. We have had many here in Tavistock for years. The amount is 4*l.* or 5*l.* a month. See last question, for many years, say 20 years the club contributions have not paid the claims.

11,870–2. Do you remember when there was a balance of club money in favour of the men?—No; for several years the club was going in debt, and I have heard that 500*l.* or 600*l.* was at one time charged to the mine, before the monthly deficits were charged as they occurred.

11,873. Is that now all exhausted?—Yes, and many scores of pounds more than that. See above.

11,874. (*Chairman.*) Has it become exhausted in consequence of the miners being off, or from old age, or from accidents?—Some of both; but we rarely have an accident, I am very glad to say.

11,875. Could you furnish the Commission with a copy of that account?—Yes, for seven or ten years, certainly, or twenty, if required.

11,876. What is the amount paid to the doctor?—Ninepence; but then he attends any man that is sick or hurt, and the family for that.

11,877. Is there any deduction made for the barber?—No, every man shaves himself.

11,878. What other deductions are there made?—There is nothing at all that I know of.

11,879. How many doctors are there connected with your mine?—We have three that attend at the mine; but every man is at liberty to choose his own doctor.

11,880. Out of the three?—Yes.

11,881. Are the doctors appointed by the adventurers?—No, they are not appointed by the adventurers, they are chosen by the men and accepted by the agents; the adventurers do not take any thought or care about those things; it is the mere wish of the men for such and such a doctor to attend them.

11,882. How do you ascertain what the wish of the men is?—We ask them.

11,883. How do you ascertain whether the men are or are not unanimous in the choice of a doctor?—When any man comes into a mine as a fresh miner to work we ask him then, or in the course of a month, what doctor does he wish to pay to, and he will say so-and-so, then this man is put down to pay to Mr. So-and so; that is how we do it.

11,884. But is it compulsory upon him to pay to one of the three?—No; there is no obligation, he may have any doctor, nor are they obliged to pay to a doctor if they have not a mind to do it.

11,885. Then they need not pay the ninepence if they do not choose to do so?—No.

11,886. Do many of the men object to pay to the doctor?—There are certain farming men who come in just as labourers, but not the miners.

11,887. Is that ninepence per head so contributed by the miners applied in payment of the doctors?—Yes; fairly I should think out of 150 men there are not 10 who are not under the care of the doctor.

11,888. Are the doctors satisfied with what they receive in that way?—We do not hear any complaint, and I believe that they are very well and fairly paid.

11,889. In paying your men what proportion of notes and of gold and silver do you obtain from the bank?—We never pay in notes; ours is generally in hard cash, gold and silver and pence; sometimes if there is a large pay required we may have a few five pound notes.

11,890. Does the bank object to give you all the money in cash?—No.

11,891. How many boilers have you at work in the mine?—We have one at the dry, but that is for the comfort of the men, just to enable them to warm their clothes; we have no steam in the mine. I should have stated that we have got 11 air shafts, and the deepest is at the 240-fathom level, the next is at the 220.

11,892. (*Mr. Holland.*) How many lodes are you working on?—Four or five.

11,893. Have you crosscuts to connect all those lodes together?—Yes, either at one place or the other.

11,894. Are the lodes worked deep?—Not all.

11,895. (*Mr. St. Aubyn.*) Is the health of the men employed in your mine good?—Yes.

11,896. Are there any cases amongst them of what is called miners' disease?—That is consumption; there is not one in the neighbourhood that I know of; not anybody who has worked in our mine.

11,897. Do you consider that your mine is in a good state of ventilation as compared with other mines in the neighbourhood?—I make no compaaison; it cannot be better, and I do not think there is hardly an equal to it to be found; many of the mines in the neighbourhood are very good.

11,898. Is your mine, upon the whole, better than most of them?—I do not think it is; but I do not think that I know enough about other mines to say; I think I can say this, that ours is as good as can ever be expected; there is not a poor air place that is being worked in the mine.

11,899. Do you bring all the men up by footways?—Yes, all of them.

11,900. Have you ever thought of having a man-engine put into the mine?—I should like it very much myself, but I am sorry to say that the mine is so poor that it will not afford it.

11,901. If you could have a man-engine in the mine you would rather prefer it?—I should be glad to have it.

11,902. You would of course require steam power for it?—No; it might be done with water.

11,903. How is the stuff drawn at your mine?—By water.

11,904. With a kibble?—On inclined planes; we have a coach (waggon).

11,905. Do you employ a skip?—Yes, it runs upon a railway.

11,906. How much underlie in a fathom is there before you begin to use a skip?—Perhaps we may go down 100 fathoms before we begin to use them.

11,907. You say that upon inclined planes you use a skip in preference to a kibble, how much underlie in a fathom is there in the shaft before you begin to use the skip?—Our inclines run from the surface down at a certain angle, about 45.

11,908. Do you consider that the kibble is better to bring up with in the right-down shafts?—No, I think that the skip is best with working guides, and a very good plan that is.

11,909. Have you ever brought any men up in the skip?—No.

11,910. Do you not approve of it?—No.

11,911. Have you ever seen it done?—No, neither do we let the men go upon our railroad anywhere to interfere with the rails.

11,912. Do you not consider it safe for the men to come up in the skip?—If the chain was to break the men might be killed.

11,913. But suppose you had a chain strong enough to avoid all reasonable chance of breaking, would you prefer it then?—It would be much easier; I do not know why it might not be done.

11,914. Are you aware that it has been done in Cornwall?—I have seen man-engines in Cornwall.

11,915. Have you never seen a skip?—I have seen them working but in drawing stuff; I have seen no men drawn up by it.

11,916. (*Mr. Kendall.*) You say that you wish there was a man-engine, but that you cannot afford it?—Yes, I should be very glad of it.

11,917. Do not you think that if you had put in a man-engine at the time when you could have afforded it the chances are that you would have been more successful in making discoveries and not so poor

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as you are at present?—I do not know what difference that would have made in the poorness of the mine.

11,918. If you had had greater facilities for sending the men down to the bottom you would have got more men to go down who would have been able to work your ends cheaper?—I do not think so, I do not see that at all.

11,919. Would not the men have been able to do more work?—They would be there a longer time, and would be quicker down.

11,920. If they had been down a longer time, and if, therefore, they could have done more work, would not that have given them a better chance of making discoveries?—Possibly it might in the time, and it would be a saving to the adventurers, because the more work they do in the time the less price is required for doing it.

11,921–2. (*Mr. Davey.*) Although the not having a man-engine may save money to the adventurers, yet it would not prevent discoveries being made?—I hardly see that the advantage of it would be greater.

11,923. (*Mr. Kendall.*) You have stated that you have no poor air in the Devonshire mines, but that there was poor air in the Cornish mines; where did you find it there?—I have seen it in Cornwall, and sometimes in Devonshire, but very little; I have never seen many mines in Devonshire.

11,924. Where did you work in Cornwall?—I worked in Cornwall, first, in the parish of Crowan; there is an old mine there by the name of Crenver and Wheal Abraham.

11,925. How long ago is it since you worked there?—Somewhere about 40 years ago.

11,926. Was that the first mine that you worked at?—Yes.

11,927. Have you been employed as an agent for 40 years?—No, for about 30 years.

11,928. How long did you work as a miner before you became an agent?—About 20 years.

11,929. How old are you now?—I am in my 65th year.

11,930. How is your health now?—Very good.

11,931. Were you ever in the doctor's hands?—Yes, many times; sometimes with a pain in my head, sometimes with a pain in my side; but I have always escaped any accident.

11,932. Did the pain in your head and the pain in your side come on from working underground?—No, I do not know what caused it.

11,933. Do you go underground now at all?—Yes, four or five days a week.

11,934. Have you ever been down to the 240 fathom-level?—Yes, as often as in any other level whilst that level was being worked, but I have been down to the 230.

11,935. How did you feel when you came up again?—Very well.

The witness withdrew.

Mr. William Skewis examined.

Mr. W. Skewis.

11,936. (*Chairman.*) Of what mine have you charge?—Crelake.

11,937. Have you charge of any other mine?—Kit Hill I go to occasionally.

11,938. What number of men are there employed underground in Crelake?—There are about 86 at present.

11,939. How many of those are tributors and how many tut-workmen?—There are 24 men employed at tut work and 62 on tribute.

11,940. What is the number altogether of persons who are at work on the dressing floors?—There are altogether 167.

11,941. Are there many boys employed underground?—In Crelake there are none.

11,942. What kind of ore does your mine produce?—Copper and lead.

11,943. Is there any mundic with the copper?—Yes, pretty much mundic.

11,944. Is there so much that you sell it?—Yes.

11,945. What is the greatest depth of any level in your mine?—86 fathoms below the surface.

11,946. At how many levels are you working at the present time?—Seven levels.

11,947. Is the copper lode developed below the lead?—Yes; the lead lode runs north and south, and the copper east and west.

11,948. What is the country?—Killas.

11,949. Both for lead and copper?—Yes.

11,950. Is there any difference in the temperature of the levels where the lead and the copper are being worked?—Yes; there is a great deal of difference in the temperature of the level where the copper is. The copper is very much warmer than the lead. I mean that at the same level there is a difference; it is not so damp nor so cold in a copper mine as in a lead mine.

11,951. Is there any difference in the air in the levels where the copper is being worked and in the levels where the lead is?—I think it is about the same. We have very good air in our mine all through.

11,952. Are there no close ends in the mine?—We have no close ends in the mine.

11,953. Has there never been a close end?—We have ends which are not so well ventilated for winzes, but we have air machines, so that the air is about the same.

11,954. How far do you drive from any winze or shaft?—We have never driven, I think, beyond 40 fathoms; in the lead mine we have driven, I think, something like 80 fathoms, but there we have an air machine.

11,955. Is the air machine employed to force in air or to take out the foul air?—It is used for forcing in air.

11,956. Did you ever try a machine for the purpose of drawing out the foul air?—We have not.

11,957. Is it your opinion that forcing in air is the best means of ventilating?—I have never tried the other.

11,958. Do you find that the plan of forcing in air is quite efficient?—Yes, we do. We have always applied the pumping engine to force it in. We do not use water generally. We have a machine attached to the pumping engine.

11,959. Do you force the air down the shaft through pipes?—We apply the air machine at about the same level, or a little above the same level.

11,960. The air you take is near the shaft, but on the same level?—It is from the shaft, but near the same level.

11,961. The machine is worked by the engine?—Yes.

11,962. Have you ever ascertained the difference of time that it takes to get the powder smoke out of a level by employing the machine, and when it is not employed?—I have never tried the difference as to the length of time.

11,963. How long should you say the smoke was in clearing out of a level that has been driven 40 fathoms without a machine?—It lies a considerable time in some instances, but there is no machine where the levels are driven a great distance; they are not without communication.

11,964. Before you put in the machine, which is now working, do you know how long the smoke was going out?—No; I never timed it in order to see how long it was, but it has lain there for a considerable time before the miners could go into work.

11,965. How soon is it driven out now?—In about 10 minutes before the men can go in again.

11,966. How long is it before it is completely cleared away?—Perhaps half an hour before it is cleared away altogether, but it is cooled down now so that the men can go in in about 10 minutes.

11,967. Is there no end or place in your mine where

the miners are obliged to hold the candle on one side in order that it may burn ?—Not one.

11,968. How long have you had the management of the mine ?—About two years now come next September.

11,969. You have not had any end in which the candle would not burn freely upright ?—Not in our mine.

11,970. How do you know when it is necessary to apply the machine ?—We can tell that by the draught and the smell ; the air is not so good.

11,971. Do you judge of that or do the men judge of it ?—We can always detect that without the men saying anything ; of course the men will make mention of it if they find that the air is not satisfactory to them, and we then apply the air machine.

11,972. Yon can judge of that by your own inspection ?—Yes.

11,973. Have you ever known any of the miners to suffer from working in those ends ?—I have known men to suffer, but not in Crelake.

11,974. Have any accidents ever occurred in your mine under your present employers ?—There was one fatal one.

11,975. From what cause did that arise ?—It was a piece of ground which fell from the side. The men were preparing to put in a piece of timber ; in fact, they left it in. It did not fit the place exactly, and they took it down, and there was a fault or a wall that they did not happen to see, of about six inches, and a ton of stuff came down and killed a man on the spot.

11,976. Has there been any accident from blasting ? —Not one.

11,977. Do you think there is no danger from blasting ?—Not when it is properly attended to.

11,978. Do you adopt any precautions different from those taken in other mines to prevent accidents ? —No ; we use the safety fuze.

11,979. Do you not use cartridges ?—We use no cartridges ; our ground is very soft, and we do not use a large quantity of powder.

11,980. Do the miners work with the pick ?—More especially.

11,981. Does not that occasion a great deal of dust ? —Not generally.

11,982. But there is some dust ?—Yes, but not more dust than there would be by boring and blasting.

11,983. Do you think that there would be as much dust by boring and blasting?—Yes, generally speaking. It would depend upon whether the ground is very dry or damp. In our mine the ends are a little damp, weepy, not wet so as to injure the men.

11,984. Do these observations apply to both copper and lead ?—More especially to lead as to the dampness.

11,985. It is drier in the copper ?—Yes ; and we blast a little more in the copper.

11,986. What quantity of candles do you allow to each man per week ?—We allow 3 lbs. a week per man.

11,987. What is the charge that you make for the candles ?—In Crelake we charge 9*d.* for powder and candles.

11,988. What is the charge made for club money ? —9*d.* per man for doctor and 9*d.* for club.

11,989. Is the club money for the relief of miners who are suffering from visible hurts, or for sickness ? —For visible hurts. We do not allow any sick-pay in our mines.

11,990. Do you keep a distinct account of the club money ?—Yes.

11,991. Is that account rendered to the adventurers ? —Not of the club money ; that is a distinct account.

11,992. It is not rendered in your general accounts, but is it included in the cost ?—That is deducted ; the club account is kept separate from the cost.

11,993. What amount of club money have you in hand ?—I think the club is rather over 100*l.*

11,994. I suppose, if there are no visible hurts to provide for, the club money increases ?—Yes. In a case of serious illness, or if a man should have a very heavy affliction, and has worked long in the mine, having a very heavy family, our rules allow the agent to make an allowance in an extreme case of that kind.

11,995. Are there any miners on the club now ?—There is one, he had been abroad and returned ; I think he was not in sound health ; he has worked in our mine, and I think he is affected on the chest.

11,996. What allowance do you make to this man ? —1*l.* per month.

11,997. (*Mr. Holland.*) But that is discretionary, is it not ?—Yes.

11,998. (*Chairman.*) How long should you continue to make that allowance to the miner ?—He has had it already some 8 or 9 months.

11,999. For how long should you feel justified in continuing it to him ?—I cannot tell how long we shall continue it ; he has a son working in the mine.

12,000. How many doctors are there to attend to your mine ?—We have four doctors.

12,001. Does the 9*d.* which is contributed by each miner include attendance on his family, or only on the man himself ?—Himself and family till they reach 14 years of age ; then they are supposed to pay their own doctor.

12,002. Can the men chose which of the four doctors they will go to ?—Yes.

12,003. Could they go to any other doctor, and yet receive pay from the club ?—We have a doctor's book, and the men come in and put down as to what doctor they wish to pay, and then we keep an exact account; they mention one, and then that money is charged to that doctor.

12,004. Might it be any other doctor than either of the four attached to the mine ?—Whatever doctor the miner chooses.

12,005. Do you think that that is sufficient remuneration for the doctor ?—They never complain of it ; they are always satisfied with the 9*d.*

12,006. And the men are satisfied if they obtain the assistance of the doctor whom they prefer ?—Yes, quite so.

12,007. On pay day, what proportion of notes and gold and silver do you obtain from the bank to pay the men ?—We mostly get change which is suitable to paying the men, without giving them any trouble.

12,008. No objection is made at the bank to give you what proportion of gold and silver you like ?—Never in any instance ; we state whether we prefer gold and silver, and they meet our wishes.

12,009. At the other small mine to which you have referred, how many men are employed ?—I think there are about 42 miners at work.

12,010. What is the deepest level that has been reached in that small mine ?—36 fathoms below the surface.

12,011. Is the water pumped out by steam power ? —Yes.

12,012. Is steam power also employed in the Crelake mine ?—Yes.

12,013. How many boilers are there at the Crelake mine ?—Three. There are three engines ; one is at some distance from the others ; that is worked by one boiler, and two boilers are connected, and twe engines are worked from them.

12,014. How often are the boilers cleaned out ?—Every three months.

12,015. Do they fail much ?—Not much ; that is, two of them. We clean out one every month, and blow it out every week ; the water is a little more foul there. We have a great blow pipe, and we blow it out every week.

12,016. As a rule, is that regularly done ?—Yes.

12,017. Have you any means of ascertaining the amount of water in a boiler besides the stop cocks; do you use a glass tube ?—Nothing but the gauge pipes.

12,018. How many safety valves are there to the boilers ?—We have one upon each boiler.

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12,019. Is the air at 36 fathoms below the surface always quite good ?—It is very good.

12,020. Is it a lead or a tin mine ?—A tin mine.

12,021. Is it in killas or in granite ?—In granite.

12,022. How far are you working in that level from any winze or shaft ?—Not above 20 fathoms.

12,023. How many shafts are there ?—There are two shafts on each lode ; they are working on two distinct lodes there, and we have also an adit level brought in on each level besides the two shafts.

12,024. Is there no place where the candle will not burn, or where you have discovered any poor air ?—Not there.

12,025. (*Mr. Holland.*) Is there any difference in the air in the granite and in the killas ?—There is more cold damp in the granite than in the killas; it is colder.

12,026. Are you speaking of the same depth ?—Yes.

12,027. Can you at all explain that ?—Not in any other way than that the granite is generally damper and colder than the killas.

12,028. Is it not naturally drier ?—It is always more damp in the stone.

12,029. There is not more water in the granite than in the killas ?—Not so much.

12,030. Then I presume you use the term "damp" in another sense from wet ?—Yes.

12,031. There is more damp, but you do not know why ?—No; it is cold and damp.

12,032. You have stated that you use air engines whenever the air is at all close ?—Yes.

12,033. Do you consider that the air-engine pays ?—Yes.

12,034. Can you furnish the Commission with any estimate of the saving in the air engine ?—In some instances probably it would be half ; it would depend upon how bad the air was, and upon whether an end was very close.

12,035. How much does it cost to work an air-engine —1*l.* a month ?—In working it with the pumping engine 1*l.* a month would more than pay it. If we worked the engine by hand, and employed boys to do it by hand, it would perhaps take 3*l.* or 4*l.* a month.

12,036. Suppose it cost 3*l.* or 4*l.* a month to work it by hand, would it yet pay by the saving that would be effected in the driving ?—Yes, the saving would be more than three times that.

12,037. In every case in which there is a palpable deficiency of good air without the use of an engine, it would pay to put one in, although it would cost 3*l.* or 4*l.* a month to work it ?—Yes, it would pay well then. You cannot work at all without them in some instances.

12,038. I suppose when you can work an air-engine with the pumping rods, it is a very small expense ?—The expense then is a mere trifle ; when you can attach it to the pumping engine it can scarcely then be considered any expense. In some instances you have an opportunity of putting in a waterfall at no expense.

12,039. Which would be the cheapest, a waterfall or an air-engine worked by the pumping rods ?—The waterfall would be the cheapest. It depenes upon the circumstances. If the water must go down the shaft then it would be a little cheaper.

12,040. If the water could run away by the adit it would be hardly any cost at all ?—It would be cheaper to work with steam power.

The witness withdrew.

Mr. WILLIAM GODDAN examined.

Mr. W. Goddan.

12,041. (*Chairman.*) Of what mine have you charge ?—North Wheal Robert.

12,042. Are you the underground agent ?—Yes.

12,043. What kind of ore does the mine produce ?—Yellow ore.

12,044. Is there any tin ?—We have not returned any tin yet.

12,045. Is there much mundic in it ?—Not a great deal.

12,046. What number of men are there employed underground in your mine ?—About 95 altogether ; 85 miners, that is 65 men and about 20 boys, tut-workmen and tributors.

12,047. What is the greatest depth of any level at which you are working ?—80 fathoms ; that is the western mine.

12,048. What is the greatest depth that you have reached in the other mine ?—62 fathoms.

12,049. Do the miners ascend by ladders ?—Yes.

12,050. How far are you driving in any of the levels from any winze or shaft ?—The bottom level which is 80 west of the trial shaft is about 65 fathoms from the shaft.

12,051. How far is it from a winze ?—There is no winze between it and the shaft.

12,052. By what means do you ventilate ?—We have very good air there.

12,053. Do you ventilate at all by artificial means ?—No.

12,054. The air is sufficiently good without that ?—Yes.

12,055. Do the candles always burn freely there ?—Yes, very freely.

12,056. (*Mr. Holland.*) How high is the level ?—It is seven feet high ; the men are bound to carry it that height.

12,057. (*Chairman.*) How broad is it?—From four feet and a half to five feet.

12,058. How many men work in that level ?—Only one pair, to be at work.

12,059. Have they never complained of the air because it was poor ?—No.

12,060. How long is the powder smoke in clearing away ?—We use Davey's new patent powder, and you see it go in about five minutes after you have fired a hole.

12,061. How long is it in clearing away altogether ?—The men tram their own stuff ; and when they have been out with two waggons of stuff, or when they have cleared the end out from boring the hole, then the smoke has gone from the end and goes away back to the level.

12,062. Are there two shafts in the part of the mine you are now speaking of ?—Two shafts.

12,063. Does the air go up or down that shaft ?—It generally plays up the trial shaft ; that shaft is about four fathoms higher than the eastern shaft. It comes down the eastern shaft, and plays in the adit level about half a mile east of the eastern shaft.

12,064. Does it change with the wind ?—Yes, when the wind is north-west as well as the other may occasionally ; not very often.

12,065. Then it comes down the trial shaft ?—Yes.

12,066. (*Mr. Holland.*) When the wind is in any of the other quarters, does it go the other way?—Yes, always.

12,067. (*Chairman.*) When there is not much wind moving, and it is a very hot day, what happens then ?—The eastern mine is ventilated. The eastern shaft, where there is the 60 fathom level, is about 290 fathoms east of the trial shaft.

12,068. Do you mean that the eastern mine is connected at the 60-fathom level; the trial shaft being the deepest, going down to the 80 fathom level ; and that the air comes down from the 60 fathom level, and also from the adit level ?—Yes.

12,069. And passes up the trial shaft where there is the 80-fathom level ?—Yes ; it goes to the 80, and then comes up.

12,070. You have a communication on the course of the lode with another mine at the 60 fathoms ?—Yes.

12,071. How low have you had the management of this mine ?—I have been there six years.

12,072. During that time have you never known an

end so close that the candle would not burn upright? —Never.

12,073. Have you never felt any inconvenience ?—No.

12,074. (*Mr. Holland.*) Is there any perceptible draught at the 60 fathom level ?—Yes; a strong draught.

12,075. Does it ever come to the bottom and go out at the top ?—Yes.

12,076. At the end of the level that is driven 65 fathoms at the 80-fathom level, do you perceive any motion in the candle ?—Yes, great motion; it goes towards the end.

12,077. Is the level holed through ?—No; the air plays back again; it plays in towards the end. The air goes in at the bottom of the level and back on the upper part of the level.

12,078. (*Chairman.*) At what height from the ground is the candle placed where that effect is produced ?—About half way down the level.

12,079. Have you ever tried where the back draught is?—No.

12,080. Is it usual at an end, at such a distance from the shaft, to have an inward draught of the kind which you have mentioned ?—No, not very common.

12,081. Then this is an exceptional case ?—Yes; I think it is.

12,082. Can you account for it in any way ?—No, not by any means.

12,083. Has the attention of the manager of the mine been drawn to it ?—No.

12,084. You did not think it worth while to draw his attention to it ?—No; so long as the men do not complain of the air.

12,085. What allowance of candles do the men get per week ?—We allow them three pounds a week for the two.

12,086. What is the price of the candles charged to them ?—8*d.* a pound.

12,087. Is the powder small grained or large grained ?—Large grained.

12,088. How much is charged to the men ?—8*d.*

12,089. What is the amount paid for club money ?—9*d.* club and 9*d.* doctor; 1*s.* 6*d.* a month.

12,090. Is club money for visible hurt or for sickness ?—We allow no sick pay, only for visible hurt.

12,091. Do you keep a separate account of the club-money ?—Yes.

12,092. Is it rendered in the accounts of the adventurers ?—Yes.

12,093. Do you know what balance there is ?—No.

12,094. Have you any men now on pay from the club ?—No.

12,095. Have you had any accident at your mine since you have been there ?—We have had two accidents: a boy killed and a man; they were both miners.

12,096. What was the cause of the accident ?—One was through a stone turning out of the side, and a little boy fell in a pass at the back of the 30-fathom level.

12,097. Did he fall to another level ?—Not right in the level; he fell about seven fathoms in the pass; he came down on the stuff.

12,098. How was the man killed ?—He was killed in the back of the 42-fathom level, the ground fell on him, the country came away.

12,099. Have you had any accidents from blasting ?—No.

12,100. Do you use any particular means for blasting besides the safety fuse ?—No.

12,101. No artridges ?—No, we generally make paper bags.

12,102. You make a paper cartridge ?—Yes.

12,103. Do you always use that ?—Yes.

12,104. The men make no objection to that ?—Not at all, they like it better than Copeland's cartridges.

12,105. Do they like it better than loose powder ?—Yes, we could not shoot with dry powder unless we made bags with paper.

12,106. Do you never shoot with loose powder ?—Yes, in dry ground.

12,107. It is only in wet ground that you use the paper ?—Yes.

12,108. (*Mr. Holland.*) Do you prefer powder to bags in dry ground ?—Yes.

12,109. Why ?—Because the paper takes up more room in the hole; we cannot get the charge to the bottom.

12,110. (*Chairman.*) How many doctors have you to the mine ?—The men are allowed to choose their own doctor; we take down the names and they pay 9*d.* a month.

12,111. Are the doctors satisfied with that mode of payment ?—Yes.

12,112. (*Mr. Holland.*) Can the men choose any doctor whatever ?—Any doctor whatever, whom the men like to choose.

12,113. They are not appointed by the mine at all ?—They are not.

12,114. (*Chairman.*) When the men join they name what doctor they wish to attend them ?—We do that every two months, or every month if they like; the men would sooner have it in that way.

12,115. (*Mr. Holland.*) Do the men choose as well as you could choose for them ?—Better.

12,116. Do they choose the best doctors in the place ?—I think they do.

12,117. (*Chairman.*) Have you any charge for the barber here ?—No.

12,118. Do you work your boilers with steam or with water power ?—We have one 30-inch engine in the western mine.

12,119. (*Mr. Holland.*) How many boilers ?—One boiler.

12,120. Is that for a pumping engine ?—Yes.

12,121. How do you manage when you have to clean it, have you to stop when you clean it ?—Yes.

12,122. Does the mine get drowned ?—No, our water is very easy.

12,123. If there was much water you must have two boilers ?—Yes.

12,124. How often have you to clean your boiler ?—We generally clean it every six or eight months.

12,125. Have you clean water ?—Yes, for condensing.

12,126. There is no copper in it ?—Not at all.

12,127. Have you a gauge pipe to show the depth of water in the boiler ?—No glass pipe, but two cocks.

12,128. Do you not think that a gauge pipe would be a good thing ?—As long as the engine man minds the taps it does very well.

12,129. Would it not be an improvement to have a glass water gauge ?—It certainly would be an improvement.

12,130. (*Chairman.*) On pay day do you know what proportion of notes and change you get ?—No; we have always plenty of change; no notes. All the money paid to labourers in gold and silver.

12,131. You pay the men more in change than in notes ?—Yes; all in change.

12,132. And the bankers make no objection to supplying change ?—Not at all, and we generally pay between one and two o'clock.

12,133. I suppose that the men have always a month in hand kept from them ?—Yes.

12,134. Why is that ?—I do not know. It is a general rule with mines. If there should be any disagreement about the money, we should have a balance due to the men.

12,135. But with tut-work men there is no reason except that why they should not be paid oftener ?—No.

12,136. For drawing your stuff do you use a kibble or a skip ?—At the western mine we use a skip and at the eastern mine a kibble.

12,137. Which is the most economical ?—The skip.

12,138. Why then is it not introduced in the other mine ?—Because it is a perpendicular shaft and skips

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are not necessary. A trial shaft is sunk in the course of the lode 80 fathoms.

12,139. (*Mr. Holland.*) How much is the underlie ?—About 20 inches in a fathom ; the other shaft is perpendicular.

12,140. You have a skip in the underlie shaft, and a kibble in the perpendicular shaft ?—Yes.

12,141. (*Chairman.*) Is there any reason why the skip should not be put into the perpendicular shaft if you had guide rods ?—None whatever.

12,142. And if it was cheaper it might be advisable to do it ?—Yes, the skip is the best.

12,143. You consider that the skip is the cheapest and best ?—Yes, and the safest.

12,144. Do you use chain or wire rope ?—A chain at the western mine, and the same at the eastern mine, but we have a wire rope to put in at the eastern mine when we think that the chain is getting poor.

12,145. You think that a wire rope will answer ?—Yes, with a large sheave.

12,146. (*Mr. Holland.*) You do not lift your men in the skip ?—No.

12,147. Would you like to do it ?—No.

12,148. Why ?—It is a very easy road as it is.

12,149. I suppose that they get up in ten minutes, do they not ?—Yes, in about that.

The witness withdrew.

Adjourned.

Note.—The evidence subsequently taken at Tavistock will be found at page 439.

FURNESS ABBEY.

Tuesday, September 30th 1862.

PRESENT :

The Right Hon. Lord KINNAIRD, K.T.
NICHOLAS KENDALL, Esq., M.P.
H. AUSTIN BRUCE, Esq., M.P.
RICHARD DAVEY, Esq., M.P.
P. H. HOLLAND, Esq.

The Right Hon. Lord KINNAIRD, K.T. in the Chair.

THOMAS ROPER, Esq., examined.

FURNESS ABBEY.

T. Roper, Esq.

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12,150. (*Chairman.*) I believe that you have an interest in some of the mines in this neighbourhood ?—Yes; in the firm of Harrison Ainslie and Company.

12,151. What is the name of the mines ?—Lindale Moor.

12,152. Any other ?—Whitriggs; that is half way between Dalton and Ulverstone.

12,153. What is the total number of men employed in those two mines ?—Men and boys, 490.

12,154. Out of that number, how many work underground ?—I should think about 400. Our mining agent will correct anything of that sort which I state wrongly. Our mines are situated between Pennington and Lindale.

12,155. What description of ore do you raise at Lindale Moor ? — Hematite ore. Harrison Ainslie and Company are the oldest miners of the country, and the mining interest here has only been of recent standing ; 25 years ago it was very small in comparison with what it is now; at that time the mines were almost entirely in our hands, that is to say Harrison Ainslie and Company, who have existed as a firm above 100 years.

12,156. The increase in the mining district has taken place within the last few years ?—25 years; in fact since the cutting of this railway.

12,157. (*Mr. Austin Bruce.*) When you speak of the district do you mean the whole of this district in Furness ?—Yes ; plain Furness we call the mining district, from Ulverstone all the way down to Barrow.

12,158. (*Chairman.*) What bargains are made with the men ; do they work in parties ? Yes.

12,159. What number are there in each party ?—It very much depends upon the particular part of the mine; the veins of ore are uncertain in their breadths, and require different ways of working ; we sometimes let them work by the fathom, and sometimes by the ton. Our underground agent is a man who worked at the mines himself; his father was our mine manager till his death, and this young man, an intelligent workman, has a practical acquaintance with the value of work, both above ground and under ground, and he, advised of course by Mr. Ainslie lets all these jobs.

12,160. Does he settle the price, or is it let by competition ?—Scarcely by competition ; certain men are wedded to certain mines, they have, perhaps, opened them at first, and they do not like to be disturbed from that shaft or shafts ; the job is generally let to the men who are best acquainted with that particular shaft and locality.

12,161. And you trust to this agent ?—Greatly.

12,162. There is no public letting ?—No.

12,163. What is the average price per ton where they work per ton ?—That is regulated very much by the rate of wages in the district at the time. We want every man to earn so much money per day, and the underground manager calculates that if he gives so much per ton for his mine, the men have the power easily to earn these wages, and if they work well and skilfully, they will earn more.

12,164. You say "these wages;" about what amount do you consider that a man ought to earn in making these calculations ?—At present the wages of the district average 19*s.* or 20*s.* per week ; a day is eight hours, and on Saturday four hours, and in that time a man ought to be able easily to earn that amount.

12,165. Do they work in shifts ? — Yes, sometimes.

12,166. Have you any night shifts ?—Very few ; all our ore is more or less mixed with little dirty particles of clay, and if it were got at night time and thrown out on the heap, the clay would never be picked out. We have women, old men, and boys employed picking the ore, and if they had not daylight to pick it the ore would become dirty, so that we at all times avoid night-work if we can on that account.

12,167. (*Mr. Holland.*) Is it necessary to pick it immediately ?—Yes.

12,168. (*Chairman.*) Are not the workings also loaded direct from the shaft ?—No, it is a small waggon which lifts the ore, and it is tipped into a larger waggon, and the pickers are employed in the larger waggon, and that larger waggon is again tipped into the railway waggon.

12,169. Are the persons who are employed in picking under cover or not ? — Very seldom under cover.

12,170. Are the men also paid by the fathom or by the yard ?—By the fathom.

12,171. Is there any particular term for the men

who work by the fathom?—I think that they are generally called undertakers.

12,172. What are the deductions which are made in the gross payment of the men?—In our own mines we have 3*d.* per week from each man, which goes to the maintenance of a doctor to attend all their cases, and to the education of all the children. Besides that fund of 3*d.* per week, there are subscriptions which each partner individually in our concern makes, and the neighbouring mine owners whose children are likely to come to our school, also assist in maintaining the school.

12,173. Does the 3*d.* include the attendance of the doctor on the family as well as on the men?—We pay 95*l.* a year to the surgeon, and he has to attend all the miners whenever called upon, and if he is calling at a mining village, and any of the women or children belonging to any of our miners want advice or medicine he gives it, but he is not called upon to go to them specially.

12,174. (*Mr. Austin Bruce.*) Does he provide medicine out of the 95*l.*?—Yes.

12,175. (*Chairman.*) And this is for all descriptions of illness as well as accident?—Yes. Our agent will read the rules of the mines if you require it. We have a rule that a man would be fined if he absented himself from his work on the plea of illness, unless that illness was certified by the doctor.

12,176. What is the name of the medical man?—John Crank.

12,177. (*Mr. Austin Bruce.*) I suppose that he attends other works as well as yours?—Not as the regular surgeon of the works, I think; he and his partner are at the head of the profession in this district.

12,178. (*Chairman.*) Where does he reside?—At Ulverstone.

12,179. How are the men paid; are they paid in notes, or in gold, or in silver?—We pay fortnightly; each man will not earn more than 2*l.*; he is paid in gold and silver.

12,180. Do you pay the head man of the undertakers?—Our underground agent will explain it, I think, in this way; there are ten interested in a bargain, the time of each man is kept by the time-keeper, by the captain of the particular mine, not by the undertaker; he gives in the time and at the fortnightly pay we pay each man his 3*s.* a day if that be the regular wage of the week or month or year. The mine is got by the ton; the money calculated out will amount to more than these wages amount to, one more comes in and gets the balance, which balance he divides amongst his men.

12,181. So that a certain amount of wages is paid to each man?—Yes, every man working on the mines gets a certain wage, and then he gets his share of the balance according to the value which the undertakers themselves place upon each man's work I suppose; we do not control the balance.

12,182. (*Mr. Austin Bruce.*) Is there a payment on account till the whole is measured up?—No, every fortnight concludes itself, we keep what is called in this country an on-ligging week, that is to say, a week in arrear, so that it gives time to calculate all this.

12,183. (*Chairman.*) You have one week in hand?—Yes, always, every fortnight.

12,184. (*Mr. Davey.*) Do you pay every man his money separately?—Yes, and either Mr. Ainslie or myself, or both, is always present at the pay. We pay in gold and silver. Saturday was our last pay, 935*l.* was paid, 30*l.* of which I paid in notes for candles, and the rest was in gold and silver.

12,185. (*Chairman.*) I have asked you as to deductions; what other deductions are there besides the club or doctor?—You can imagine that eight men are essential to perform a certain work; if one man is absent when the other men are ready to go to their work, that man is fined; that is a deduction.

12,186. Is the work done at all by blasting in your mine?—A good deal.

12,187. Have you any accidents from blasting?—Very rarely. One man last year I think burnt his face; he is at work again.

12,188. Did you ascertain how that happened?—From some careless tamping I think.

12,189. Do the men generally reside near the mine, or at a great distance from it?—The greatest distance will be Ulverstone.

12,190. (*Mr. Austin Bruce.*) How far is that?—Two miles by the path which they take; they take the footpath.

12,191. (*Chairman.*) Do the men change their clothes when they come up from the mine?—Not always; it used never to be the case.

12,192. But they do so sometimes?—Yes, they have the liberty to do it.

12,193. Is there any place for them to change in, called a changing house?—Every pit has a boiler, and the men are allowed to change in the boiler-house; there is no place built on purpose.

12,194. Are the men who work in your mines liable to any peculiar disorder?—No. The iron mines are peculiarly healthy, working in hematite ore.

12,195. (*Mr. Austin Bruce.*) What is the annual produce of your mines?—It averages 140,000 tons in the last five years.

12,196. You mentioned that you employed 490 men and boys; how many women do you employ?—I should include the women amongst the boys; we have five women I think.

12,197. Exclusively for picking?—Altogether for picking; they are generally the widows of miners.

12,198. What wages do the 90 out-door people get?—2*s.* 7*d.* and 2*s.* 9*d.* per day, according to their value.

12,199. Does that apply to the women?—No; I am speaking now of the labourers outside.

12,200. What do the boys and women engaged in the picking get?—1*s.* and 1*s.* 3*d.* a day.

12,201. You say that you let the working of the ore by contract to the men; does one man take it and employ other labourers under him at day's wages?—No; we always know who will form a company of undertakers; the bargain may be with two, but we know that there are four others who are sure to be working with them.

12,202. Are those four others paid by day's labour, or do they share in the contract?—They share in the contract; there are a certain number of the miners who share in the contract.

12,203. Then in fact there are more working at day labour?—Yes, underground; our mining agent will tell you exactly how that is; there are a certain number who get days wages both above ground and below.

12,204. To what accidents are the men subject in the works?—There have been accidents of this sort; men repairing a shaft, standing on a plank, striking and missing the blow when aiming at the wood, and striking the plank from under them, and going down; there have been no accidents I think from machinery in our pits, except one.

12,205. Have there been any accidents from the fall of the mine, or of the roof?—No, all our mines are supported with larch timber; larch will give notice by cracking and splitting, and so on, before any danger can accrue; we have never had an instance of that sort.

12,206. Are there any of those accidents which frequently happen in a large coal mine from a large mass coming down?—Very rarely.

12,207. As one of the partners, have you any complaints from the men of the want of those conveniences or securities for life or health which it is the duty of a master to furnish?—I have never heard of such a thing; we superintend the people; our object being always to be there, so that if a man has a complaint of any sort, he has his master to apply to.

12,208. Have you lived all your life in this district?—Very nearly.

12,209. Do you observe any difference between the

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physical appearance of the men employed underground, and of the agricultural labourers ?—No ; I fancy that we have the better of it.

12,210. You consider that the higher rate of wages which your men get, and their better feeding compensate for any unhealthy effect from working underground ?—I never heard of it complained of as unhealthy ; it very frequently occurs that farm labourers come to us.

12,211. You consider the health of miners to be as good and the life as long as of those who work underground ?—Certainly.

12,212. Does that observation apply generally to the mining district ?—Of course I know more of our own men than of any others, but I should say all through the district.

12,213. (*Mr. Davey*). Do you open your mine by driving a gallery from the bottom or how is it generally worked ?—A shaft is sunk and generally on what we call the south side of the vein,—it is really west or nearly west, the miners have got the habit of calling one side north and the other south, north rock and south rock,—and we sink a shaft into the south rock and drive across the vein to the north rock.

12,214. Have you any level communicating from there to the bottom of the hill called an adit level ?—There are two such levels in our mines, we call them day levels.

12,215. What size are your veins generally ?—Very variable in width, we have the vein 50 feet and we have it 5 feet, there is an alternation, there are pockets as we call them, narrow places here and there where the two rocks seem to come together again.

12,216. How do you keep the sides from falling in ?—With two pieces of larch very nearly the size of a railway sleeper, the trunk of a tree from which you would cut a railway sleeper, and a piece of equal strength on the top ; the upright parts are called the forks because of their being forked a little, and the other is called the head tree and it rests on the forks.

12,217. Do you work at all under the day level ?—No.

12,218. Have you any steam engine for the purpose of drawing the water ?—Yes, we have 14 steam engines all drawing water, either by pumping or by lifting in buckets.

12,219. They are not connected with the day level ? No ; our two levels having been driven some years ago the workings have got below them and they are only useful to take the air during summer.

12,220. Is your ventilation very good ?—Very good generally ; there is very rarely any complaint ; we hear a complaint in very sultry weather ; when there is very little current in the upper air, the air below gets tainted and foul.

12,221. What means have you of improving ventilation at any time ?—Most of our mines are connected one with the other so that the one operates as a down shaft and the other as an up shaft. If, however, that is inoperative we employ a fan occasionally to blow the air down, a fan which we can move from one shaft to another. In many cases we employ a fire-pan, we fill a pan of a cylindrical shape made of open grating with quite dry wood, and when it is furiously burning we let it down the shaft by a chain and it will go down glowing.

12,222. (*Mr. Austin Bruce.*) That is down the upcast shaft ?—Yes.

12,223. (*Mr. Holland.*) About how far is the fire pan lowered ?—It depends upon how far the bad air has risen in the shaft.

12,224. About how deep is it generally lowered, 20 or 30 yards ?—Of course it must depend upon the depth of the shaft itself—40 yards or so.
we immediately set to work to remove this tainted air,

12,225. Is not it rather a weak draught if it is only 40 yards high ?—Perhaps I do not make myself quite understood ; the shaft or pit from which all the ore is drawn is 50 yards deep ; the men say that the air is tainted, and that they lose their light, and the moment they lose their light they come out of the place, add and we do it by letting this fire-pan down, and it goes down and down until it comes to the tainted air.

12,226. (*Mr. Davey.*) What is the effect then on the air ?—It creates a vacuum as it goes down, I imagine. The moment it comes into carbonic acid gas or anything which is more or less tainted with an excess of carbonic acid gas, there is nothing to support combustion, and the fire goes out. I do not know whether I am right or not, but when the pan is going down I imagine that it is creating a vacuum by its own consumption ; the air is perfectly still in the shaft. If there were a current in the shaft, if it were lively, it would not be required ; so that I imagine that this is a perfectly calm atmosphere where it is going down, and it removes the oxygen as it passes down and destroys a great amount of the volume of the air, and to supply the vacuum the heavier air rises, and after a while it comes out like a cloud ; it comes out perceptibly.

12,227. (*Mr. Austin Bruce.*) Then do you mean to say that the fire is not extinguished till all the bad air is removed ?—The fire-pan goes out, and we lift it again and ignite it again ; the second time it has not to go so far down the shaft, and so gradually.

12,228. (*Mr. Davey.*) Do you bring it up again to ignite it ?—Yes, and fill it again with wood, and it goes down so much less each time.

12,229. (*Mr. Austin Bruce.*) Has this operation to be performed often ?—No ; perhaps eight or ten times in a year.

12,230. (*Mr. Davey.*) I presume that you drive galleries in the ironstone ?—Yes, from the shaft.

12,231. After you get in a certain distance, how do you find the air ? how far can you drive without putting in a fan ?—That would depend upon the state of the atmosphere above. When you have a lively current above you can drive 20 or 30 yards, and have good air all the way. Most of the drifts will not be more than about 30 yards, and then they come back again towards the shaft.

12,232. (*Mr. Holland.*) Is the whole width of the ironstone bed 50 yards ?—Yes, sometimes.

The witness withdrew.

Mr. Robert Kendall examined.

Mr. R. Kendall.

12,233. (*Chairman.*) You are the agent or manager of the Lindale Moor mine ?—Yes.

12,234. And only of that mine ?—Only of Lindale Moor mine, and only under Harrison Ainslie and Company.

12,235. About how many men work under ground at the Lindale Moor mine ?—About 330 actually underground, and 100 connected with them about the pit heads and in sinking.

12,236. Does that include boys ?—No, we do not allow boys to go underground ; they are generally 18 or 19 years old before they are able to do underground work.

12,237. Do the men work in partnership ?—Generally in drifts or sometimes pits wholly together.

12,238. How many generally work in one drift ?—Generally about four, when they work double sets, two in each set.

12,239. What are their hours ?—Eight hours.

12,240. Do you ever work night shifts ?—Very seldom, unless it be on some very necessary occasion.

12,241. What is generally the size of the drifts ?—Our drifts are 8 feet by 8 ; when wood is put in it is 6 feet by 6 inside, when the drift is made new.

12,242. Have you any drifts driven for taking away the water or preparing for your lower workings ?—Yes, in some cases we have.

12,243. Which are the more difficult to ventilate, the lower drifts or the drifts where you are working ?

—The lower drift is more difficult to ventilate in general.

12,244. What means do you take to ventilate those lower drifts?—We contrive to make upright rises into an air drift and connect that by ventilation with another shaft.

12,245. What distance is there between the working drift and the drifts which you are driving for after working?—It just depends upon circumstances, provided we were putting down a shaft we might put it down 10, 12, or 15 feet lower than where we were driving.

12,246. And then you would put in a drift to join that shaft?—In some cases we do.

12,247. Do you adopt any artificial means of ventilation?—When we have not ventilation by a shaft, but by driving a level to meet one we generally apply a fan blast.

12,248. How is the fan blast worked?—By pipes down the shaft and blown from the surface.

12,249. By means of an engine?—No; we always employ hand labour for it, but that is only very temporary, just while we take one heading.

12,250. Does a man work it at the surface?—Yes; the man who attends to the fan blast.

12,251. He drives the air down the bottom of the shaft and then along the drift?—Yes.

12,252. Do you ever use water for that purpose?—No; we have never used water.

12,253. What is the pipe generally made of?—Generally of wood, but sometimes we have tin pipes. We have found that large wooden pipes answer better than smallish tin pipes.

12,254. Do you find that fully efficient to ventilate?—Yes; so long as we require it. I do not mean to say that it would do for a permanent thing, but in driving from one pit to another we should use that.

12,255. What should you say is the longest distance between one pit and another that you would think of driving?—I should think that 65 yards is a good distance to take in. We generally contrive to have our shafts 100 yards apart, and in some cases 60 yards, or just as it happens; but we are obliged to have shafts very near one another.

12,256. You have a great many shafts?—Yes; our ground is very treacherous. We have a dirty clay which squeezes, and our shafts do not last very long.

12,257. The shafts collapse?—Yes; we have very poor ground to work in. It is generally a swelling tough clay.

12,258. Have you any shafts which are specially downcast or specially upcast?—Yes; the nature of our ground generally allows that to be the case. The shafts which are in the lowest ground are generally downcast, and those in elevated ground upcast.

12,259. Are they not affected by the weather?—Very little then. If they are on level ground they are a good deal affected by the weather.

12,260. Supposing they are affected by the weather, what means do you adopt to create an upcast?—We generally put down an open fire-pan filled with chips and shavings, and when we have good air outside we generally succeed in getting a good draught.

12,261. Is it affected by the direction of the wind or by the want of wind?—It is generally by the want of wind. In sultry thundery weather it is worst. For instance, if there be a thunder storm rising we generally find the air affected by it.

12,262. (*Mr. Holland.*) When the external air is hot it spoils the draught?—Yes, in a great measure.

12,262*a*. Do you find a difficulty in stirring the air with the fire pan?—We never find a difficulty when we put fire-pans on.

12,263. (*Chairman.*) When do you consider it necessary to put fire-pans on?—When the draught is completely at a stand still and does not work either way.

12,264. How do you ascertain that that is necessary?—Because the candles will not burn.

12,265. Have you any other means of ascertaining it?—No.

12,266. Do the men feel the effect of it?—No; I have never known any man affected by what we call bad air, because the candle ceases burning. I have no doubt that if they remained for a length of time after the candles went out that might be the case, but I have not seen it in my experience.

12,267. Do the men leave the work as soon as the candles go out?—Yes; at once.

12,268. And they report to you?—Yes; or to one of our underground captains.

12,269. How many shafts have you through Lindale Moor mine?—We have 11 shafts working, and we have four sinking.

12,270. About what is the greatest distance that any of the drifts are driven?—We have some drifts at 100 yards from the shaft. That is the longest which we have; but we pass one or two air shafts in that distance.

12,271. In taking away the ore is the whole of it removed and is the ground supported by wood?—Yes.

12,272. Does the whole ground collapse after the ore is removed?—Yes. Our ground is so very weak and broken that it settles down.

12,273. Have you ever had an accident from the ground falling in from above?—No; I do not think that we have ever had one from that cause.

12,274. The stuff in which you have to work is not rock?—No.

12,275. (*Mr. Austin Bruce.*) What are you working in?—Our surface is generally pindle and clay and some small detached stones.

12,276. You are obliged to keep it up by artificial means?—By wood. We put in our wood as close as it can possibly be put.

12,277. (*Chairman.*) What is the distance between each row of cross bars?—We put them in two feet apart, and then put intermediate ones.

12,278. How do your men meet with accidents?—When we do meet with an accident I can scarcely say how it arises. The last accident which we had was on account of being drawn at the pit head by some little carelessness.

12,279. Have you ever had any accident by the stuff falling on the men?—No; I think that we have never had one in my recollection.

12,280. (*Mr. Holland.*) Is the crushing in of the timber a very slow process?—Yes; you cannot distinguish it.

12,281. (*Chairman.*) You have to put down the pan more than once to make the shaft act as an upcast, have you not?—If we have a good air course and two shafts are connected, which we generally contrive to have, it generally happens that the first fire-pan is sufficient, and that may continue for weeks and months, and the bad air not come in again.

12,282. The men work in parties, do they not?—Yes.

12,283. What allowance of candles do they get?—We find candles for them, and we allow them 2lbs. a week, which is quite sufficient, and if it be very good air weather they will save one or two, and if it be bad air weather so that the candles get soft and burn quicker, they have to find one or two themselves, and a very strong current will burn the candles faster; but we can regulate that by putting on doors so as to stop the ventilation.

12,284. Do you put on doors to regulate the ventilation?—Yes

12,285. What do they pay for the candles?—We do not charge them for candles; we find candles and tools for them; we give them sufficient candles to supply them, and if they be extravagant they have to make them up, and if they can spare one or two they can take them home.

12,286. Are the wicks of the candles made entirely of cotton?—Yes.

12,287. Where do the men change when they come to the surface?—Some men do not change at all,

they prefer going home, and some men are allowed to change on the boiler or in a part of the engine house, which is made on purpose; we have a good few men who have only a quarter of a mile or so to go home.

12,288. Have you a copy of the rules of the mines ?—Yes (*producing the same.*)

12,289. Do you give an order for any of the wives to get provisions ?—Yes; we give them subsist every week, so that they can get provisions at a store, and in some cases when it is actually needed we give money.

12,290. Does the store belong to the mine, or is it an independent shop ?—It is an independent shop.

12,291. And it is merely an order on that shop for such an amount of money ?—Yes.

12,292. (*Mr. Austin Bruce.*) You say that when the candles go out the men complain to you and you take methods for improving the ventilation ?—Yes.

12,293. Do you think that a man can work healthily and well in air, which, without actually putting out the candle makes the light weaker than it ought to be ?—I do not think that they can, and in fact, if it does not actually put the candles out, but there is a want of air, we apply some method to relieve them.

12,294. Do you ever apply these methods before the candles refuse to burn ?—Yes ; we always provide for them ; we have many cases where we gain ventilation without being subjected to the candles going out for want of air, but we always take this precaution to get our connections as quickly as we can.

12,295. Where, as a rule, is the ventilation weakest? —If we have cut air courses I do not know that there is any such bad air, but it generally happens that when we have no air courses, and are driving in among old workings for connections with another shaft we find the air worst there.

12,296. And you then introduce artificial ventilation ?—Yes.

12,297. What do you mean by "air courses" in your last answer ?—By air courses I mean one shaft being connected with another, so that air can go between one and another.

12,298. Are all those courses 6 feet by 6 ?—Yes ; when they are first made, but they gradually get closer and closer, and we have sometimes another air course going on at the same time when this is at work, it requires that on account of our bad ground.

12,299. Does it ever happen to you, when you have received a complaint that the ventilation is bad, although the candles are not actually put out, to examine the ventilation and to find that the complaint is unreasonable and unnecessary ?—I have never had a complaint to me where it has not been reasonable and necessary, for I generally keep a very strict control, as regards ventilation, and I do not allow the men to go to work there if the ventilation be not good; if it be bad we always contrive to improve it by artificial means or by air courses.

12,300. Did I rightly understand you to say that none of your drifts are driven more than 100 yards from a shaft ?—Yes, I did say so.

12,301. Then your shafts are seldom very deep?— They are not very deep ; we have them from 60 to 80 yards, but we have some not so deep ; I think 90 yards is the deepest pit which we have.

12,302. Is your upcast always the same, or does it vary with the state of the external atmosphere ?—It sometimes varies, if the ground where the shaft is be on a level ; but if one shaft be put on to lower ground and the other on more elevated ground, we have the up-cast generally on the highest ground, if it stops we put the fire-pan on the highest ground.

12,303. Practically you do not find the ventilation in these mines to be a difficulty ?—No, I have never known men take hurt by want of ventilation.

12,304. Have you ever known men becoming ill in any way from the want of pure air below ?—No, I do not think that I have ever experienced it.

12,305. Do you sometimes use powder ?—Yes, a great quantity.

12,306. Is that in the ore itself, or in the rock ?— In both.

12,307. As a rule how soon does the smoke disappear after a blast ?—It sometimes remains perhaps 10 or 15 minutes, if it be dull heavy weather, and if it be a good sharp drying blast we have it out in less than five minutes.

12,308. (*Mr. Holland.*) Does it ever stop an hour ? —It is a very rare case if it stops an hour ; it might stop an hour in one of the courses which we are driving for an air course.

12,309. (*Mr. Austin Bruce.*) When it stops a long time do you find that the men go in before it is clear ? —No, they do not go in till they can see ; the smoke must die away before the men get to work again.

12,310. You have never known the men suffer from breathing the smoke ?—No, we always consider that it is rather healthy.

12,311. How does it happen that your ton is 33 cwt. ?—It is only just our weight that we let the men have it for ; our waggons which take it away are expected to hold 33 cwt., and if the waggon does not hold that it is so much taken off, it averages 33 cwt.

12,312. Do you allow the men to take away more than 33 cwt. ?—Yes, and whatever is sent more they are paid for it, and whatever is short we deduct.

12,313. Have you any trouble with the men on the question of weights ?—No, I do not think that we have ever had a question of that kind.

12,314. By whom is the weigher appointed ?—By the Duke's agent and ourselves.

12,315. Have the men anything to do with the appointment of the weigher ?—No, the men can go down to any machine and see the ore weighed if they choose, and they are paid exactly by the same weight as we pay our lordship by.

12,316. Up to what age do the men continue to work in your mines ?—We have some men working 60 years old I should think, and some a little older ; there may be some men of 65.

12,317. Underground ?—Yes.

12,318. I suppose that when they get unfit for underground work they sometimes get light jobs above ground ?—Yes, we always contrive to give them light jobs above, such as picking the ore.

12,319. Do you think that a man is able to work as many years at this underground work as he is at agricultural work ?—Yes, I believe that he is. I believe that, as far as his health is concerned, he is quite as able ; we have had men who have worked till they have been over 70, and have worked in mines the principal part of their lives.

12,320. At what age do you take boys ?—We take them about 16, and some rather below 16, just as the case may be.

12,321. Who is responsible for employing or refusing a boy ; is it you ?—I always take them. We do not take boys underground at 16 ; they begin to work underground about 17 or 18.

12,322. What is your reason for not allowing them to work underground before that age ?—Because they are worth nothing ; we have no work which is suitable for them ; we have not anything excepting rather heavier work than they are able to do till they come to that age.

12,323. Do all the children of your workmen go to school ?—They do, principally ; we have a good school close by the works, and a school at Orswick, and we have two schools at Ulverstone. I cannot exactly say what number go to the other schools.

12,324. Up to what age do they remain at school ? —We do not tie them to leave school at any particular age. I should think that they leave school at 14 or 15 years of age. We have had some very good scholars, and they have been over 15.

12,325. (*Chairman.*) Is something deducted from the wages of the men for the maintenance of the school, whether they have children or not ?—Yes, we charge 3*d.* a week for school and doctor.

12,326. (*Mr. Austin Bruce.*) Have you no employment for boys between 10 and 14 ?—There is very little at our place, excepting just picking some ore, and they are rather too small for that.

12,327. What is the age of the boys who are employed in picking ore ?—From 14 to 16.

12,328. (*Mr. Davey.*) I do not understand the manner in which you work the mine. After you have taken one drift away you sink how far ?—Eight feet is what we consider to be a sufficient drift.

12,329. You cannot drive through that and leave anything above ?—No, we take it all off as clean as we can.

12,330. You carry it away all before you?—Yes.

12,331. (*Mr. Austin Bruce.*) Have you a plan of your workings here ?—Yes (*producing the same*).

12,332. (*Chairman.*) With regard to the relief fund, how much a week do the men pay ?—3*d.* a week.

12,333. That is for school and doctor ?—Yes.

12,334. Is it for accident and illness ; whatever is the illness, are they attended by the doctor ?—Yes.

12,335. What allowance have they when they are ill ?—It is not a rule that we have to give them any allowance, but if we have any surplus money we give them something out of the school and doctor fund ; and if a man gets fined, which is very rare, but which sometimes happens, that money goes to the school and doctor fund. In some cases a man may leave his work for a day or two, and then what he forfeits goes to the school and doctor fund.

12,336. A separate account is kept of this fund ?—Yes, it is a separate fund altogether.

12,337. Are the receipts from the men sufficient to support it ?—No, it seldom pays for itself except in some cases with these fines being put to it, but whatever falls short Harrison Ainslie and Company make it up.

12,338. Does the doctor attend the men's families ?—No, he does not attend, but if any of the family will go to his surgery, he will give them advice and medicine free. He will attend men, but only men; but if he was passing through a village where they lived, he would call in if they asked him.

12,339. Have you any accidents from blasting ?—We have had an accident from blasting, but it is very rare ; we have had one accident from blasting this last year.

12,340. How did that happen ?—It was on account of leaving rather more fuse than a man ought to have done ; he was deceived in it, and he went to see the charge, and he thought that it was not going to explode, and it exploded before he was aware of it.

12,341. Do you always use the safety fuse ?—Yes.

12,342. (*Mr. Holland.*) Have you no rule that the men are not to come near the fuses till a certain time after firing ?—We give them instructions how long they are to remain. A fuse should travel such a distance in so much time, and this accident was on account of the man's being mistaken as to the length of his fuse.

12,343. Do you not allow a long interval to elapse ?—Yes, it should be so.

12,344. An hour or two ?—We can not always watch a man.

12,345. Have you no such rule ?—No, we have not a rule for it.

12,346. (*Mr. Davey.*) You stated that your deepest shaft was about 90 yards ?—Yes.

12,347. Do you still continue to sink that ?—Yes ; as soon as we get that ore out we shall sink it deeper.

12,348 That does not come to the bottom of the ore ?—No, we have ore below that.

12,349. Have you any idea how far down the ore lasts ?—I do not know.

12,350. (*Mr. Austin Bruce.*) How do the men come out of the shaft ?—They ride up in cages.

12,351. Always ?—Yes.

12,352. (*Mr. Holland.*) What is the underlie ?—About 1 in 2.

12,353. What is the thickness of the bed ?—It varies ; I should think that it is about from 10 feet to 20 yards.

12,354. Are the workings very dry ?—In some places, they are not all very dry.

12,355. Do the men often get their clothes very wet ?—No.

12,356. Do they sweat very much ?—Yes.

12,357. So as to wet their clothes ?—They pull all their clothes off generally, excepting their drawers and working shirts.

12,358. Do those get wet with sweat ?—Their shirts get wet with sweat.

12,359. Do they go home in their wet shirts ?—No, they generally change ; if they do not change altogether, they have a dry shirt to put on underground ; they sometimes do that.

12,360. Is the air ever so bad as to prevent a man doing a fair day's work ?—No ; we have never had complaints from any men on account of bad air, that they could not do as much work as usual.

12,361. Is the amount of work which the men can do affected by the state of the air ?—No ; our shafts are so near together that we contrive to have them very well ventilated.

12,362. Do your men suffer much from cough ?—No, they are generally very healthy, except it be some of those parties who are naturally of an asthmatical tendency.

12,363. Have you many of them so ?—No.

12,364. Are there any diseases of the lungs among miners here which are called miners' diseases ?—No, I have never heard of any.

12,365. There is no disease known as a special miners' disease ?—No, I have never heard of such a thing.

12,366. You have spoken of men working at 60 years old or upwards ; is that considered unusual ?—No, we have several men at 60 and upwards who are working.

12,367. There is no remark made upon it, it is not thought extraordinary ?—No.

12,368. Are a large proportion of the people here employed in mining ?—I do not know the proportion.

The witness withdrew.

HENRY WILLIAM SCHNEIDER, Esq., examined.

12,369. (*Chairman.*) You have an interest in a good many mines in this district ?—Yes.

12,370. Will you state the different mines in the Furness district with which you are connected ?—Parks, Mousell, Newton, Whitriggs, and Old Hills.

12,371. Will you state about the total number of men in your employment ?—In round figures 460 are employed on the mines.

12,372. About how many of those are employed underground ?—About 250 underground.

12,373. What is the amount of produce of ore which these men raise ?—In round figures on the average of the last three years 260,000 tons per annum.

12,374. Which is your principal mine ?—Parks.

12,375. What is the deepest shaft at Parks ?—50 fathoms.

12,376. About how many shafts are there at Parks ?—There are 10 shafts at work at the present time besides the principal shaft.

12,377. How do the men ascend and descend ?—Entirely by ladders ; they are not allowed to ride in the cages.

12,378. You use the cages with the bogies for drawing the ore ?—Yes.

12,379. Therefore safety cages are not required ?—There are no safety cages, they are not required, and we are rather of opinion that greater care is exercised by the men under such circumstances in not using the safety cages ; that when they have them they are too

apt to rely upon them ; we have tried them in one instance, and it did not answer satisfactorily. If the men used them we should most decidedly adopt safety cages, because we think that it would not be right to allow the men to be exposed to any casualty which could possibly be avoided. The safety cages which we should adopt in the event of the men riding on the cages would be disengaging cages, which in the event of the rope breaking would remain suspended in the shaft, and so prevent their falling to the bottom. Also cages which would disengage on reaching a certain point to prevent their being drawn over the pulley, and immediately on the cage being disengaged the clutches would take effect, and the cage would remain suspended.

12,380. The men, you say, descend by ladder ways; are there ladder ways in the pumping shaft ?—Yes.

12,381. Are they fenced off?—Yes, from the pumps and from the drawing part.

12,382. Are there sollers at the bottom of every ladder ?—Yes.

12,383. So that a man falling from one would only fall to the next ?—He would only fall about 12 feet.

12,384. Are the ladders with wooden or iron spokes ? —Some have wooden and some have iron. In the winter near the surface we consider the iron staves very objectionable on account of the ice affecting them. We once very nearly had a serious accident on that account ; they are slippery.

12,385. The deepest shaft that men have to climb is 50 fathoms?—Yes, but the average depth of the present workings does not exceed 30 fathoms.

12,386. To what description of accident should you say that men are liable, any particular description of accident ?—The accident to which the men are most exposed is from rocks of ore dropping either from the end or top of the levels while they are in the act of either timbering or preparing the timber.

12,387. But when once the ground is timbered up it is safe ?—Yes ; we never have known an instance of any level suddenly giving way, although the crush upon the levels is enormous, so much so that a stick of timber nine inches in diameter has been known to be crushed in 24 hours ; still it is gradual and it never entirely closes up the level.

12,388. Are the men generally healthy ?—Extremely so. I consider that the underground men whom we have in our employ are by far the finest class in the country.

12,389. Do you think that they are stronger and finer men than the agricultural class ?—Decidedly so, infinitely superior to them as a rule ; I speak of the underground men. I attribute that partly to the fact of their being the finest class of men physically, but also to their earning higher wages than any other class in the country, and therefore being able to live better than any other class in the country.

12,390. (*Mr. Holland.*) Are they well lodged ?—Very well.

12,391. (*Chairman.*) How often are the men paid ? —We pay once a month.

12,392. (*Mr. Austin Bruce.*) Are there any intermediate draws ?—They are allowed to draw whenever they like. If any man wants a draw he has it, but the system with us is so well understood that the men very seldom require a draw. They can always procure during the month everything that they wish to have ; there is no difficulty at all. I should mention in reference to that that if we had experienced any difficulty whatever we should instantly have altered our system and made the pay once a fortnight ; but inasmuch as we have so many pays, including the iron furnaces, it is inconvenient to pay oftener than once a week, and therefore the pays are distributed every Friday, so as to bring in a certain class of the men once every week. The men at the furnaces are paid once a fortnight. I wish to mention one thing in connexion with that subject, namely, that for some years we had Saturday as the pay day, but we found that the men coming to be paid on the Saturday afternoon in their clean clothes went immediately to the public houses from the pay office in the town and got drunk, and remained drunk during the Sunday. After reflection it was determined that we would pay them on the Friday afternoon as they left work in their dirty clothes, and we have found that it has operated in a very marvellous manner in checking drunkenness, because the men are now disposed to go home at once, and they get their money taken possession of by their families instead of going to the public houses to drink it.

12,393. (*Chairman.*) Do the men come back to work on the Saturday ?—Always. I accompanied that with another rule, which was this. Feeling thoroughly satisfied that I could depend upon my men not leaving me for the penalty which I had determined to inflict upon them, I established a rule that any man who was absent from work either on the Saturday or the Monday after the pay day should be allowed to play for a week,—he was not allowed to come to work for the remainder of that week ; in other words, we inflicted the penalty upon him of the loss of the week's wages.

12,394. And you found it answer ?—Yes.

12,395. (*Mr. Holland.*) Very few incurred the penalty ?—None. When I say none, one perhaps in 450.

12,396. (*Mr. Austin Bruce.*) Then, in fact, there is no more drunkenness after pay day than there is at any other time ?—Just so.

12,397. (*Mr. Holland.*) Was that change effected without any grumbling on the part of the men, or with very little grumbling ?—I never heard anything of it. I believe that one or two did grumble a little. When I first established the Friday's pay the men were disposed to be absent on the Saturday entirely, and under the then rules they were fined half-a-crown for being absent from their day's work. I made a calculation by which I found that the loss by a man of his day's work, paying his fine of 2*s* 6*d*., and losing what he would earn during the time, and the money which he spent came to an average of about 10*s*. ; I then found that that 10*s*., divided over the whole of the ore which we raised, came to something like a penny upon what we call our pit ton (which is not an imperial ton); I immediately determined that I would knock off a penny from the wages, and I put it to the men that as they could afford to be absent in this way from drunkenness and to lose 10*s*., by taking a penny away from them, if they worked during that time they would just get such an increased quantity of ore as would give them exactly the same wages by working continuously as they had done previously, and that, therefore, they would be in exactly the same position, but without having the opportunity of spending their 10*s*. in drunkenness. I therefore determined to take this penny off from the whole of the mine, the effect of which was that I made the steady men so excessively angry with those who had brought the penalty upon them, that I created a moral influence and established a very wholesome system, which enabled me afterwards to carry out the other system which I have mentioned, of letting them stop away for a week, and I also succeeded at the same time in producing an economy in the working of the mine.

12,398. You turned the good men upon your side ? —I turned the good men upon my side. I had the curiosity to take out very carefully the men's wages prior to that reduction of a penny, and subsequently to that reduction of a penny, and in the following two months they actually earned a shade more on the average than they had done before the penny was knocked off them.

12,399. (*Chairman.*) Is there a doctor specially attached to the mine ?—Only for accidents.

12,400. Is there any club ?—The system with which we commenced our mines was this :—It was a rule of the mine that every man should contribute 1*s*. 6*d*. a month towards a club, and we took upon ourselves the responsibility of guaranteeing that that money should be sufficient for its objects, which are to give every

man 10*s.* a week when he is absent from the mine, in consequence of either sickness or accident, and in proportion to the severity of the cases where any accident may result in death, either a pension to the widow and children of 2*s.* 6*d.* to the woman, and 1*s.* 6*d.* to each of the children, or a lump sum, which would vary according to the circumstances and number of children, of from 20*l.* to 25*l.* given to the widow, so that in the event of her being a stranger, she might return to her own part of the country, or if she was a native, to establish her in some small business. We have found that answer very satisfactorily; so much so that we have hardly ever had a case in which the widow has been compelled to apply to the guardians for relief, excepting for a very temporary period; they have succeeded in getting established in some small business. Then I should mention that the reason why we have not a doctor for sickness attached to the club is this, that most of our men belong also to the Odd Fellows Club in the district, and inasmuch as that club provides them with a doctor, if we proposed to provide them with a doctor too, we should have to pay them less sick pay, and they would then be found with two doctors, which, of course, is not required; therefore the men themselves prefer their having the 10*s.* to being found with a doctor and 9*s.* only.

12,401. Is there any demand for education?—The system of education in this country has been excessively bad in this parish, in consequence of their being under the influence of an endowed school, which practically afforded no education and stopped all efforts which were made to get education established upon a proper principle; but under the new law which was passed a short time back we have been enabled to get the old trust put an end to, and we have now succeeded in getting schools built in the parish of Dalton at a cost of about 2,000*l.*, which will accommodate about 500 children. Those schools are now on the point of being opened, and we shall commence with their opening a system of charging every man 6*d.* a month, whether he has children or not, and undertaking to educate the whole of the children which those men may have, whatever their number may be.

12,402. (*Mr. Holland.*) Do the men who have no children complain of that?—Not at all. I may say that in future the facilities for education in the parish will be as great, I think, as in any parish in England; there will be accommodation for 1,200 children in the parish.

12,403. What is the population?—About 12,000.

12,404. (*Chairman.*) Do the men generally reside near the mines?—Taking the average, I should say that the distance which the men have to go to their work is about two miles.

12,405. In the Parks mine, have they far to go?—About two miles.

12,406. Do the men change their clothes there when they go underground?—Yes, at least they have the facilities for doing it if they wish to do so. We have a changing house, with means of drying their clothes, and hot water for washing; in fact, we have that at all the mines.

12,407. Do you think that the men appreciate it?—They do appreciate it, and a greater number of men every year are availing themselves of the opportunity of changing. I may mention one thing, which I believe has done more to improve the cleanly habits of the men than anything, and that is, the formation of a volunteer corps in the district. The effect which that has had upon my own men in particular is extraordinary; it has not only set them up and given them more care of their appearance, but it has induced cleanliness, which I find through the reports of our clergyman has extended into their houses, and in that way been productive of a very great moral effect, totally irrespective of other things.

12,408. In taking out the ore you use a great quantity of timber for supporting the superincumbent material?—A very large quantity indeed; the calculation which we make roughly is a foot of timber for all purposes in the mine for one ton of ore. I may mention with reference to that timber question, what, at first sight, may appear extraordinary, but it would be at once understood by anybody who entered the mines, namely, that the first height of workings is the safest, and the second height the most dangerous, for this reason, that the ground above has not got thoroughly crushed, neither is there a sufficient quantity of timber between the second height of workings and the ground to make a roof of timber.

12,409. (*Mr. Austin Bruce.*) You have not in fact so strong a buffer?—You have not so strong a buffer, but after you get down when there are many heights above the timber gets spread in every direction, so that it distributes the weight more equally upon the whole mass, and the timber does not crush to the same extent as it has previously done.

12,410. You have said that the most accidents which occur are from falls?—Yes.

12,411. What are the other sources of accidents?—Carelessness.

12,412. You employ, in round numbers, 500 men?—Yes.

12,413. What per-centage of accidents do you think, one year with another, you have?—About $\frac{1}{2}$ to $\frac{3}{4}$ per cent.

12,414. Do these accidents result occasionally in death?—Yes; our total number of accidents from all causes in the mines in 20 years have been 16 resulting in death; 5 from falls of ore, either in the roof or in what we call the fore breast coming out from the end, one from the powder firing in a bore hole in blasting before the man was prepared for it; in stemming the hole it went off and killed him; and there have been 10 accidents arising from causes entirely beyond the control of the masters and from the negligence of the workmen. The average number of men employed in those 20 years were 300 per annum, or 6,000 in the whole, so that it is 16 cases of death in 6,000 workmen employed; if we had employed 6,000 workmen for one year, there would have been 16 deaths in that one year.

12,415. You have agents who practically manage your works, or superintending them and visiting them occasionally?—Yes.

12,416. Do you ever have complaints made directly to yourself of the want of adequate ventilation in any portion of the pit?—No, and for this reason, that it is a very rare occurrence that we are deficient in ventilation, and in all the cases where there has been a deficiency of ventilation I have invariably found that the captains have instantly come to the head captain and asked for instructions as to what they were to do to obviate the difficulty. It only arises from this cause, that under certain circumstances where we are obliged to drive a level to communicate one pit with another, we experience a quantity of light air just at the end of the level as they are approaching the communication, but not under any other circumstances. Summer weather affects us slightly, not from deficiency of ventilation, but from the deadness of the air; then the principle adopted is to hang a fire-pan in the pit, which in the course of two or three hours will just carry round a current, and then the air is perfectly right again, but we are not exposed to any bad air in the pits in the same manner as in coal pits.

12,417. Do you find as a liberal owner of mines any tendency in your agents to stint the men of proper ventilation in order to prove that they are economical managers for you?—On the contrary, I find just the reverse, the very first thing that the whole of my captains attend to is ventilation, and for this very simple reason, that the moment ventilation is deficient that moment the wages rise in proportion to the work done, and that moment my attention is called to it, and therefore if they wished to do it they could not do it without my finding it out.

12,418. Then you have, in fact, no complaints made personally to yourself of inadequate ventilation?—Never.

12,419. (*Chairman.*) When ventilation is necessary, what means do you adopt?—In all cases where

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we are driving levels to a great distance we put in air pipes. The general plan which we adopt here is to have a hood similar to what is used for ventilating the stoke hole of a screw steamer or other steamer, and it is placed opposite to the way in which the wind is blowing, so that the wind blows down the pipes and along the pipes to the end of the level.

12,420. Do you use any other artificial means of ventilation?—We have repeatedly thrown water down the pits so as to drive a current of air into the workings simply a waterfall.

12,421. (*Mr. Austin Bruce.*) As an occasional expedient?—Just as an occasional expedient.

12,422. Have you ever any strikes?—Very seldom.

12,423. When they have arisen, from what causes have they arisen?—From a momentary fancy, I should say, nothing more than that.

12,424. For an increase of wages?—Yes; in fact, we have only had one strike all the time that I can remember, and upon that occasion our mining captain did not even consult us; he was on the mine, and the men turned out and said that they would leave work if their wages were not increased. "Well," he said, "I shall soon settle that for you, I am going into the "office and I shall be out again in a quarter of an "hour, and whoever is not at work will leave the mine, "and I shall never employ him again." In five minutes every man had gone to work again.

12,425. Then it was a mere question of wages and not of management?—Just so.

12,426. Having had as I know that you have had, great experience of workmen in other districts what character would you give of your men for their sobriety and good conduct?—I think that they are a fair average but not above an average, a fair average of the better class of men; I think that they are decidedly superior to what I know they are in Wales.

12,427. (*Mr. Holland.*) More steady?—Steadier.

12,428. (*Mr. Austin Bruce.*) Do you know Staffordshire?—Not well. They are decidedly very superior to Staffordshire.

12,429. (*Mr. Holland.*) Do you know Cornwall at all?—Not very well.

12,430. You said that your deepest shaft was 100 yards?—Yes.

12,431. Is it used by the men for the purposes of ascent and descent?—Only a few men, about 10 or a dozen, who are at work in that pit.

12,432. When you said that the average depth of your shafts was 30 fathoms, that is the average depth which the men have to climb by ladders?—Yes.

12,433. Do you think that that in any way affects their health or strength?—Not 30 fathoms or 50 fathoms, but I should not feel disposed to increase the depth beyond 50 fathoms without taking very seriously into consideration the propriety of raising them by some other means.

12,434. Have they ever to mount 30, 40, or 50 fathoms of an up-cast with the return foul air?—We do not know such a thing, we have no upcasts or downcasts, we do not know the meaning of the words "upcast or downcast."

12,435. If you have no regular upcast or downcast there must be some shaft up which the air which has been vitiated comes to the surface?—It is every shaft in rotation, exactly as the wind happens to be, sometimes the current sets in one direction and sometimes it sets in another.

12,436. Then the men must occasionally mount by the shaft up which the vitiated air travels?—No doubt, that is to say to the extent to which it is vitiated, practically there is no vitiation; I have never been able to discover the slightest difference in the air either in one shaft or in another. When you consider that there is an extent of ground open beneath, which amounts to something like six acres invariably open, and that the total number of men at a time does not exceed 130, and that there is in a great portion of the mine a very strong current of air blowing you will find that there can be no vitiation to a perceptible extent.

12,437. (*Chairman.*) Do they use powder for blasting?—Occasionally, but it is only occasionally when they are driving rock levels.

12,438. (*Mr. Davey.*) You have said that there is some foul air, is not that generally at the bottom of your deepest shaft?—We never get this foul air where there is water, the deepest shaft being the drainage shaft, there is so much water falling about that there is always a current of air kept up in that shaft and although it has at the present moment very long levels attached to it there is no perceptible foul air in it.

12,439. When do you find the air so bad that you are obliged to put down a furnace?—We have not done it this year.

12,440. But you have done it?—We have done it. In the course of a year we shall perhaps find 2, 3, or 4 days when the air is very oppressive from a thunder storm coming on; it then is very dead, there is very little wind; instead of the air pouring through the mine in its usual course it seems to lie dead throughout the whole of the mine and it would soon become oppressive if the men were allowed to go to work under those circumstances; they therefore put in a furnace just sufficient to create a current of air to re-establish the equilibrium of the circulation of the air, that is all.

12,441. Then that foul air has accumulated during the time that the men are not working?—I want to draw a distinction (because it is important) that we have not what is techincally called foul air in these mines at all, it is dead air, it is not foul air, because foul air conveys to everybody's mind the air which you have in coal pits; tho only foul air that we have is when there is the want of a current, arising from the calmness of the air in very hot weather, and at a time when the air is oppressive upon the surface, there is a stagnation arising in the mines, which if not removed, would in course of time render that air unfit for the men to breathe from the exhaustion of the vital principles of the air.

12,442. That does not occur very often?—It does not occur, on the aveargе, more than three times in the course of a year.

12,443. Then it would not be worth while to alter your shafts so as to make one higher than another, in order to make an up-cast?—We had better stop working on those days, and pay the men, than adopt any system of that sort; we have nothing that we can depend upon for twelve months together except our pumping pit; the ore lies so irregularly that that which may be a good shaft this month may be entirely gone in the course of twelve months, and therefore we cannot adopt any permanent system of that sort, and we are repeatedly obliged to vary the operations of the mine because one shaft is shut up, and a new shaft is opened; therefore we cannot adopt any system of that sort, because it would only be fallacious, and would entirely destroy the object which we have in view. The ore in this country lies so irregularly, that you must treat every deposit according to its own rules; there is no general rule applicable. This district is perhaps more investigated by geologists than any district in the country, but the universal result is, that the more a person knows of it, the less he finds he can understand it.

12,444. Are these mines the same as the others in the conglomerate?—These mines lie in the limestone; in one case Lindale Moor the slate rock lies at a part of the mine, but not universally. At Parks mine we have the slate rock adjoining the mine, but nowhere touching it; and all the other mines in the district appear to be entirely in the limestone rock.

12,445. Is it in the limestone that the boulders come down and cause the accidents which you speak of?—No; they are large lumps of solid ore lying in the soft ore. They will appear to be perfectly safe, but some little pressure may accidentally come upon them from above, and disengage them, and cause them to fall out. There is no warning, and there is no means of detecting that they are loose; in fact we do not know the size of them; the peculiarity of the ore is such, that you may not even know that there is a large mass of ore above you or near you.

12,446. Do these stones fall out just after they are exposed, or after a time?—There is no rule.

12,447. What are your average wages?—I have taken out a return purposely to give it you for the last five years, and the average of every man and boy employed upon the mines, adding up the number of hands employed upon the mines, not distinguishing boys from men, amounts to a guinea a week; those are the net earnings; all the deductions are taken away first, candles, tools and powder, which are deducted from the bargains, those do not appear in our pay sheets at all.

12,448. What are the highest wages of those who work underground?—A few men will occasionally earn up to 7*l.* a month. Men repeatedly earn up to 25*s.* a week.

12,449. Is that for any peculiar work?—No, simply that they have worked hard, or that for a time that their pits have been rather favorable for their working. Last month, which is a very fair average, the underground men at the Parks mine earned 4*l.* 10*s.*, the underground men at Whitriggs mine earned 4*l.* 15*s.*, and the Newton and the Mousell underground men earned 4*l.* 10*s.*

12,450. (*Mr. Austin Bruce.*) Were those months of four weeks?—Yes. We have thirteen months for the year.

12,451. (*Mr. Davey.*) Is each man paid separately; —All the surface men are paid separately; the men who work upon the tops of the pits are paid separately but the underground men are put into what is called a set, and are paid so much per ton for the ore which they raise. They depute one of their number to come, I do not know whether it is invariably the same, I never enquired into that, but he is deputed, and his ticket is given to him properly made out, and the money, and they invariably meet together, look at the ticket, and divide the money.

12,452. Is it paid in gold and silver, or any portion of it in notes?—We pay as much gold and silver as we can get; we are obliged to use notes.

12,453. To each of those parties, I presume that the money is divided equally?—I believe so; we have never heard of any distinction.

12,454. What is the number of a party?—They will vary from six or even four, and sometimes as low as two but very seldom that, to as high as 20 or 25. We pay to one man, but the bargain is made with the whole; in a certain respect you may say that one man is responsible, but practically it is not so; simply for convenience sake one man's name is taken.

12,455. Supposing that a man undertook a bargain would you recognise that man and allow him to take men at labour instead of their being partners with him?—Certainly not; I must mention, however, that in one of our mines, which is a peculiar one, dealing with a different class of ore altogether, which is called puddling ore, namely, Whitriggs, the ore lies in a very peculiar manner amongst the rock, and after the mine has been wrought and re-wrought somehow or other the levels get filled with ore again; how it gets there we cannot tell; and we have found it sometimes an advisable thing to let a man take a small piece of ground for two months or three months, and work that piece of ground at so much per ton, and let him do what he likes with it, and allow him to employ men, but it is a thing which we discourage, and which we should only do in a particular case of that sort, and for this reason; if they take a pit they may perhaps work for a fortnight or a month where two men are amply sufficient for the purpose without getting any ore of any moment; they may suddenly get into a piece of ground where there is a good deal of ore; it would be very hard to prevent their taking men on to get it, because two men would not be sufficient; it must be got out quickly, but it only amounts to a few tons in the course of a week, it is not to be considered at all as a system, and it is not a thing that we like.

12,456. (*Mr. Holland.*) What is the nature of the accidents which happen?—About eight years ago a party of men were at their dinner, when a small quantity of water broke into the mine; it got into one of the levels and made a noise in rushing through it. The men immediately went to the bottom of the pit; all of them came to the surface except four, who thought they would go back to see what it was; they went without candles, and got into the level where the water was running; they got confused and were taken off their legs, and were drowned, the depth of water in the level never exceeding a foot; in fact they were in darkness; there was a quantity of sand, they fell with it, and it choked them.

12,457. (*Mr. Kendall.*) Those men went from mere curiosity?—Yes. The next accident was this: a party of men wanted to leave work rather sooner than usual, and they sent up a top hand to assist in working the waggons a little quicker on the top. Under those circumstances rules are disregarded; both sides of the pit were opened together; the man put one of the bogies into the empty part; not being accustomed to it, it went to the bottom, and he followed it. The next accident was through a direct breach of a rule. A man went down to the bottom of the pit to see that it was ready to arrange the bottom of the pit for the skip to come to the bottom, and then the men at the top were preparing their timber, and they had to pass down their timber and their tools, but before the men had got the pit top arranged they passed on to the cage the timber and the picks; one of them fell over and struck him in the centre of the head and killed him on the spot. The next accident occurred about 12 months ago; we were temporarily obliged in a pit to have a ladder way up the side of the pit in the cage shaft. At that time, and now we are working that engine, both for drawing ore and pumping water. At certain periods they disengage the skips, and let them rest at the bottom of the pit, but during intervals of work the cage is in the pit while they are pumping the water, and the rule laid down for the men is that no man is under any circumstances, to go into that pit to climb without ringing to the top of the pit and having the winding engine stopped while he is climbing the pit, and he has no right to go into that shaft until it is signalled back again from the top that all is in order. While the cage was going up these men went into this pit and set to work to climb, the cage instantly went down, and knocked both men down over the ladder.

12,458. (*Mr. Holland.*) Are there accidents often from the falling of the timber?—Very rarely indeed; the men are accustomed to it, and they keep their ground properly timbered. So strongly do we feel upon that point of keeping the ground properly timbered that we never work in our mines more than one set of men a day, and it would be a very urgent case of necessity that would induce us not to put in the timber before they began to work. Each man is sure to throw the blame upon his neighbour for not keeping the ground timbered. We found that the men worked to such an extent as to enable us to get a sufficient quantity of ore per annum without working more than I have stated.

12,459. Would it be expedient to employ separate timberers from the men?—No; because the distances are so great that you would not have them when you wanted them, and if anything went wrong the timberers would be blamed immediately, and they would not have the same interest in the men's safety as the men who do it themselves. The men have to repair, and if it is not done properly it falls upon them to do it without extra pay, whereas with the timberers it would be otherwise. The system is altogether so different from that of coal mines that you can hardly compare the two.

12,460. (*Mr. Kendall*). As I understand the nature of the deposit, you cannot work upon any regular system as regards shafts?—You cannot. We endeavour to do so as much as possible.

12,461. Is your ground very expensive in sinking shafts or not?—It would not be called expensive as compared with Cornwall, but it is expensive in sinking in the rock.

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12,462. What is the average depth?—Thirty fathoms. Our engine pit has cost us a guinea an inch for the last 10 fathoms.

12,463. Is there any material difference between the working of your mines and of the other mines in the neighbourhood?—I do not think that there is.

12,464. (*Mr. Austin Bruce.*) Have you any little people here?—Yes; there is just the usual difference between great people and little people. We find it to our interest to manage the mines well, and if we were little people we could not afford to spend the sum of money over them which we do.

The witness withdrew.

Mr. Richard Hosking examined.

Mr. R. Hosking.

12,465. (*Chairman.*) Of which mines are you the manager?—Parks, Mousell, Whitriggs, and Newton; the mines belonging to Schneider, Hannay, and Company.

12,466. How often do you visit each of these mines?—Newton is a very small affair; perhaps I go there once a week or twice, just as occasion requires. Whitriggs is very small, I am not so often present there. Mousell is rather larger, and I am perhaps there twice a week. At Parks I am every day when I am at home.

12,467. Can you give the number of men employed underground in each of these different mines?—There are 450 men in all the mines underground and at the surface.

12,468. How do the men go underground at Newton?—By the ladders.

12,469. What is the greatest depth of the shaft there?—Thirty fathoms.

12,470. What is the greatest length of the drift?—The greatest length of the drift is on the plan. I should think that it would be about 60 yards.

12,471. In any of these mines have you had to adopt any artificial means for ventilation?—Very seldom indeed. In some chance times in driving the opening level we have had to put in a waterfall, but we have never had to do what may be called blowing the bellows or anything of that sort.

12,472. Have you any machinery for blowing in air?—No.

12,473. What course do you ad pt when it is necessary to improve the ventilation?—When it is necessary we put up pipes and raise them a good height above the pit; the air descends and draws the bad air out; it causes a ventilation. We put wooden pipes and fasten them to the side of the pit, and raise them in the air, and extend them into the level, and that causes a communication.

12,474. Does that take air down or bring air up?—It takes the air up.

12,475. How high above the surface of the ground do you take the pipes up?—Twelve to 15 feet.

12,476. Is that sufficient to make a current of air?—Yes; it is only required occasionally just for a trial pit or anything of that sort; we should not require it for working.

12,477. But for working you have a waterfall have you not?—Yes.

12,478. Have you it now anywhere at work?—Yes, at Parks; that is for a drainage level at the bottom of the mine to communicate it with the other pits, and as soon as we can we put down those other pits to communicate with that bottom level, and then this waterfall would not be used.

12,479. You find the waterfall sufficient?—Quite.

12,480. Do you ever use a fire-pan?—Occasionally we have had to do so in summer, in case of very hot weather, but very seldom; perhaps for two or three hours in a day during the hot days of the summer. This summer we have never had occasion at all to use it except once, only one day.

12,481. Whatcaused you to use it on that day; and how did you ascertain that it was necessary to use it?—There seemed to be a stand of the air; it wanted the current breaking; it waved backwards and forwards in the level, but would not ascend.

12,482. Who found that to be the case?—You found it in going down the pit.

12,483. Did you discover it, or did the men discover it?—The men discovered it.

12,484. How did they discover it?—By the candles not burning.

12,485. Did they come up immediately?—Yes, and adopted this system.

12,486. How long had they to be off work?—Perhaps two or three hours.

12,487. After the fire pan had been put down two or three hours they could go back again?—Yes, by putting the fire-pan down it breaks the light air at the bottom.

12,488. You do not blast much, I believe?—We do not blast any of the ore in any of the mines, only in sinking the rock pits, or driving the rock levels to open a mine.

12,489. Are you particular as to the quality of candle which you give the men?—We use one quality of candle. I never remember seeing any but one quality of candle here; it is the common tallow with a cotton wick.

12,490. (*Mr. Austin Bruce.*) Do you ever have any complaints of the men that they are working in insufficient air?—No; they cannot work in insufficient air, the candle will not burn, that decides it at once.

12,491. A man may work in air that may be unwholesome, although it may not be bad enough to put out the light?—I do not think he can in these mines.

12,492. There are degrees of badness before a candle is put out?—We do not drive it to that extent as to put the candle out before we stop it. First of all, it burns upright; if the air is getting to be what we call impure or short of air (bad air we call it) you have to lower the candle more and more until it gets down on its side before you can get it to burn, and after you begin to lower it from a horizontal position then the grease begins to run on the wick, so that it puts out the candle of itself.

12,493. Is the heat very great below?—Not at all.

12,494. How do the men work, as regards their clothing?—Some work in flannel, and some in a check.

12,495. Do any men work naked?—No; it is not so warm as to require that; I never saw a man work naked in those mines.

12,496. (*Mr. Kendall.*) Have you ever worked in any other mines than these?—Yes; I have worked in Cornish mines.

12,497. (*Mr. Davey.*) You are a Cornish man, are you not?—Yes.

12,498. (*Mr. Kendall.*) Have you known bad air there sometimes?—It is much similar to what it is here.

12,499. Is it just as bad in Cornwall as here, and just as bad here as in Cornwall?—I found the air in Cornwall give way just the same as it does here.

12,500. (*Mr. Holland.*) As frequently here as in Cornwall?—No, I do not know that.

12,501. (*Mr. Kendall.*) In how many Cornish mines have you worked?—I have worked in Carn Brea mines, and I have worked in some mines near Pool, East Crofty; and I have worked in some mines near Marazion.

12,502. Have you worked as a tributer or as a tutworker?—Both.

12,503. Have you worked in the deepest levels as well as in shallower?—I never worked below 100 fathoms.

12,504. Was that in consequence of the fatigue, or in consequence of the air?—I did not like the climbing of the ladders, that was the thing that I most looked at.

12,505. With regard to the ventilation, did you

ever suffer much from bad air there, so far as 100 fathoms goes?—No, I never did. Sometimes in driving a level, before you could communicate, the air was not good.

12,506. You do not see much difference between the air here and in Cornwall?—Not at all.

12,507. What do you call the air here?—I consider that here it is very good air indeed, but we are not plagued here with the powder smoke which they have in Cornwall; our air is purer, we have not the sulphur in the working of the mine the same as they have there; there may be some little impurities there which we are not troubled with here.

12,508. If I understand you generally speaking your air is good, but when it is bad air it is very bad?—Yes.

12,509. There is not much degree about it, it does not get from bad to worse?—You feel first that the candle will give way and the next thing is that you will feel a want of breathing.

12,510. When the air is at all bad it is generally distinguished by being very bad?—Yes.

12,511. Is that rapidly?—It will vary in the distance that you are extending your level; another thing accounts for it, namely, the way in which the wind blows on the surface.

12,512. As I understand you your deposits are so very uncertain that you cannot work as in other mines upon anything like a system?—We can in the Parks mines.

12,513. Why can you do so there?—Because we have there a sufficient flow of ore which will allow us to lay out a sufficient amount of money for it, but in the little patches of ore you cannot do so; you then sink down a shaft into the ore and then you perhaps get another to communicate and you just work those two pits.

12,514. Are your shafts expensive or not?—The rock ones are, we have one that cost us nearly 100*l.* a fathom, I am certain that 10 fathoms of it did so.

12,515. Does not it sometimes happen that in consequence of the expense of shafts there is a greater delay in sinking a shaft than there ought to be?—I do not think that.

12,516. (*Mr. Holland.*) You know that miners' consumption is very common in Cornwall?—Yes.

12,517. Do you see anything of it here?—No, I have never known a case of it here.

12,518. What do you think is the reason of its absence here?—The mines are not so hot and we have not the powder smoke to contend with, there is no doubt that that is the cause.

12,519. Is there less climbing?—Yes.

12,520. Is there as much beating the borer here as in Cornwall?—It is nearly all pick work here.

12,521. Do you attribute much importance to that?—No, I think not.

12,522. Have the men less oppressive work here than in Cornwall?—They have heavier work here than in Cornwall.

12,523. They have more heavy lifting and so on?—Yes, the picking is harder work than the boring and the metal that they are working amongst is heavier.

12,524. Does the picking put them out of breath as much as beating the borer?—It is much the same, but the Cornish work is generally lighter than this work is. Of course you can use the pick or the hammer to any extent, you can work easy or you can work hard with either of them.

12,525. Have you ever known men obliged to charge more for their work because the air is bad here?—No.

12,526. You have often known that in Cornwall, have you not?—Yes.

12,527. When the air has been very bad they have been obliged to charge a considerably higher rate?—Yes, they perhaps are paid twice or three times the price for the ground in Cornwall that should be paid for it if the air was good.

12,528. You have known that in Cornwall?—Yes.

12,529. But you have never known it here?—No; in Cornwall they have hard ground to get communication but that is not so here.

12,530. If the men are exposed to poor air here is it only for short periods?—Yes.

12,531. But in Cornwall it may be for a long period?—Yes, it may be for months in order to establish ventilation. The distance here is nothing, you can put down a pit in a few days and if you want to drive a level the ground is so soft that you can get it in a very few days.

12,532. Are not the wages better here than in Cornwall?—I think they are.

12,533. Do the men live better here than there?—I think they do.

12,534. Are they as sober do you think?—Generally I think they are.

12,535. Are not miners both here and in Cornwall very sober men as a class?—There are always exceptions, but as a class I think they are very well, I have not any cause to complain of it, taking them as a general body of men.

12,536. Are they a stronger class of men here than the Cornish men?—I think they are.

12,537. They are bigger men?—Yes, they are more adapted for this class of work.

12,538. Are they more muscular men?—Yes.

12,539. Have they more flesh about their bones?—They are stronger men generally.

12,540. Are there more old men amongst them?—Yes.

12,541. Are you sure of that?—Yes.

12,542. Are there a good many men of 50, 60, or 70 years of age?—Yes; we do not call a man old here unless he is after 60 years of age; in Cornwall there are hundreds of them old men at 45, their constitutions are breaking up.

12,543. Have not the mines here expanded very rapidly?—In the last 15 years.

12,544. The men are generally young men when they begin?—Yes.

12,545. (*Chairman.*) Can you state the number of men at the different mines which are under your charge?—The underground men at Parks are 131; surface men 111. At Whitriggs underground and surface 74. At Newton 44 undergound and surface. At Mousell 90 underground and surface. The total is 450.

The witness withdrew.

Mr. STEPHEN JACKSON examined.

Mr. S. Jackson.

12,546. (*Chairman.*) You are manager for the Ulverstone Mining Company?—Yes.

12,547. What are the names of the mines over which you have charge?—Lindale, Cote, and Eure pits.

12,548. They are iron mines?—Yes.

12,549. Which is the largest of those two mines—which has the most extensive workings?—They are worked together as one mine.

12,550. What is the number of men altogether employed?—We have only about 60 men and boys altogether.

12,551. How many are underground?—I should think about one half, as nearly as I can recollect.

12,552. What is the greatest depth of shaft?—The greatest depth that we are working is 115 feet.

12,553. What is the greatest quantity of ore which you raise in one year?—About 25,000 tons.

12,554. How long has this mine been at work?—The Lindale Cote mine has been worked for about 25 years, and is worked out. We are not working there now, we are working the Eure pits now. We are only beginning to work as it ought to be worked. We have heretofore not had anything very satisfactory, only

single workings, but now we have sunk an engine shaft; we are about putting up an engine, and we are driving a level through all the mining ground.

12,555. Do you go into all these drifts from the shaft?—We shall go into the drifts from the engine shaft, at least we shall have a connection from the level to all the shafts that we shall sink.

12,556. How many shafts have you sunk?—We have four shafts working at present.

12,557. Are those connected?—They are not connected. The No. 3 and No. 4 shafts are connected, and the No. 1 and No. 2 are connected as air shafts—there is an air draught between.

12,558. Is the air draught below where you are working?—No, it is a little above where we are working.

12,559. Is that air shaft under the limestone rock, or is it through the ore?—It is through the ory ground.

12,560. What is the nature of the surface above where you are working?—Generally pindle.

12,561. Do you support that with timber?—Yes.

12,562. What amount of timber do you suppose is used?—We use a large quantity, according to the quantity of ore that we get.

12,563. What proportion?—We calculate that every ton of ore costs us a foot of wood, so that our consumption of timber would be something over 20,000 feet in the year.

12,564. In these workings have the men ever found fault with the air?—Very rarely.

12,565. But they have sometimes?—Sometimes, in a very extraordinary hot time.

12,566. What means do you then adopt?—We have a fan blast.

12,567. How is that worked?—By a boy from the surface.

12,568. That forces the air down what kind of pipes?—Through wooden pipes.

12,569. What is the size of those pipes?—I think they are about five and a half or six inches square.

12,570. Are they taken that same size the whole way down?—Yes, and forced into the drift.

12,571. How are the wooden pipes made air-tight?—They go one into another, and they are clayed at the joints.

12,572. Are they morticed in the wood, or is the wood merely nailed together?—It is nailed together; it is planed and put together with white lead, but we very seldom have occasion for them.

12,573. When you have had occasion for them, what has caused the necessity to be apparent to you?—The heat of the atmosphere.

12,574. Have the men complained?—Of course the men make a complaint to the underground agent.

12,575. How do they ascertain that the air is light?—When they cannot keep their candles burning.

12,576. They have no other means?—No. If they find that the candles will not burn well, they say that there is not sufficient air to work.

12,577. Do you supply the men with candles?—Yes.

12,578. What do they pay for them?—They pay 7*d.* a pound for them.

12,579. Do you allow them any special quantity?—They have as many as they require.

12,580. Do they use them at their own houses?—I think not; I have never known an instance where they have done so.

12,581. But if they paid for them, would you find fault with it?—We should. We do not wish them to be used for any other purpose than our own.

12,582. But you do not limit the quantity?—No, we pretty generally know hat a wset of men should want in candles during the week.

12,583. But you would give them more if they wanted it?—We should not hesitate to give them a pound or two extra, if the men could assign any reason.

12,584. On working in a party, how much a week is used?—They use about a pound a day, about 7 lb. in a week, that is for one set of men.

12,585. How many men?—Generally about two men.

12,586. Do the men pay anything to a club?—No, we have no sick club.

12,587. Are there any deductions for a doctor?—No, none at all.

12,588. Or for schools?—No. I think that Mr. Brogden subscribes pretty liberally to schools.

12,589. What are the deductions from the men?—We have no deductions from the wages of the men excepting for candles.

12,590. And for sharpening the picks?—No, we find them with picks.

12,591. They bring them back to you?—Yes.

12,592. How often do you pay them?—Every four weeks.

12,593. Are they paid up fully, or is there an arrear?—There is the on-lying week.

12,594. Do the men live near the mine?—Not near the mines generally.

12,595. Do they change their clothes when they go into the mine?—Some of them do, and some of them do not.

12,596. Where do those who change their clothes change them?—We have a changing house.

12,597. Are there any means of drying the clothes?—The clothes are always dried in the engine-house.

12,598. But there is another room for them to dress in?—Yes, but they very seldom use it, unless you you forced them there they would go to the engine-house.

12,599. There is no lodging house on the mine?—None.

12,600. (*Mr. Austin Bruce.*) Do you consider them a healthy race of men?—Yes, they are very healthy.

12,601. As healthy as the agricultural labourers about?—I think so.

12,602. You have 30 men underground?—Yes.

12,603. What is the age of the oldest among them?—I should think that the very oldest, perhaps, may be 50 years of age, something of that sort.

12,604. Do you find that 50 is the age at which they usually leave off work?—No, I think not; they often times get a job at the surface when they get up to an age of that sort.

12,605. Which they like better?—Yes, as a top hand. We find our own top hands from them; those are the men who land the bucket and wheel it to the heap.

12,606. The work underground I suppose is hard?—It is hard for a man getting up to that age, it must be so.

12,607. You do not employ any before 18?—No, and none, I think, so young as that. I think they seldom, if ever, come to the mines till after they get married. I scarcely know one. They generally have been farm servants, and then as soon as they get married, they want some more money, and they go to the mines.

12,608. Do you know of any complaint to which miners are subject, and other people not subject?—No, I never knew any complaint whatever. I think they are as healthy as any other class of men that we have in this country.

12,609. Have you had any strikes at your works?—No.

12,610. The men on the whole are contented, are they?—Yes. I have been manager for 14 years, and I have never had the least disturbance with the men at all.

12,611. Is there any difference in the appearance of a miner and of a man who works on the surface?—I think that the miners really look as well as any other men either on the surface or under the surface.

12,612. He is not paler?—No; I do not think that any class of men looks better.

12,613. You are a representative of a company?—Yes.

12,614. Are there some mines carried on by people with small capital?—Yes.

12,615. Is the ventilation there equally good?—There is only one that I know of, and that is the Dalton Mining Company; and they are only just starting, and they have only two shafts, and they have a roadway between one and the other; so that there they have abundance of ventilation.

12,616. Have you plenty of labour here?—Yes; we have never had any difficulty in finding labourers.

12,617. Do you employ imported labourers, or does the district supply you with a sufficient number?—They are either raised in the district or come from a distance.

12,618. Where do they come from?—There are a great many both from Ireland and from Cornwall.

12.619. Do the men object to strangers coming among them?—No.

12,620. Do the Irishmen never get ill-treated?—No; they work comfortably together from anything that I have known; and if it had not been so, I am sure I should have known.

12,621. Did you ever know the men complain of the ventilation without reason?—No, I do not think they do.

12,622. Have you ever known any complaint not attended to?—No, it is our interest to attend to it. If the men cannot work without air, we must get it for them. The new mine which we are opening out now will be upon a much better principle than the old one was, for the main drain which we are taking up, will afford ventilation from one end of the mine to the other; and all the mines which we sink independently of that will be connected.

12,623. Then if the ventilation of this mine is better, in the former works it must have been worse?—Yes. I am speaking of the same works about which the gentleman was asking me before.

12,624. Were the men none the worse for working in the inferior air?—They cannot work at all in inferior air.

12,625. But they did work in these pits which were not so well ventilated as those which you are now going to work?—So soon as they find that the air is not good, they cannot work, and they come up and they must do so.

12,626. There is a degree of bad air in which a man may work, although he is not forced to relinquish work?—Perhaps there is.

12,627. Was not that the case in the pits which you say were less well ventilated than those which you have in hand?—It must be so till there were such appliances as would make them better.

12,628. Nevertheless do you say that the health of the men was satisfactory?—Entirely so.

12 629. Do you know any part of the country where the health of the men is not good?—Among the iron miners, I do not know of any; I think that the iron miners are as healthy a class of men as any in the country.

12,630. (*Mr. Kendall.*) What I understand you to mean by better ventilation under the present system is, that whereas under the old system at times there was bad air, and the men could not work and did not work; by the present system men will be able to work on?—Yes, clearly so.

12.631. Though they could not work at times in consequence of bad air, yet those times were few and far between?—Yes.

12,632. And that will be now remedied?—Yes.

12,633. The men did not suffer?—No, not in their health.

12,634. What was your occupation before you were an agent?—I was agent for the Lancaster Banking Company, and I was an ironmonger and grocer and general merchant.

12,635. You were not a miner?—I was not.

12,636. As far as the mining goes here, you take the men from husbandmen?—Almost invariably they are husbandmen who get married.

12,637. Then as I understand it does not require very much skill to be a miner in these mines?—There is probably somebody in the mines that they are acquainted with, and they get introduced, and get to be wheelers, and then fore-breast men, and so on.

12,638. They easily slip into the work?—Yes.

12,639. It is not like the copper mines?—No.

12,640. Do the men ever make money and go into trade?—I do not believe that they do; no one of them has ever saved money that I know of. They get more than 1*l.* a week on the average.

12,641. You do not know an instance of men saving money out of their wages, and building their own houses?—Yes, they save a little money and build houses, and some have money in the savings bank, but they generally confine themselves to that.

12,642. They do not go into business or take farms?—Not that I know of.

12,643. Do they live better than the husbandmen?—They live very well. I could not positively say that they live better.

12,644. (*Mr. Austin Bruce.*) What are the wages of the husbandmen in this district?—I should fancy that a good husbandman would get 20*l.* a year, and his meat in the house.

12,645. (*Mr. Holland.*) They all have meat?—They all have meat pasties.

12,646. (*Chairman.*) What are a country labourer's wages per week?—Our own labourers are generally paid about 2*s.* 6*d.* a day. That is for men that we have occasionally doing about.

12,647. (*Mr. Kendall.*) And you think that your miners get about 25 per cent. more than your labourers?—I think more than that; they get nearer 50 per cent. more, and they only work seven hours. They are eight hours upon the mine, but there is an hour wasted, they have an hour for dinner.

12,648. (*Mr. Holland.*) Do they occupy their spare time productively at all?—Many of them do in the summer time; they garden.

12,649. They do not hire themselves out to other persons?—No, excepting a little bit in the harvest time; they may go and do a little bit at shearing or something of that sort.

12,650. Have they commonly gardens attached to their houses?—Yes, a great many of them have; those who live in Ulverstone. There are patches let out as garden plots.

12,651. Then their real wages are more than you say; there is their profit upon that garden; it saves money?—Yes. An underground man on an average will get a guinea a week, and some more.

12,652. They are constantly employed the whole year round, are they not?—Yes.

12,653. Do agricultural labourers get constant employment the whole year at that rate?—No. What you would call occasional farm labourers are, I know, very subject to be thrown out many months in the winter.

12,654. In that case the miners' wages are very much higher that the agricultural labourers' wages?—Yes.

12,655. Do they lodge better than the agricultural labourers?—Yes.

12,656. And feed better?—Yes.

12,657. Do they clothe better?—The farm labourers I think clothe as well as the miners do.

12,658. Are they quite as sober and steady in their habits as farm labourers?—Our men are at any rate. I have never had cause to complain of one of them since I was at the mines. They are generally, I believe, entirely well behaved.

12,659. They enjoy a good character for good behaviour?—Yes, and for honesty.

12,659*a*. I believe that the statistics of the district show it to be remarkably free from crime?—Yes; we have little petty thefts now and then, but not much.

The witness withdrew.

EDWARD WADHAM, Esq., examined.

FURNESS ABBEY.

E. Wadham, Esq.

30 Sept. 1862.

12,660. (*Chairman.*) I believe you are agent to the Duke of Buccleuch?—Yes.

12,661. Has he any land in this locality?—He has some small quantity of land, but his property is principally mineral property.

12,662. How long have you been agent to the Duke of Buccleuch?—Twelve years. The owner of the minerals is not the owner of the soil.

12,663. Had you much acquaintance with the working of mines before you came here?—Before coming here I was engaged in Scotland in the working of mines.

12,664. What is your experience with regard to the working of mines? Is it in the actual working or in the management of mines more especially?—Both in the actual working and in the management.

12,665. Do you know how the mines are worked underground?—Yes.

12,666. Do you go underground?—Yes.

12,667. Is that part of your duty?—It is part of my duty to inspect the underground workings.

12,668. Can you give the names of the mines of which you have charge?—There are the Lindale Moor mines, Whitriggs, Cross Gates, Lindale Cote, Newton and Eure pits. I think those are all.

12,669. Has the Duke of Devonshire much mineral property in the neighbourhood?—The Duke of Devonshire has only one mine in the country, namely, Parks.

12,670. From your acquaintance with the men, do you consider them healthy?—Decidedly so.

12,671. Are they well conducted as a class?—I think they are as well conducted and in fact better conducted than so large a body of workmen generally are in masses together.

12,672. Is there any peculiar disorder attaching to the miners?—I am not aware of any. If there is anything they are rather subject to rheumatism.

12,673. Are the mines wet here at all?—In some instances they are.

12,674. Which are the wettest mines of those of which you have charge?—I think Whitriggs is the wettest.

12,675. Is the water pumped out?—Yes.

12,676. Which are the deepest mines worked?—The deepest mine worked here at present is, I think, at Lindale Moor; but we are continually sinking deeper and deeper. We do not partake of the nature of a coal stratum.

12,677. Are not what they call air levels from one shaft to another generally driven preparatory to working a greater depth?—We drive the air levels in the course of our regular workings, and we leave the old drifts above with troughs in them to form air levels after they are done with. When we have done with a drift (which closes in, in the natural order of things), it is filled full of troughs to convey the air; it gets squeezed down to that small size, so that afterwards it is preserved as an air course; by that means the troughs carry the air.

12,678. What are the troughs made of?—Wood.

12,679. Is that sufficient?—We have always found it so.

12,680. Must they not crush in at times?—By that time we have other air courses open. The whole system of our working is a system of air courses. We only depend upon the troughs just for a temporary arrangement; they eventually become closed up. We are obliged in our mining here to make fresh arrangements continually. You cannot sit in an office and say, "We will bring our air round here," and so on, because our top is continually coming down. We have no roof. We are always making provision below while we have that above as a safeguard.

12,681. What artificial means are used in these mines for ventilation?—It is seldom that it is required. When it is required two methods are adopted, either hanging a fire-pan in a shaft, and thereby drawing the air, or putting down pipes, and attaching a fan blast and forcing the air down.

12,682. Do you ever use a water blast?—We have no water blast in the mines under my charge.

12,683. Have you ever been in any of these drifts when the air has been bad?—Yes, upon one occasion.

12,684. Did you feel the effect yourself, or did you see it?—I felt it myself.

12,685. What was the sort of feeling?—A kind of feeling of want of air altogether, which would cause fainting.

12,686. Not excessive heat?—No, just a dullness, a want of ventilation.

12,687. Did the candle go out?—No.

12,688. (*Mr. Holland.*) Did it feel cold?—No, I felt a gradual sinking.

12,689. (*Chairman.*) So that that may happen although the candle does not go out?—It may happen although the candle will burn, but burn dull.

12,690. In the mines with which you are connected is there any uniform system of payment as to the days on which the men are paid?—They are paid once a month in some of the mines, and once a fortnight in the others.

12,691. What is the length of time for which the money is retained in hand?—Universally a week.

12,692. On what days of the week are they paid generally?—On the Saturdays.

12,693. Some mines are paid on the Fridays?—Yes; Mr. Schneider's mines are paid on the Fridays, but the others are all paid on the Saturdays.

12,694. Do you observe any difference in the conduct of the men of those mines which are paid on Fridays, and those which are paid on Saturdays?—No; I think no material difference.

12,695. Do the men get advances during the week if they require them?—They do. On every Friday or Saturday they can obtain an advance.

12,696. Is it given by an order to get provisions?—In some cases in cash, and in some cases by an order to get provisions; it is at their own option entirely; I do not think that in any one instance in the whole district we have a shop connected with the mine.

12,697. But there are shops where an order from a mine would be attended to?—Yes.

12,698. (*Mr. Austin Bruce.*) I suppose it is your duty as agent to the Duke of Buccleuch, to see that the mines are worked in a manner advantageous to your employer?—Yes.

12,699. Has it ever occurred to you that the men have complained to you of the ventilation of the mine?—Never.

12,700. In the instance which you mentioned of your having found yourself in bad air, the men, I suppose, had ceased working?—Yes.

12,701. They could not have worked there?—They would not have worked; the men are never forced to go down a place here; as soon as ever the air becomes dull they are allowed to come up immediately, which they always do.

12,702. Is it always on those occasions, when, from external causes, the draught ceases, that the men suffer from deficient ventilation?—That is the only time.

12,703. Have you never known them suffer when they were driving a-head before they connected one shaft with another?—I have never known them suffer; I have known them not being able to work so many hours, but I have never known an instance of a man being injured by it at all. We have stopped drifts from that cause because we could not carry them any farther.

12,704. What is your opinion of the relative healthiness of the mining and the agricultural population?—I should almost think that the miners had the advantage.

12,705. The population of this district is on the whole a very robust population?—Very much so indeed.

12,706. What mines were you working in Scotland?

—I was at the Forth Iron Works. That was coal and ironstone together.

12,707. Should you say that the workmen here were better or worse, or that there was any difference between them and the workmen at Forth ?—I think that our men here are better off.

12,708. In what respects ?—They are both better clothed and better fed.

12,709. They have better wages I suppose ?—On an average they have better wages.

12,710. (*Mr. Holland.*) Are they better lodged ?—Yes.

12,711. (*Mr. Austin Bruce.*) Have you ever known any strikes ?—No.

12,712. Have you known anything like general discontent among the workmen ?—No.

12,713. Do you believe that inspection on the part of the Government would do any good ?—I do not think it would ; the Government would require to send a man who had very peculiar experience to make any inspection of any value ; it is entirely an isolated description of mining.

12,714. Assuming a man to be perfectly qualified, of what use do you suppose he could be ?—Merely that the Government would feel satisfaction by gaining reports that things were carried on properly. I see no reason whatever for appointing an inspector, but it might be a satisfaction to both parties.

12,715. (*Mr. Kendall.*) Do you think that the appointment of a Government inspector would create a jealousy ?—I do not think so. I do not think that a man among them would object to it.

12,716. Not those parties who work the mines ?—No; provided that a man were appointed who understood this description of mining. I consider that they would feel very great jealousy if a man were put on who had never seen a hematite mine before.

12,717. I would ask you a general question, take the simple question. Do you or do you not think that the appointment of inspectors of mines in this neighbourhood would create a jealousy among the parties ?—It possibly might.

12,718. Would it do good or harm as far as it went as to the development of the mines ?—I must give you a qualified answer to that question. It could not do any harm provided the man understood his business, and it might do good ; but it might very possibly do a serious injury if a man were sent down here who had never been in a hematite mine before.

12,719. Are the mines worked here by parties taking them as a speculation ?—No.

12,720. Does the Duke of Buccleuch work his own mines ?—The Duke of Buccleuch lets them out to tenants.

12,721. Do you think that you would have the same facilities of getting tenants if there were inspectors as if there were none ?—Quite so, I think.

12,722. You merely go down the mines to see that they are fairly worked ?—Yes.

12,723. You have nothing to do with the setting of the work ?—No, excepting that if they were worked in such a way as that by those workings they would hinder future workings, I should at once direct the works to be set out in a different way.

12,724. You do not set a bargain to any man ?—Nothing of the sort. I am merely an inspector of mines for the Duke of Buccleuch.

12,725. Therefore you are not required to go underground very frequently ?—No.

12,726. How often do you go underground on an average ?—I perhaps average once a month at each mine.

12,727. With regard to the foul air from which you once suffered, is that the only time that you ever suffered from it in your life ?—Yes.

12,728. Can you account for that at all ?—The atmosphere at the time was heavy, and there was a want of circulation in the pit.

12,729. Were the men working there at the time ?—The men had been working, but they had gone out because the air was tight, and I went in to see what sort of a place it was.

12,730. The men had quitted on account of the foul air ?—Yes.

12,731. And you wanted to know what foul air was, and you found out ?—Yes, I satisfied myself.

12,732. (*Mr. Davey.*) You say that all your mines are paid on a Saturday ?—Yes, with the exception of Mr Schneider's.

12,733. Are the men paid at the mine in their working clothes ?—Yes.

12,734. Do they come regularly again to work on the Monday morning ?—We miss a few; but as a rule they come very regularly. I think that the behaviour of the men has been very much improved in the last four or five years; we have not so much drunkenness. There has been great provision made by schools and clergymen, and also the tenants themselves have set on fines for men who do not appear on the Monday morning, and that has a great effect in checking the drunkenness.

The witness withdrew.

Mr. ALAN BACKHOUSE SALMON, Junior, examined.

12,735. (*Chairman.*) Of what mine have you charge ?—I am managing clerk for Roanhead Mine.

12,736. That belongs to Kennedy Brothers ?—Yes.

12,737. That adjoins the Park mine ?—Yes.

12,738. Is it worked in exactly the same way as the Park mine ?—Upon the same principle.

12,739. In ventilation, when that is required, what means do you adopt ?—The underground captain I expected would have been called probably for that purpose ; he is here.

12,740. With regard to candles, is that a deduction ?—It is a deduction.

12,741. How much ?—The men are charged 8*d.*, but then it is made up in the price which is given for fathom or tonnage work.

12,742. Do they pay for tools ?—No, every working tool is found.

12,743. They do not pay for wear and tear of tools ?—No.

12,744. What do they pay for powder ?—That is found.

12,745. When are the men paid ?—Every four weeks.

12,746. Is a week retained ?—The-on-ligging-week is kept back.

12,747. On what day in the week are they paid ?—On the Saturday, at about two o'clock in the afternoon.

12,748. Are they paid at the mine ?—Yes.

12,749. Do the men come back to work regularly on Monday ?—Very regularly indeed. I am happy to say that they are perhaps as sober as any, or the most sober I think of any working in the district.

12,750. Do they pay anything towards schools ?—Nothing is paid towards schools.

12,751. Do they pay towards a club ?—We have a sick club.

12,752. What do they pay to the sick club ?—1*s.* 6*d.* a month ; 4½*d.* a week.

12,753. Does that include sickness and accidents ?—Sickness, and in case of death a payment at death.

12,754. In case of sickness is there an allowance ?—Yes, a weekly allowance.

12,755. Is there any doctor ?—We have no doctor for the mine. The chief of our miners are connected with clubs in the town of Dalton ; if they by chance are on the sick list they are really getting nearly as much from our sick club and the club that they are in as if they were working.

12,756. Although they are on a club you pay the same ?—Yes. We allow 8*s.* a week to them in sickness, and 3*l.* in case of death, and invariably the pro-

FURNESS ABBEY.

Mr. A. B. Salmon.

30 Sept. 1862.

prietors inter any one who dies by accident, which I am happy to say is of very rare occurrence.

12,757. Have you had any accidents?—Very few indeed.

12,758. Any within the last three years?—Two fatal accidents I think in that time.

12,759. By what were they occasioned?—By the falling of earth from what we call the fore-breast; the man had struck rather too far in.

12,760. Was that fall from the roof?—Yes, a sort of sloping fall."

12,761. What is the allowance of candles to each man?—About 2lbs. per week per man.

12,762. Are they limited?—No; if they work by what we call day work, we find the candles; the candles are merely paid for when they work tonnage and fathom work; we make no charge when they are working by day work, only when they are working by contract.

12,763. (*Mr. Austin Bruce.*) Have you ever had any complaints from the workmen that they were working in insufficient air?—No, we have not had any complaints at all on the mine.

12,764. Is your mining population a healthy one?—Very indeed.

12,765. (*Mr. Kendall.*) Your mines are nearly all worked on the same system about here?—Yes.

12,766. And when you know the history of one mine you know the whole of the mines?—I think that when you get the history of Harrison, Ainslie, and Company's mines, and of Schneider Hannay and Company's mines, you get the history of the whole of them. They are all worked upon the same principle, and they are all very unanimous in their work.

12,767. How long have you been with Kennedy Brothers?—Nearly six years.

12,768. What was your occupation before that?—I was a bookseller and stationer

The witness withdrew.

JOSEPH RAWLINSON, Esq., examined.

Rawlinson, Esq.

12,769. (*Chairman.*) You are owner of the Carr Kettle, Liddle Moor, Old and New Cross Gates and Eure Pits mines?—Yes.

12,770. How are they worked?—By shafts and drifts.

12,771. What is the deepest shaft?—The deepest shaft that we are working at present is about 65 yards; I believe the shaft is sunk to 80 yards, but we have never been at the bottom of the pit yet; it is sunk ready for extending the drifts.

12,772. What is the extent of any of the drifts that you are now working from the shaft?—From the shaft to the extent of some of the drifts may be perhaps 150 yards, or something like that.

12,773. Does the overlying ground collapse, and do you support it with timber, the same as in the other mines in the district?—Yes; it is much the same; we have a loose earth on the surface, what they call a pindle.

12,774. What means do you adopt when the air gets foul?—We generally have air passing from one pit to another, so that we get a regular communication, and in some cases, where we have an air way closed up (sometimes we go through clay) we put in a wooden trough about 12 inches square, which forms an air-way, that is a temporary act, comparatively speaking, in case that some of the drifts should get closed.

12,775. Have you never in your workings found that the men's candles would not burn?—In some instances, but it is very rare.

12,776. When that is the case, what do you do?—We should blow air in, or get a communication to another shaft as quickly as we possibly could.

12,777. Till you get a communication to another shaft, what means do you adopt?—We sometimes blow in air, either with a bellows or with a fan blast in some cases.

12,778. How is that fan blast worked?—By the engine or by hand.

12,779. Have you one fixed to the engine that we could see?—Not at present, we have no occasion for anything at present, but we have had such occasion.

12,780. Have you one on the mine that we could see?—We have a large cylinder bellows which you could see that we have used for blowing the air into one pit where we have not a sufficient room of royalty to have an air pit conveniently, and we adopted that plan, but it is not working, and has not been for three years.

12,781. Of what kind is that?—It is a large round bellows, a sort of cylinder-bellows, and it blew quite sufficient air in.

12,782. (*Mr. Holland.*) Working in water?—No; a common bellows, the same as the blacksmith's occasionally use, but on a larger scale.

12,783. (*Chairman.*) Was the air blown down wooden pipes?—Gutta percha pipes.

12,784. Of what diameter?—Three inches.

12,785. You found that to answer?—It answered very well indeed.

12,786. To how many men did it supply air at the end of the drift?—About ten men in the pit.

12,787. You do not use much powder, I suppose?—Very little powder indeed, but in that pit we had a few shots every day.

12,788. Was what you have mentioned the means of dispersing the smoke?—Yes; it deadened the smoke, and the men could work very comfortably.

12,789. Have you ever observed how soon the smoke got away so as to let the men in?—It drove it away from the fore-breast so that the men could work and after that it got so much deadened that the men did not feel the effects of it much; the men were away a very short time.

12,790. Do you remember about the length of the gutta percha tube which you had?—It would go down the pit about 55 yards deep perhaps, and I think there were some 70 or 80 yards from the pit bottom; that would make about 130 yards. It was an expensive pipe; I should say that it cost 40*l.* or 50*l.* altogether, but it was very effectual for a temporary thing of that sort, where you could not get an air shaft down well.

12,791. What deductions are made from the men for candles?—We charge our men with the candles. They take the ore, or the working of the mine, so much per fathom, or so much per ton, and we just charge them the cost price of the candles.

12,792. Do you limit the quantity which they are to get?—Not at all, they are as careful as possible, because they have to pay for the candles.

12,793. They are not likely to dispose of them?—No, I am sure that they will not do so.

12,794. Did you ever see a fire-pan used in a shaft for ventilation?—I have seen it but it is very rare that we have occasion to do so. We have not a fire-pan about our place.

12,795. Is it effectual?—It is effectual when the air gets dense in the pits. When there is a communication between two pits, and it is dense and will not circulate it is effectual; it circulates the air and makes it clear in the interior.

12,796. And creates an upcast current?—Yes, if ever we want circulation we only throw some water down the pit and that creates a circulation without any more bother.

12,797. (*Mr. Holland.*) It falls freely down the pit?—Yes.

12,798. And carries the air with it?—Yes, and makes an upcast draught at the other pits.

12,799. About how much water is required for it?—We let all the column go down, it is only for a short time.

12,800. (*Mr. Austin Bruce.*) How many men do you employ?—About 100 men.

12,801. What is the age of the oldest men among them?—We have miners working underground who are 65, I daresay.

12,802. Are they able to do a good day's work at that age?—Perhaps they are not, but still they will work amongst the rest; they work at the fore-breast.

12,803. Do they suffer from any complaints from which the agricultural labourers are free?—No; the miners employed here are a very healthy race of men.

12,804. Do you think that they suffer from rheumatism more than other men?—Very little; they never get much wet in the iron ore mines.

12,805. But there is a difference of temperature between the pits and the surface?—Yes, but the iron ore is not at all injurious to the health, I believe.

12,806. Have you ever had any complaints from your men of insufficient ventilation?—No, never.

12,807. The men as a rule are content are they?—Yes, the miners of Furness are a very contented set of men indeed. I think that I have been the manager of mines and owner for from 25 to 30 years, and I have only lost three men in that time; only three men have been killed during that time, and there have been very few accidents as to men being hurt.

12,808. (*Chairman.*) Do the men live near the mine?—Not far off.

12,809. Do they change their clothes when they go down to work?—They change their working dresses but they do so at home; they do not change at the mines. Our men do not; I believe that some do. I believe that some of Mr. Schneider's men do. The dwellings of our men are not far away from the mine, and they go in their working clothes from their own houses.

The witness withdrew.

The Rev. JAMES MORRISON MORGAN examined.

12,810. (*Chairman.*) You are vicar of this parish?—Yes.

12,811. Have you been long vicar of this parish?—I have been curate and vicar of this parish since 1846, with about three months intermission.

12,812. Do you consider the population here generally healthy?—Yes, I think so, with the exception that consumption has increased very much of late years.

12,813. Among what class should you say that it has increased principally?—Among persons of sedentary habits—young men and young women—married women die occasionally of this disease. Cases of consumption have occurred amongst the miners, but as a body they enjoy very good health.

12,814. (*Mr. Holland.*) Since about what date has the increase been?—Since about 1846, more in proportion than the increase of the population.

12,815. (*Chairman.*) But you think that that increase has not been among the miners?—No, I think not.

12,816. The population of the whole parish has increased, has it not?—Very much.

12,817. Is that owing to the increase in the number of mines?—Yes, railway and other works, brick-making, and ship building, &c.

12,818. And yet should you say that the average of deaths by consumption has increased?—Very much in proportion.

12,819. Can you account for that in any way?—I think that it arises from the inclemency of the late seasons and the want of ventilation in the houses.

12,820. Are the lodgers in the houses crowded?—Yes, in Barrow-in-Furness, not in the remaining portion of the parish. They are dangerously crowded I should say in Barrow. They are, however, building houses very rapidly. The house accommodation is not sufficient.

12,821. (*Mr. Austin Bruce.*) Barrow is in the parish of Dalton?—Yes; it has lately been made an ecclesiastical district in the parish of Dalton, viz., the District Chapel of St. George's Barrow.

12,822. (*Chairman.*) How is the population of Barrow chiefly employed?—They are employed at the blast furnaces, railways, railway works, ship-building, brick-making, &c.

12,823. So that the accommodation of houses and lodging you think is not sufficient for the population which has grown up there?—Certainly not.

12,824. Have there been any epidemics in your parish in the last few years?—Small-pox was prevalent some years ago. Fever prevailed to a great extent in Dalton until we drained it.

12,825. Do you think that there is more drunkenness in the parish now than there was formerly?—I do not think that it has increased.

12,826. Notwithstanding that there has been a large increase in the population?—Just so.

12,827. Should you say that the miners as a class are sober and well conducted?—They are a respectable body of men.

12,828. Do they acquire any property here or any houses?—Yes, occasionally; steady men occasionally build houses.

12,829. (*Mr. Austin Bruce.*) Do you ever receive any complaints from the working men of the nature of their work in mines?—No; I believe that they are provided with every material that is necessary for the carrying on of mines.

12,830. You have observed, I think I understood you to say, no special complaint or disease as connected with the operation of mines?—Certainly not.

12,831. Is the mining population on the whole as well conducted as the agricultural population?—Quite as well. I would remark that the law affords great facilities for the license of beer houses. They have increased to a very great extent, and they are doing much mischief. Cock-fighting prevails, to the certain demoralization of some persons among the mining classes.

12,832. I suppose of all classes equally?—Yes; of all classes who practise it.

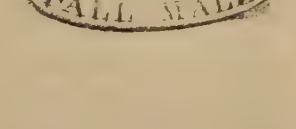
12,833. (*Chairman.*) On what days is the cock-fighting principally?—Generally about Whitsuntide and Easter, the old times, on Saturday afternoons, and at other times.

12,834. Do you think that the means of education now are ample?—Yes; they will be when we have established the schools which we have in contemplation; the schools are nearly ready.

12,835. And will the people be inclined to take advantage of it?—Yes.

The witness withdrew.

Adjourned to to-morrow at Whitehaven.



WHITEHAVEN.

Wednesday October 1st, 1862.

PRESENT :

The Right Hon. Lord KINNAIRD, K.T.
NICHOLAS KENDALL, Esq., M.P.
H. AUSTIN BRUCE, Esq., M.P.
RICHARD DAVEY, Esq., M.P.
P. H. HOLLAND, Esq.

The Right Hon. Lord KINNAIRD, K.T., in the Chair.

Mr. JOHN LINDOW examined.

WHITEHAVEN.
Mr. J. Lindow.
1 Oct. 1862.

12,836. (*Chairman.*) Will you be kind enough to mention the name of the mine with which you are connected ?—We are working at the present time the Wood End mine and also the Gutterby mine.

12,837. What description of ore do you obtain from these mines ?—These mines produce hematite ore ; red hematite ore ; we have two mines as I have already stated, and there are many different pits, the Wood End pits and the Gutterby pits.

12,838. What is the total number of men employed on the two mines ?—Our manager will be able to tell you more minutely than I can, but, as near as I can possibly say, there are about 380 or 400 men employed on the two mines.

12,839. About how many of those men work underground ?—The principal part of those men work underground ; we have no open workings, that is, not from the surface.

12,840. Are the mines connected the one with the other ?—No ; they are not.

12,841. What is the depth of the lowest level at which you are working ?—The depth of the lowest level is about 70 fathoms, that is, the fullest extreme of the depth.

12,842. Does the shaft go down below that ?—No; we have an incline a little below the shaft, but the shaft does not go down to the extreme level.

12,843. What number of shafts are there ?—There are two shafts which are connected with that pit, we sunk one upon a rise of ground to ventilate the lower level.

12,844. The one that was sunk from the high ground is merely for ventilation ?—No ; we raise a little ore at it.

12,845. In the other shaft is there a pumping engine ?—We lift the water in cisterns in a patent box which lifts the ore and the water both at one time ; it has a valve in it ; it fills itself when it goes down, and immediately on arriving at the surface, there is a machine, which it runs into it, strikes a valve, and lets the water run out.

12,846. Is that worked by a steam engine ?—Yes, there is a large steam engine of 40-horse power.

12,847. As I understand, you raise both the ore and the water together ?—Yes.

12,848. But not in the same tank ?—No ; there are two separate tanks.

12,849. Is one placed above the other ?—Yes.

12,850. (*Mr. Holland.*) Is there a sort of platform above the tank in which the ore is put ?—Yes.

12,851. (*Chairman.*) Is the ore brought up in a cage above the water ?—Yes.

12,852. With a bogie running upon the cage ?—Yes.

12,853. Is there a great deal of water in the mines? —No, and that is the reason why we merely use these, on account of the economy.

12,854. Are there different drifts along which the water runs ?—Yes, there are different chambers for working, nearly the same as laying down the town of Whitehaven into streets.

12,855. How do the men go down into the pits, and how do they ascend ?—The men go down by an engine in the cages.

12,856. Do they all go down in the cages ?—Yes.

12,857. Are there no ladder-ways ?—At one time we had ladder-ways, but we found that plan very dangerous ; we had more accidents occur by the ladders going down to a great depth, and a great many of the men dared not go down on account of fear and nervousness.

12,858. Of what description were the accidents that occurred ; did the men fall off from the ladders when they were in use ?—We have had one or two men with broken legs which occurred from the use of the ladders. In case three or four men were going down the ladders and the top man lost his footing, he would take all the remaining party below him down with him.

12,859. (*Mr. Austin Bruce.*) Did such an accident as that ever happen ?—No ; we prevented that by putting up a staging.

12,860. (*Chairman.*) Between each length of ladders there should be, and you had, a staging ?—Yes. We had a staging at the foot of each ladder.

12,861. (*Mr. Holland.*) How long were the ladders ?—They were about 20 feet long ; but it was a small shaft, I should say not more than the length of four ladders, and the men will go down on account of its saving time ; some are more anxious than others are to make money, and such men as those will go down an hour or two earlier, before the engine is set to work.

12,862. What number of hours do the men work ? —We do not limit them ; although many do limit them in this neighbourhood, we do not.

12,863. Do the men work by shifts ?—They work by piece.

12,864. Do they work by night and day shifts, or do they not work by night at all ?—Yes ; a few do work by night, but we do not, if we can avoid it, let them work by night, that is a point of economy.

12,865. Do you let the work by the fathom to the miners ?—No ; we let it by the ton.

12,866. May the men, under such circumstances, go to work at what hour they like, and stay at work as long as they like ?—If the question is confined to our pit alone, they certainly can go at any hour they think proper.

12,867. (*Mr. Austin Bruce.*) In point of fact they may come and go when they please ?—Yes ; the engine is set to work for them at any hour.

12,868. (*Chairman.*) How many men are there in a party ?—That depends upon the width of the working and upon the hardness of the ground ; some portions of the ore are much harder and much more difficult to penetrate with the jumpers than others, and when we find that that is the case, if we were to put a number of men in we should find the profits so much less; the men will have wages, they earn as much as 4*s.* a-day, and many others earn much more ; the best men have the privilege of making as much as they can.

12,869. (*Mr. Holland.*) You aim at that, do you not ?—Yes.

12,870. (*Chairman.*) You let the work to the men, and they may work it in shifts, or just as they think proper ?—Yes.

12,871. Are they permitted to engage men to work for them at night, as well as in the day ?—Yes, it is an advantage to work during the night in some of the workings, but not at the principal ones. We only get five days during a week, and five nights for six days, and when one class of men goes into the workings and leave, the others who follow them on to the shift may not be so competent as miners, and

the advantage that has already been prepared by the first class of men will be likely to be taken away and lost, when the others ought still to be manœuvring to get a certain quantity of ore with one shift, whereas those who follow the others into the workings, that is, the second shift, will be likely to take half of that advantage away by want of skill. On these grounds, and for these reasons we select our men, and have a first class set of men to follow the others if we have a double shift, but we never have a double shift, that is, night and day, if we can avoid it, unless it is a case of emergency, and that is, for getting ore.

12,872. You find from practice that it is important to have experienced men employed ?—Yes, and I dare say all our men are miners that we have ; we have made nearly all the miners in the immediate neighbourhood ; that is, we have reared them, and taught them to become miners.

12,873. You have been employed in mining all your life ?—Yes ; I have.

12,874. And you are connected with one of the oldest pits in the neighbourhood ?—Yes ; the Gutterby and the Big Rigs pits are two of the oldest pits.

12,875. Do you let the work to the miners by the piece ?—It is by the fathom ; if we are driving a stone drift in sand or in lime.

12,876. Are the lowest earnings 4*s.* a-day ?—That depends entirely upon the kind of man, whether he is an energetic, clever man or not ; some men will make 7*s.* a-day, and if so, we are proud to pay that amount to skilful men, but some are making less than that, from 22*s.* to 24*s.* per week ; and referring to those men who work underground as competent miners, you may take the average at 24*s.*, taking the whole of our miners together.

12,877. Are the miners very healthy ?—Yes, very much so.

12,878. Do they suffer from no particular disease ?—None ; there is nothing but pure air.

12,879. Do you never, when driving a drift through stone, meet with poor or thin air ?—Not if you ventilate the place properly, if you do there is no impure air whatever.

12,880. Is there any air in your mines in which the candles will not burn ?—Yes, frequently; if they do not ventilate that drift they will find that the candle will gradually die out of itself, unless they resort to some means to prevent it; if they are driving a drift, but we have none at present. It is 12 months since we had one at which we put a pit down merely to ventilate it at the end of the drift, and to ventilate the adjoining pit.

12,881. Until that connection was effected was the air such that a candle went out in it ?—Yes ; that is to say, it did not go out, but it did not burn well.

12,882. Did you resort to any artificial means for improving the condition of the air in that case ?—We conveyed tubes in a box, pipes to convey the air in to the fore end of the mines.

12,883. Were any means employed for the purpose of forcing air in ?—We have frequently employed such means upon former occasions, but latterly we have not ; we have sometimes applied a fan.

12,884. In what way was the fan worked ?—It was worked by hand by two men.

12,885. Was it so worked on the surface ?—No ; it was near the foot of the shaft, they could not have driven it from the surface ; the air at the foot of the shaft on the low level is equally pure.

12,886. Should you call the air in the low level poor air ?—Yes, but it is not inflammable.

12,887. On the occasion to which you have referred, before you succeeded in making a communication, how were you able to resort to these means ?—We had a connection formed ; we did not work long before we got a connection with the adjoining shaft.

12,888. Did you work as long as a month ?—Yes, and more than that. During the time that we are driving to this place the men can work in the fore end with the candles standing to one side. In our case the candles were not required to incline ; but that does frequently occur.

12,889. How long do you imagine the men had to work as you have described before the circulation was completed, for three or for six months ?—In the drift which I have mentioned I do not think in driving to the shaft which we were putting down, that the men would have been at work there more than two months. We were working our adjoining drift that I am now speaking of ; and it was to take so much of the drift out towards going to the upper shaft which we were sinking for ventilation, for air.

12,890. While you were there driving, am I to understand you to say that the candles never went out ?—Not altogether ; still the place was not what you call so pure as the other part of the mines.

12,891. Did you find the wooden box or pipes to which you have referred answer the purpose for which it was used ?—Yes, until we got the drift through.

12,892. Was there much blasting carried on there? —Yes.

12,893. Did much time elapse before the powder smoke was cleared away ?—No ; it is advantageous, of course, to get it away quickly.

12,894. How long was it before it was cleared away ?—That is a matter which depends entirely upon the management of the person driving the air into the working, I mean the person at the fan.

12,895. If he did not attend to it, what would be the consequence ?—That the air would be so much longer in coming out.

12,896. Have you ever employed any artificial means, such as an engine, independently of men driving a fan ?—You cannot get water at a place of this kind. When you speak of an engine, I may say that we frequently apply water to clear a shaft in sinking it. You merely apply water to clear it in a few seconds.

12,897. Do you let the water go down ?—Yes, in order to force the impure smoke up.

12,898. In that case the water has to be pumped up again ?—Yes, but that is really nothing as compared with keeping the men out of the workings.

12,899. Have you ever seen any of these fan machines driven by an engine ?—Yes, but not by us.

12,900. How often are the men paid ?—Once a fortnight.

12,901. Do you keep anything in hand, or is there what is called a week's in-legging kept in hand ?—We do not do that. We pay them up to the last moment ; the men come from the works to the pay place and receive their money at 3 o'clock in the afternoon.

12,902. Is the quantity worked out all weighed after it is drawn up from the pit ?—At times it is not weighed. Some work by measure ; but it generally amounts to the same thing.

12,903. Do you reckon by the cwt., or is a cwt. practically with you so many more pounds ?—We have 21 cwt. to the ton.

12,904. (*Mr. Holland.*) Is a cwt. 112 lbs.?—Yes, when I speak of 21 cwt., that is to the lessor.

12,905. (*Mr. Austin Bruce.*) But how is it as to the workmen ?—I do not know. Our workmen generally work by buckets.

12,906. (*Chairman.*) Are the men paid by the ton? —Yes, five bogies go to a ton.

12,907. Do you not weigh the bogies ?—No, not with us, to check the men ; but I dare say many do. We do not approve of the principle.

12,908. (*Mr. Holland.*) You see that the kibble is fairly filled ?—Yes.

12,909. (*Chairman.*) To what deductions are the men subject; for powder and candles ?—Yes, those are all with us.

12,910. What do the men pay per pound for candles? —I am not aware of that.

12,911. Is a certain allowance of candles made to them ?—They have the candles, but they may get them where they like ; they are not compelled to get

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them of us. We provide the candles to accommodate them, as they have not cash always by them with which to purchase them.

12,912. So that no deduction is made for candles if a man brings his own?—No.

12,913. Is your practice the same with regard to powder?—Yes.

12,914. I think you stated that 24*s.* per week was the amount of the net wages?—The net wages run from 22*s.* to 24*s.* per week, taking the average.

12,915. Is there any doctor's club or sick club in your mines?—There is a doctor's club if the men choose to be in it; and if so, they pay twopence per week; but it is not compulsory. Many of them have doctors of their own, and, of course, in that case they are not in the club.

12,916. How is this club managed; is it by the owners of the mine?—It is managed by my nephew; he acts as their cashier.

12,917. Is a separate account kept of the club?—Yes.

12,918. What allowance is made to a miner when he is a sick?—He receives 10*s.* a week.

12,919. For what is it that they pay the 2*d.* a week?—They pay 6*d.* for the doctor and their sick money; but independently of that, their net wages which I spoke of are 24*s.* a week. Nothing is coming out of that; they pay 6*d.* for the doctor and their club; but there is no compulsion. Many of them are members of Odd Fellows' clubs, and there are many in Rechabite clubs, and those enter into our club also.

12,920. I suppose the miners who are members of others clubs are permitted to join your club as well if they please?—Yes, if they are inclined to do so.

12,921. Is the fund obtained from the contributions of the men sufficient to pay 10*s.* a week to a man off work?—I do not think it is sufficient; but we have, nevertheless, always given 10*s.* a week. In case their club money ever ran out, I generally made up the deficiency myself.

12,922. (*Mr. Holland*). I suppose there has not been any very large deficiency?—No, if the club is well managed there is not.

12,923. (*Chairman*). To what description of accident are the miners, in your opinion, liable?—A broken limb.

12,924. In what way would that be caused?—It happens very frequently when they have been shooting; many of them are high spirited men, possibly without as much judgment as others, and they will go into a working after firing a shot, and instead of taking their hammers to sound the working, they will go in immediately under it, and very possibly not take a crow bar to bring the loose metal down, and some part of it very often falls down.

12,925. After the blasting has taken place the metal becomes loosened, and it falls down upon them, because they have not taken proper precautions to ascertain whether it has become loosened or not?—Yes.

12,926. Do many accidents occur from blasting?—We have had very few; none have been killed by blasting.

12,927. Are there any blind men?—One of our men, I think, is blind.

12,928. Are you able to trace that to any cause?—It was entirely caused by foolishness.

12,929. Can you describe to the Commissioners in what way an accident happens?—Very often after the miners fire a hole the shot does not run, and it happens in taking the stemming out of the hole again; very often they fire a hole in that way upon themselves; they attempt to clear the old hole out rather than put a fresh hole in.

12,930. Do the miners use an iron pricker?—Yes, we have iron prickers; we have had copper ones, but if you give them to the miners they lay them on one side, and they will take up an iron one.

12,931. Do you not think it would be safer to use copper prickers?—Yes, in hard ground; but in wet and softer ground we fire with a fuze.

12,932. You do not use a fuze in all cases?—No.

12,933. By what means do the men fire the shots?—In ordinary holes with straws.

12,934. Do they put a straw into the hole?—Yes, after they have drawn the pricker out.

12,935. Do they use touch-paper?—They use merely touch-paper which they make themselves.

12,936. Do they judge of the time before the explosion will take place by the length of the touch-paper?—Yes, they judge what distance it is, and they have generally but a short distance to go, say, 10 or 15 yards, until they get behind a pillar to protect themselves.

12,937. Can you state the reason why the patent fuze is not always used?—No, but it is only used in wet ground. In hard ground, in stemming a hole they frequently get their fuze cut into two, which of course prevents the fuze then running down to the bottom of the hole, and in case they were to bore that out it would be more dangerous for them.

12,938. You are of opinion that the men prefer the old plan to the patent fuze?—You could not get them to use the fuze in hard ground, where the ground is dry you cannot get them to do it, they would lose so much time.

12,939. In what way would there be a loss of time?—By the cutting of the fuze; and then they would have to open the hole out again, and that would make it more dangerous, they might easily ignite the powder then.

12,940. (*Mr. Holland*). Do the miners use hard material for stemming?—They use shale, and when that is thumped down by a hammer, it becomes a very solid substance.

12,941. Have the miners any other objection to the patent fuze than that which you have mentioned?—That is the only one; in wet ground it is a great saving.

12,942. Have they any objection to the fuze on account of the smoke?—Not with us; in a badly ventilated place, of course it does cause a little more smoke; but in the places that I allude to they could not work otherwise than with a fuze. I am now speaking of wet ground.

12,943. Do the men generally speaking reside near the mines?—We have some cottages which are as near to the works as we could have them.

12,944. Do the miners change their clothes after they have been underground?—They do not change them until they come home; but their clothes are perfectly dry, except they have been at work merely sinking a shaft, which is more subject to water, and then the men change their clothes in the engine-house as soon as they come out of the mines.

12,945. What proportion of your men do you suppose reside in the neighbourbood of the mines?—The greatest distance is about a mile and three quarters.

12,946. Do the great majority of the men reside close to the mines?—Yes; we build as many cottages as we can, and the majority of the men are in the immediate neighbourhood.

12,947. (*Chairman.*) What rent are the men charged for the cottages?—The highest price that we charge for a cottage is 2*s.*, but in many cases the charge is 1*s.* 8*d.*

12,948. (*Mr. Holland.*) Is that about the value of the cottages to you?—We consider that that sum is sufficient for a poor man to pay, and we are satisfied with it. We consider that that pays us 6 per cent. for our money invested in household property; but many persons charge 2*s.* 6*d.* and 2*s.* 9*d.*, and sometimes the men are charged 3*s.* and 3*s.* 6*d.*

12,949. What amount of accommodation is contained in a cottage?—There are two rooms upstairs and two downstairs, and a yard and a privy behind.

12,950. What is the cost of the cottages to you?—I believe that the last that we built and those that we are now building will cost us about 65*l.* each.

12,951. Each containing four rooms and every

accommodation ?—Every accommodation that I have already spoken of.

12,952. (*Mr. Kendall.*) Is this mine worked by a company or is it worked by the proprietors ?—It is a private mine ; it is our own. It may be worked by ourselves privately. We have a lease from one individual or two ; we have one lease from Sir John Walsh of one mine.

12,953. (*Chairman.*) Have you any other partners in this mine ?—No ; my brother and myself.

12,954. You are the sole proprietors and work the mine yourself ?—Yes.

12,955. (*Mr. Kendall.*) I presume that your men have been, as it is called, bred up as miners, and that they are picked men ?—Yes.

12,956. You do not employ men who are not good workmen ?—No.

12,957. Do you think that the average wages of the miner in this neighbourhood is 24*s.* per week ? —No.

12,958. What do you think is a fair average to take of the wages in the neighbourhood ?—I cannot say ; they vary much in different pits ; and there is a certain class of men who are not worth 24*s.* a week.

12,959. Do you think that the wages average 20*s.* a week, taking one pit with another ?—I do not think they do.

12,960. Do you think they average as much as 18*s.*? —We give to the very poorest men that we have 18*s.* a week.

12,961. Which in your opinion is the most healthy class, the agricultural labourers or the miners ?—I think that the miners are equally as healthy, if not more so.

12,962. Which of the two classes do you think lives the best ?—I can only tell you how our farm servants live and how the miners live ; they live as they think proper.

12,963. Do they live well ?—With 24*s.* a week they need not live very badly.

12,964. I suppose they do not save much out of their wages ?—Not any of them, except a few picked men.

12,965. As a body do the miners drink much ?—I believe they do. I believe they live up to the whole of their earnings generally speaking ; but in certain districts, I am proud to say, that we have many teetotallers, and not one drunkard. We have no fewer than 200 men possessing freeholds which they have obtained from their savings. But I am speaking now of our own mine ; I have nothing to do with the adjoining mines.

12,966. Referring to the men who have worked for the last 20 years in your own mines, you think that as a body they have been more saving than the miners generally are ?—Yes.

12,967. And among those you can reckon many freeholders ?—Yes, there is a great number.

12,968. They have purchased their freeholds out of the savings they have made in your mines ?—Yes.

12,969. As I understand, your miners not only may work as long as they like, but for as short a time as they please ?—Certainly.

12,970. And they not only may work themselves in that way, but they may take a man down into the mine to work under them ? — Yes, to work as a labourer.

12,971. And he may receive from the miner so employing him much less wages than the miner gets himself ?—Yes, of couse that is so.

12,972. May they take another miner down underground with them ? — Not without consulting our manager.

12,973. Do you ever give permission to a man, who has taken a certain quantity of work under you, to return a certain quantity of ore to you, to hire other miners, he arranging with them as to what they shall receive ?—Certainly not.

12,974. If a miner takes down another miner to work with him must that miner share equally with him ?—Certainly so, our manager will look to that, and he will approve of the man before he is allowed to go underground, and he is then put in to share and share alike with the other.

12,975. You are anxious that the labourer shall receive his hire, and you pay him up as close as you can ?—Yes.

12,976. How do you manage to pay him up on the Saturday, do you pay up close, or measure up close ? —A man has finished his work by two or three o'clock.

12,977. Do you measure his work close up to his heels ?—Yes, for the last bogie that comes out is weighed, and he is paid for it in a few minutes.

12,978. In what shape do you pay the men, in notes or in gold ?—In gold and silver.

12,979. No notes ?—No.

12,980. Do you hand over the money to one man, and does he divide it among his comrades ?—Yes ; when there are four or five men in a working we pay the most respectable man of the party, and he divides it amongst his fellow men.

12,981. You have stated that you sometimes have bad air ; in the instance that you referred to, do you happen to recollect the length of the drift before you communicated at all ?—Between one pit and the other I dare say, where we put down the air shaft, it would be 73 or 74 yards.

12,982. How many yards were you in before you felt any difference in the air ?—A great distance, up to the rise before we felt the least difference in the air ; as long as we could work in the ore before we came into the stone drift we had no difficulty in ventilating ; in case you cut through a pillar you thirl through it, and you bank it up.

12,983. Suppose you were driving through the ore with a view to ventilation, and you were to pass from the ore into the rock, would there be any difference then ?—Yes, certainly.

12,984. (*Mr. Austin Bruce.*) At what age do your men begin to work underground ?—We have no boys ; they are 18 or 19 years of age. When we take a labourer to commence work he has generally been a farm servant before he came to us to work as a miner ; he goes down into the works at the age of 18 or 19 as a labourer, and works for two or three years, and after the expiration of that time he would become a thorough miner.

12,985. Are the majority of these miners able to read and write ?—The whole of our men are.

12,986. Are there any schools connected with your works ?—Yes, we have a school ; it is not a national school, it was built by ourselves in the village of Cleator, it is half a mile off.

12,987. Do you manage the details of the ventilation yourself, or do you entrust the management to an agent under you ?—It is entrusted entirely to our own manager who is my nephew.

12,988. Do the miners ever make complaints to you of what they consider a deficiency of air ?—No, I do not know that we have had any complaints made for a great many years.

12,989. Do you find that your miners are, generally speaking, a contented set of men ?—Yes, they are a very happy set of fellows.

12,990. Has there ever been a strike amongst them ?—There was about 30 years ago.

12,991. Have there been many strikes in this neighbourhood among the miners ?—There have been strikes in nearly all the pits, with the exception of Mr. Hill's and our own. I know that there have been two or three very violent affairs—threatenings.

12,992. Do you know what the cause of those strikes was ; was it some difference between the masters and the men ?—They followed upon some questions arising about management.

12,993. Does the truck system prevail in this neighbourhood ?—No, not in any cases that I am aware of.

12,994. You stated that among your workmen, who, I think, were fewer in number than 400, some 200 of them had been so provident as to acquire

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freeholds?—I dare say that there are 200 of them who have done so.

12,995. Do you think that that is a larger proportion than exists generally in the neighbourhood?—Yes, I do.

12,996. To what do you attribute the superiority of your workmen in this respect?—It is merely on account of our selecting them, and getting men of good standing in their position; we select them from a respectable class of men.

12,997. If you are short of workmen, and men apply to you for employment, in what way do you examine them?—We merely test them by putting each of them into particular workings, and if we find a man who is either dissatisfied or a drunkard, we remove him.

12,998. That may show that a man is not a good or a steady workman, but it hardly shows whether he possesses those moral qualities which will lead to his becoming a saving man; do you apply any other test?—When we find that a workman is not a steady and saving man we immediately discharge him.

12,999. Do the men that you thus discharge find employment elsewhere?—Yes.

13,000. You have stated that you allow your men to come and go when they please, and to work for as few and for as many hours as they like?—Yes.

13,001. Do you find that the men generally make an ill use of that privilege?—No.

13,002. Has it ever happened that your machinery has been kept idle on account of the men not attending regularly?—Not now, nor for many years.

13,003. Probably in your case such indulgence may be safely allowed in consequence of the care you take in selecting your workmen?—No doubt of it.

13,004. I presume you would hardly consider that a prudent course to pursue in general?—I do not know that. I think that if you open your pit at a certain hour, and you do not allow the men to return up or go down the shaft for a given number of hours, you will find that you will not have so good a class of men applying for work as if you allowed them a little more liberty.

13,005. Do you consider that there would be any hardship in requiring that every workman who works in your pits should continue for a certain number of hours, say 8 or 9 hours a day, at work?—A miner would consider it a great oppression if we compelled him to remain down the shaft for eight hours.

13,006. Is it not almost the universal practice to do so, both in this district and elsewhere?—It is not so here; there may be an isolated case or two of the kind, but it is not general.

13,007. Is your practice the general practice of the district?—Yes; but I know that they are getting up a fresh principle now, in order to compel the men to go down for 8 or 10 hours, and not to permit them to come up again until that time has expired; but we do not approve of it.

13,008. Practically, how many hours a day do the men work?—They will not work more than 8 hours a day; what with having their luncheon during the day, and smoking, and doing different other things.

13,009. I suppose that being steady men they usually do work 8 hours a day?—Yes, and some of them work more than that if they want to make more money.

13,010. Is your ore picked at the pit's mouth?—Ours does not require it.

13,011. (*Mr. Holland.*) Your lifting machinery is going on always is it not, because it draws the water?—We have a tolerably large sumpt, so that we do not require it to go on during the whole night, unless we are lifting the ore during the night; we have a large sumpt below.

13,012. But it is going on, is it not, a great deal more than 8 hours a day?—Yes, we lift ore more than that, for 10 or 12 hours a day.

13,013. But you would be obliged to work it, would you not, more than 8 hours a day if you were not lifting the ore?—I think 8 hours would keep the water out in the whole of the 24 hours.

13,014. Do the men attend regularly?—Yes, in practice they do.

13,015. Have you among your workmen a fair proportion of elderly men?—Yes.

13,016. At what age is a man considered old for a miner?—We have some of them, I dare say, as old as 65.

13,017. Is that age remarkable among them?—There are some miners of the age of 70 in the immediate neighbourhood.

13,018. Then that fact does not attract much notice?—No.

13,019. Have you a good proportion of men, say a third, above the age of 50?—No, I do not think that we have; our men are a younger class of men.

13,020. At what age do they generally give over mining?—They work as long as they live almost, those who have been brought up to it.

13,021. If they are chiefly a young class of men, and work as long as they live, does not that imply that they die rather prematurely?—None of them died prematurely, they generally live to a good old age.

13,022. Are the elderly men employed upon lighter work?—No; we have a man who is upwards of 60 years of age, between 60 and 70, who is now working for us, he is able-bodied still and a hearty man.

13,023. But the great majority you say are young?—Yes.

13,024. A greater proportion than in other employments, or the same proportion?—I see a great many old men in other employments as well.

13,025. How long are the men compelled to breathe air in which it is necessary to slope the candle; several weeks?—That depends entirely upon the length of the drift.

13,026. But, generally speaking, for how long a period would they breathe such air; for several months?—Sometimes weeks, sometimes only for days, sometimes months.

13,027. But which is the most common; days, weeks, or months?—Only a few weeks; we never drive a drift to any extent; we drive it quickly, and we do it by three shifts, that is by three sets of men in the 24 hours, and by 8-hour shifts; we drive it as quickly as possible, and when we have bad air we always keep a fan blast at work to convey the air in.

13,028. But is that sufficient to keep the air so good that a candle will burn in it upright?—Yes, if you give in a sufficient quantity of air from the shaft foot where you have it pure, and drive it directly to the fore end, the candles will burn.

13,029. But is that done?—It is so seldom that we have drifts of that kind that it is very rare indeed.

13,030. It is very rare is it to have men working in drifts where the candle has to be sloped?—Yes.

13,031. In such places do they continue working more than a month?—Yes, in hard ground it requires more than a month. If it is soft ground they will cut a long drift in a month.

13,032. What is the longest time during which the powder smoke hangs about, and prevents the men continuing their work?—In some places, after they have fired a shot, our men can go on in a few seconds.

13,033. But what do you suppose to be the longest time that elapses before the powder smoke is sufficiently cleared away?—I do not know.

13,034. Did you ever know the powder smoke to hang about for half an hour?—Never so long as that, they remain for a few minutes or for a few seconds out of the workings.

13,035. If the powder smoke hung about for half an hour, and so prevented the men from working, would that be considered a very remarkable circumstance?—Yes, and a very injurious one to the mines, both to the men and to the masters.

13,036. Does such a case as that ever happen?—Not with us.

13,037. Do you think that it happens in other mines?—I do not know; there are instances I have no doubt where they are under the necessity of taking a longer time before they can go back again to their work.

The witness withdrew.

Mr. JAMES DEES examined.

13,038. (*Chairman.*) I believe you are a civil engineer by profession?—Yes.

13,039. What is the name of the mine or mines in which you have an interest?—The name of the mines is the Parkside mines; we trade under the name of the Parkside Mining Company, they are situated about five miles from Whitehaven.

13,040. Does the company consist of shareholders?—The company consists of four individuals.

13,041. Do they reside in the neighbourhood?—Yes, all of them reside in the immediate neighbourhood.

13,042. For how long a period have you worked these mines?—Between seven and eight years.

13,043. What description of ore is produced in the mines?—It is hematite iron ore.

13,044. What is the total number of men employed in the mines?—I cannot tell you the exact number of the men employed, but we have upwards of 500 miners, and, I think, including the men who are employed at the surface, we must have nearly 620.

13,045. What is the greatest depth of any of the shafts in the mines?—The greatest depth in our mines at present is 60 fathoms, or 120 yards.

13,046. How many shafts are there?—There are five shafts that we are working.

13,047. What is the greatest distance between any two of the shafts?—160 yards.

13,048. Is your mine a wet or a dry mine?—It is perfectly dry.

13,049. How do the men go down into the mine?—They descend by a cage; we have a cage fitting into slides or wooden uprights, and the cage slides down without any lateral motion whatever.

13,050. Do you employ a safety cage?—Yes; we have safety cages in one or two of our mines, and we are applying them to all the rest.

13,051. Do you consider that they are attended with advantage?—Yes; very great advantages; indeed we have had instances of the great utility of them, for example, from the chain breaking, and the cage seizing hold of the slides, it did not go down more than half an inch with a loaded bogie.

13,052. Do you use a wire rope or a chain?—We use a wire rope in two of our mines, and a hempen rope in the others; it is a flat wire rope.

13,053. Do the men not object to going down in the cages?—No.

13,054. Are there any ladder-ways in the mines?—There is a ladder in one of our mines; but it is in an entirely distinct portion of the shaft from that through which the ore is drawn, and it was rather to enable the men to get up and down when the engine men were not there; we do not use it except they want to go down on a Sunday, or when the engine is not at work; it is never used on any other occasion.

13,055. I believe you blast the rock?—Yes.

13,056. Have any accidents occurred from blasting?—We have accidents frequently, but they are almost all attributable to the carelessness of the men.

13,057. Do you know how these accidents occur generally?—They frequently occur from the men using an iron rammer, as they call it, instead of a wooden rod, which we provide them with to push the powder in. There are many small cavities in the iron ore, and the iron is very apt to strike fire by hitting the edges of those cavities. When the men seize hold of an iron rod instead of a wooden one to push in the powder it explodes the powder and their faces are injured.

13,058. They require to use an iron rod I suppose for tamping?—Yes.

13,059. What do they put in on the top?—They put in clay, which is found in the mines. There are large cavities, which are filled with very fine clay, that clay is cut into oblong pieces, sent up and dried on the boilers, and when it is dried the men use it for tamping.

13,060. And in that process there is no fear of any explosion?—No, unless the pricker happens to strike fire against the bottom of the hole.

13,061. Is that made of copper or iron?—We use iron, we have tried a copper one, but on account of the great number of small cavities in stemming, from the softness of the copper, it is driven into these cavities in the side, and there is great difficulty in drawing it out. We have therefore been obliged to discontinue it, and we now use iron.

13,062. If any metal harder than copper could be found it might answer the purpose?—Yes; I should rejoice to have anything like bronze, or any other metal that would not bend with the tamping or stemming, and that would not strike fire.

13,063. Do you use the patent fuze in your mines?—No; and for the same reason that we cannot use the copper pricker. When the patent fuze is used it is put in with the powder, and the stemming is driven in round the fuze. We have tried it, and we find that the fuze is driven into those cavities in the same way as the copper rod is, and it breaks, that is, the connection between the firing at the end of the powder is broken off from the irregularity of the bore hole. We use a straw filled with small powder instead of the patent fuse, which is put into the hole left when the pricker is withdrawn.

13,064. Why can the fuze not be used with safety?—Because of the nature of the ore, being so full of cavities, and those cavities having very sharp edges, so that if the safety fuze was used, the act of tamping would force the fuze into those cavities, the sharp edges of which would cut it, and thus render it entirely ineffectual.

13,065. How is the straw filled?—The straw is of the same length as the pricker, and that is filled full of very fine powder; it is split at the end, and a match longer or shorter, according as the safety distance may be from the hole, is lighted, and as soon as the fire reaches the straw the powder in the straw explodes and communicates the fire.

13,066. What is the match made of?—It is made of linen rag, generally speaking; the men will take some tallow from the candle and grease it round, so as to cause it to burn; they light the end of it; and according to the distance they have to go to get to a place of safety, so is the length of the match; it is a sort of wick.

13,067. Do the miners make it themselves on the spot?—Yes.

13,068. Have you ever thought of firing the holes by any other method?—Yes; I have given orders for a magnetic machine in London, which I expect will not only be economical but also be the means of preventing many accidents. By that machine I hope to be able to fire half a dozen shots at one time; it can be removed to any distance behind a pillar, and we have many in our mines; the men working it might be there, and by using wires covered with gutta percha, they could fire several shots simultaneously.

13,069. Do you think it would be desirable to fire off many holes at once for the purpose of detaching a larger piece of rock?—Yes, I think that the simultaneous action of six or more shots fired at once would be beneficial as one would help the other, and would bring down a much larger mass of ore than so many single shots.

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13,070. Has the experiment ever been tried?—I am not aware that it has, I believe it has been tried in sinking shafts. In sinking shafts the practice has been to get one shot in the centre to throw out a portion of the material, and then to have so many more all round firing them off simultaneously, in order to blast the material out round the centre.

13,071. Have you a very large wall of ore to work out?—Yes, the ore in our mine varies from 20 to 70 feet in thickness.

13,072. Is it all pure ore?—Yes, all of it, it is a solid mass of ore.

13,073. Are there no deads or rubbish to draw out?—No.

13,074. Do you consider the safety cage a very safe mode of carrying?—Yes, I do, there have been accidents with them, but they have occurred when the cages have been neglected. I never heard of any accident occurring when the cage has been kept in good order.

13,075. Are the men in your mines perfectly healthy?—Yes, very healthy indeed.

13,076. Is there any club connected with the mines?—Yes, we have a sick fund and combined with that is a relief fund.

13,077. What do the men contribute?—The men pay 6*d.* a fortnight; and for that we find them medical attendance, both for themselves and their families; for the first six months they receive 8*s.*, a week, and then there is a reducing scale from 8*s.* to 6*s.*, and from 6*s.* to 4*s.* If they are a long time on the sick fund I think the least they get is 4*s.* per week. We pay them every two weeks.

13,078. Is a separate account kept of this fund?—Yes.

13,079. Is the amount contributed by the men sufficient to provide them with these allowances when they require them?—Yes; what the men pay is sufficient, but I will explain that. The banksmen or the pit-top-men, originally received 6*d.* per man for getting out the clay, drying it and preparing it for the stemming; some time ago I thought that 6*d.* was too much for those men; 6*d.* is still taken for it, but one half of that sum only is given to the men who prepare the stemming, the other half goes to the sick fund, therefore the men really only pay 3*d.* a week for the sick fund.

13,080. With this addition the fund is sufficient to meet all calls upon it?—Yes.

13,081. Is there a special doctor attached to your mines?—Yes.

13,082. What is his name?—Mr. John Bateman Wilson.

13,083. Are the miners paid once a fortnight?—Yes.

13,084. Is it your practice to keep back a week's legging as it is called?—No, our books are made up to the Wednesday night, and the men are paid on the Saturday following.

13,085. Are the men paid in gold or in silver?—They are paid in gold, silver, and copper; we never by any chance pay them in notes.

13,086. Is there one man at the head of a partnership who pays the rest?—The men generally work in gangs, varying from 4 to 10 or 12 in a gang, and one man of each gang comes and receives the money for that company or gang; not always the same man each fortnight.

13,087. Is a contract made with the men by the ton?—We pay them by the ton.

13,088. When is the ore weighed, as it comes to the surface?—Each of our bogies contains so much, and a certain number of those bogies constitute a ton. The men put in a wooden ticket with their number in each bogie, and a man at the top takes it out and puts it into the receptacle for that number. Five constitute a ton, and as soon as 5 are accumulated in their pigeon hole, the man at the top marks down a ton for the miners.

13,089. Is the weight taken according to measurement?—Yes, a bogie full of ore was weighed originally, and that serves as a guide for each pit.

13,090. Is the ore sent away in railway waggons?—It is; we have a railway to each of our pits, and the ore is put into the waggons at the pit.

13,091. Is the ore weighed in the waggons?—Yes, and the railway waggons are weighed empty; we have a weighing machine on our own railway, as the waggons go to the mines they are weighed, and when they come back they are re-weighed; of course tare is taken of the waggon, and an accurate account kept of the quantity.

13,092. About what do you pay per ton to the men for working?—The price varies very considerably.

13,093. What is the cause of the variation that takes place in the prices that you pay to the miners?—It is on account of the hardness or otherwise of the place in which they are working. There are some places in our mines that would cost twice as much labour to work in as in others.

13,094. Is the price settled every fortnight?—No.

13,095. How often is it settled?—It is left very much to the underground steward as to the nature of the working, whether it is getting harder or softer; there is always a fortnight's notice given; but sometimes the same price will continue for a couple of months. We rely upon the judgment of the underground steward.

13,096. The price is not regulated by competition among the men?—No.

13,097. Will you have the goodness to state the highest and the lowest wages which the miners earn?—There are some of our men who get upwards of 30*s.* a week, and others of them do not get more than from 16*s.* to 18*s.* a week, but then that varies. Perhaps there is one man who is getting 18*s.* for one fortnight, and in the next fortnight, if the place gets better to work, he may get as much as 25*s.* I think that the average is about 22*s.*

13,098. What deduction is made from that for candles?—I think that the price for candles is 7*d.* a pound.

13,099. Are they limited to any particular quantity?—No, they can get as many as they like.

13,100. Do the miners ever take them away or use them at their own houses?—I am not aware that they do, but I think not; they are small candles.

13,101. Whatever they may pay for candles and for powder it comes out of the price that you pay to them per ton?—Yes, it does; but the wages that I stated the men earned are quite independent of all these out-takes; that is the net wages, the 22*s.*, after all deductions are taken out.

13,102. What deductions are made besides for powder and candles, and the club, or are there any?—Yes, they pay for sharpening their tools.

13,103. Is the wear and tear of the tools taken into account, and are they weighed?—No; when they first begin to work the place they have a set of tools given to them; the most expensive of them are the drills, which are made of cast steel, and before the miners can get a new one they must bring the short one in; but there is no deduction made for wear and tear; if they lose one they must pay for it.

13,104. Have the candles which the miners use a cotton wick?—Yes.

13,105. If a candle with a cotton wick goes out, is there not some difficulty in blowing it in again?—I never heard of any difficulty.

13,106. I suppose they all use candles with cotton wicks?—Yes, so far as I am aware.

13,107. Have you never seen a candle with a mixed wick in use?—No, I have not.

13,108. Do the miners reside near the workings?—We cannot get lodgings for all of them, but as many as we can get places for do, and we are very glad of it; but some of them have to walk as far as three or four miles, but only a few of them now. The houses are very much increasing in the neighbourhood.

13,109. Have you built some houses for the miners to live in?—Yes, I have built in the neighbourhood about 25.

13,110. What do you let them to the miners for?—The men pay 2*s.* 9*d.* per week.

13,111. Do the houses in which they lodge consist of four rooms?—Yes; and there are conveniences outside of each house, such as a privy, an ash hole, a coal house, and a sink; the whole of the premises are thoroughly drained.

13,112. Are there any schools for the children?—There are schools in the neighbourhood.

13,113. How are they supported?—The schools are supported by the contributions of the workmen themselves.

13,114. Are there any deductions made for school fees?—Not in our case.

13,115. (*Mr. Austin Bruce.*) Do you ever receive any complaints from the men as to the management of the works?—No, we have been extremely free from complaints. We had a manager who understood his business well, and he had been with us between six and seven years, but was addicted to drinking; he was several times warned, and at one time a reduction was made from his wages; but we found that the habit had become so strong upon him that he broke out upon one occasion more than usual, and we discharged him; and some of the men, who we found afterwards were some favourites of his, incited the rest of the men to strike, and they were trying to compel us to take the man on again whom we had discharged; but we gave them notice that if they did not go to their work in 12 hours we should not employ one of them again. Within 12 hours we had more than half of them at work; we have never had any complaints as to wages.

13,116. Have any other accidents occurred besides those arising from the blasting with powder?—We have had two or three accidents which arose from the incautiousness of the men getting on to the cage after it had started; they did not get fairly into the inside, and were caught against the framing of another eye above; we have had two accidents of that sort, and accidents from falls. Sometimes when the miner's have fired a blast they were not sufficiently careful to take down the ore that had been loosened, and it came down upon them.

13,117. At what age do the miners generally commence to work underground?—I do not think we have any man who goes to work underground under the age of 20; we have a lot of boys who work at the surface.

13,118. Up to what age, under ordinary circumstances, are the men able to continue working underground?—We have men working at the age of 60. I do not think there are any older than 60.

13,119. Do you consider that the miners are, on the whole, a healthy body of men?—Yes; I think they are extremely so.

13,120. Do you think they are as healthy as those who work aboveground?—I think they are quite as healthy; they are a very robust body of men.

13,121. Have you ever known any instance of a man suffering from any complaint that you could connect with his employment as a miner?—Not a single instance.

13,122. (*Mr. Holland.*) Are you sure that they are not more liable to any disease of the lungs than other men?—No; I think not.

13,123. (*Chairman.*) Do you adopt any particular mode for ventilation?—We have a connection between all our pits, and the air has a free course through from one to the other.

13,124. While working the pit, have you never had any place where the air has been dead or poor?—We have in one solitary instance I think; we had to put up what we call a brattice in the middle of the drift to get a connection with another portion so as to get connected with another shaft, and that effectually cured it.

13,125. Was this drift through the ore or in the rock?—In the ore.

13,126. (*Mr. Holland.*) Are you sufficiently acquainted with the men of this district to speak generally of their health?—I think I am.

13,127. You say that generally they are a healthy class of men?—I do, and I think it is quite borne out by our own medical man's reports. I think that the iron tends to preserve health; that it gets into the system; it certainly does not injure it.

13,128. (*Mr. Austin Bruce.*) Is the system of working the mines the same in all the mines in the neighbourhood of Whitehaven?—I think it is. The mines vary; in our case the ore is almost stratified, but that is an exception; in the generality of mines it is found in veins, which lead to what are called sops. A place may be found as large as this room, then will come a narrow vein leading to another sop. We have the mines all connected; it is not stratified rock, but in our case it is stratified to a certain extent; it has a regular dip, and leads from No. 1 pit to No. 3; we generally work it in three levels; we begin at the top, leaving a table of ore between that and the second working, another table between the second and third, which is on the bottom.

13,129. What is the number of separate mining establishments in this neighbourhood?—I cannot state off hand. Mr. Hunt's book, I believe, tells it correctly. I think that there are 23 mines, if I recollect rightly.

13,130. Under 23 different proprietors?—No; some proprietors have mines in different parts of the country.

13,131. Are all these mines in the hands of resident proprietors?—Very extensive mines belonged to the late Mr. Hill of Plymouth, but with that exception they all belong to resident people.

The witness withdrew.

THOMAS AINSWORTH, Esq. examined.

13,132. (*Chairman.*) What are the mines in which you are interested?—The Cleator Iron Ore Company.

13,133. Is the description of the ore in the mines the same as at Parkside?—Yes; the hematite ore.

13,134. Have you ever been into the Parkside mines?—No.

13,135. Can you tell whether the ore is worked in the same way?—Yes; I think that all the hematite ore in this district is worked nearly in the same way.

13,136. What is the quantity of ore raised at Cleator?—We raise from 800 to 1000 tons a week.

13,137. Is the taking out of the ore let to the men by the ton?—Yes.

13,138. Do you know what deductions there are from the price which you pay the men per ton?—They pay for their own powder and candles, and sharping and shafting gear.

13,139. Do they pay to any sick club?—They have a doctors club; they stop so much out of their wages in the office, and this is paid over to a doctor who attends them, who is settled in the parish.

13,140. What is the name of the doctor?—Dr. Thompson.

13,141. Is there any allowance to the men out of that fund when they are off work from sickness?—No; we formerly did that, and we found that we were so much imposed upon, and that the really good men had to suffer for the indiscreet men, that we gave up the sick fund.

13,142. So that there is now no allowance for a sick man, but the doctor attends him?—Just so.

13,143. Does he attend his family or only himself?

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—He attends the family. Any one of the family under 14 years of age being ill the doctor attends.

13,144. What price do the men pay for candles ?—They pay the price which we contract for. We make a large contract, and they get them at the same price.

13,145. And the same with powder ?—And the same with powder.

13,146. What is the payment per week for the doctor ?— I am opposed to that system inasmuch as the men never think that they are well attended if they pay in advance, and the doctor sometimes is not able to satisfy them even by the best attendance. Therefore I object to it upon principle, but the clerk collects the money from the men and pays it over to the doctor at their wish, but it is in opposition to my own wishes.

13,147. By whom is the doctor appointed ?—By the men. I have nothing to do with it.

13,148. Do you not think a sick club an advantage? —No ; I have found it in my experience to work badly. The health of the dissolute and the bad men is naturally worse ; they are more frequently on the sick club than discreet and good men, and therefore I have always told them that I think it is a disadvantage to the honest and the upright and the good men and a premium upon indiscretion and dissolute conduct.

13,149. The men are not obliged to contribute to the doctor unless they like ?—No ; I place no restriction. I say, " This is your own affair, and you " must manage it in the most satisfactory way to " yourselves."

13,150. Do all the men contribute ?—In the iron ore pit I believe they all contribute to the doctor. In the coal pit I know that there is a difference of opinion, and that some do not contribute to the doctor. I subscribe to the Infirmary ; I also subscribe to the Eye Institution in Liverpool ; and I also subscribe to the Harrogate Baths, so that if an accident happens they are taken care of in the Infirmary, if they choose to go there. Sometimes they have an eye accident from the explosion of shots, and I then get them into the Eye Institution at Liverpool. They also have the benefit of having the Harrogate Baths free if they can pay the expenses of their journey there and their return.

13,151. Do the men reside near their work ?—Very generally, as I have a good many cottages of my own.

13,152. How do the men go down ?—We have safety cages attached to the pits.

13,153. Have you had any accident with the safety cages ?—The only accident that we ever had was through the indiscretion of the under steward and the person who had charge of the cages at the top. The instructions are, presuming that this is the ground level, and that this is the pit head level, that no man is allowed to get on at the top of the pit ; he always should be made to get on at the ground level. The underground steward and the man who had charge of the cage were going down the pit, and they drew up the cage to the pit top, and both got in there. Instructions were then given to the engine man to start the engine, and in doing so, he reversed his engine, drew the cage against the top, it was detached from the rope, and the guides which should have acted did not act, it being frosty weather ; the slides were frozen and the two poor creatures went down to the bottom and were killed. If they had obeyed the instructions which were issued, that they should only get on at the ground level, the accident would not have happened.

13,154. Then in frosty weather when the guides were above the ground, the safety catch did not answer ?—It did not answer there, and also down the pit, because the draught of air up the pit and down the pit was pretty strong, and the slides themselves were frozen. It was the water from the pumps in this case which had frozen.

13,155. (*Mr. Holland.*) Did it go rapidly down ? —Yes ; that is the only accident which we have ever had.

13,156. (*Chairman.*) How do the accidents from blasting happen ?—It is the men's own fault.

13,157. In what way is the accident principally brought about ?—We insist upon them all using copper prickers ; they say that they cannot work with these copper prickers. We profess only to supply copper prickers ; they have iron prickers and they also use iron stemmers.

13,158. Do you supply them with pointed copper stemmers ?—No.

13,159. We have been told that the copper pricker, owing to the nature of the cavities in the ore and the edges being sharp, does not answer ?—A copper pricker is very liable to be bent and to be twisted, and perhaps worn away ; but if the men would be more careful, if they would not wish to do ten minutes' work in five minutes, and would take a little more time, I do not think that that would happen.

13,160. But the copper being a softer material than the iron gets bent ?—Yes.

13,161. (*Mr. Austin Bruce.*) You say that you employ men in collieries as well as in mines ?—Yes.

13,162. Where are the collieries ?—They are here in the same parish with the mine.

13,163. Do you observe any distinction between the conduct of the one and the other set of workmen ? —I think that the iron ore miners are more respectable than the colliers.

13,164. To what cause would you attribute that ? —The trade of this district has developed so rapidly lately that there is a great deal of imported labour and a great deal of new labour which goes into the collieries as Irish labour, and therefore you have generally speaking an inferior class of work people to deal with. In the other case the persons who work in the iron ore mines are made up from the agricultural labourers of the district, and therefore they are a better class of men originally.

13,165. Is the employment equally regular in the collieries and in the mines ?—Yes, we are always able to give them labour.

13,166. Do the men ever make any complaints to you of the management underground ?—No, I have never had any complaint.

13,167. Have you ever known any dissatisfaction to exist among the workmen ?—I have had no complaint, and therefore I could not say that I know of any dissatisfaction.

13,168. You have had no strikes ?—I do not think that I have had one strike, I do not remember it.

13,169. Your workmen, I suppose, are like the rest in the district, they come to you when they are full grown ?—I was just asking that question to-day ; having a mill also, we there have the educational question introduced, and I never wish any boy to be employed in the mine till he is above 13.

13,170. Do you begin to employ them in the mine as early as 13 ?—Yes. We have very few boys in the mines: in the iron mines I do not suppose that we have above one or two ; in the colliery there are more, and there the workpeople are a greater distance from the works, and therefore we have not the same control over the children.

13,171. Have you ever observed that the iron ore miners suffer from any special complaint which might be attributed to their employment ?—No ; I think that it is a very healthy occupation.

13,172. (*Mr. Davey.*) What is the difference in the wages between your colliers and the miners ?— The men go from one to the other, so that there is very little difference with us, I think, between a miner's wage and a collier's wage.

13,173. You have stated that you think that the miners are generally a better class of men than the colliers ?—Yes.

13,174. Is there any difference in the wages to account for that ?—No. Among the colliers there are what they call trailers and inferior men, men who trail the coal to hook it on to the engine after it has

been hewn. There is a good deal more of that sort of work in a colliery than in an iron ore mine.

13,175. (*Mr. Austin Bruce.*) Have you not something equivalent to trailers in the iron mines?—Yes; but we have a fewer number of trailers in the iron mines than in the coal mines. An accomplished collier and an accomplished miner would, I think, get nearly the same wages.

13,176. (*Mr. Davey.*) How is your mine ventilated?—We have shafts; where we have very long workings we divide the air as you would in a colliery.

13,177. You brattice it?—Yes. The manager of my iron mines was formerly the manager of my coal mines, and therefore, where it is necessary, we provide them with bratticing.

13,178. (*Mr. Holland.*) Do miners look older than other men of the same age?—No; but they look a little paler.

13,179. (*Mr. Austin Bruce.*) Do you ever have any accidents at your collieries?—I think that we have only had one accident resulting in death, and that, I think, was above ground.

13,180. Have you ever had an explosion?—Never.

The witness withdrew.

Mr. ARCHIBALD BELL examined.

13,181. (*Chairman.*) You are manager of the Cleator Iron Ore mines?—Yes.

13,182. Can you state the number of men employed there?—Sixty-four.

13,183. How many of those are under ground?—We have 60.

13,184. Do you make any particular allowance of candles?—No, we leave them to purchase their candles; we supply them at the works.

13,185. But they are not obliged to take them from you?—No; we are often out of candles, and the people may go where they will for candles.

13,186. Is it the same with the powder?—Yes, we supply it. It is the wish of the miners for the Company to provide these things for them, and when it is a wish of theirs of course we let them have them from us.

13,187. With regard to ventilation have you ever found that the candles will not burn in a drift?—No.

13,188. Then you have never had to apply any artificial mode for ventilating the iron ore mines?—No.

13,189. How many shafts have you?—We have two shafts in operation now.

13,190. What is the distance underground between each shaft?—The shafts are not both sunk to the one seam.

13,191. What is the deepest?—Forty-three fathoms.

13,192. And what is the shallowest shaft?—Twelve.

13,193. Was the 12-fathom shaft sunk for the purpose of ventilation or for the purpose of getting ore?—It was sunk in the first place for the purpose of getting ore.

13,194. Is it still used for that purpose?—Yes.

13,195. What is the distance between those two shafts?—It is, I think, somewhere about 20 yards.

13,196. Is there any communication between them?—There is a drift put through from the deepest pit to the 12-fathom shaft going up to it.

13,197. And that answers the purpose of ventilation without any artificial means?—Yes; we have a division in the pit, the air coming down the one side and returning up the other shaft.

13,198. Does it always go up the one shaft?—Sometimes it will take a turn. A bogie will very often turn the air in going down and put it in its right course again.

13,199. You blast?—Yes.

13,200. Have you had accidents by blasting?—There has been one since I came to the place.

13,201. Could you trace the actual cause of that accident?—So far as I could see it was from tamming in the ore.

13,202. The rod struck fire?—I think so. I could trace it to nothing else.

13,203. Do you use the safety fuze?—Yes, where it is wet; but we use a pricker where it is dry.

13,204. Do the men prefer the pricker?—Yes.

13,205. Is there any reason why you should not use the safety fuze when it is dry?—With the little cavities perhaps you might go through two or three of those before you had a blast, and if you put the safety fuze into these cavities it very likely might be cut through.

13,206. (*Mr. Kendall.*) Have you had any strikes in your mine?—Not since I came.

13,207. How long have you been there?—Two years.

13,208. The men are very healthy?—Very healthy indeed.

13,209. Do they go down at stated periods?—Yes.

13,210. Supposing that they disobey any of your rules, have you a system of fines?—If they disobey the rules I let them be away for a few weeks and then perhaps take them back again.

13,211. You find that that is a better system than fines?—Yes.

13,212. You do not like fines?—No.

13,213. And they would not like it?—No.

13,214. They are very independent, are they not?—No, I think not; the people are reasonable enough. Some of them are, and some of them are otherwise.

13,215. Taking them as a body they are very amenable to orders?—Yes.

13,216. Do they save much money?—I cannot say.

13,217. Their wages are good but they spend freely?—Yes, in too many cases.

13,218. As far as the families go are they fairly taken care of?—Yes, so far as I am aware. The men are in general from all countries, Cornwall, and Scotland, and Ireland; they are mixed up.

13,219. You have a frequent change of hands?—Yes.

13,220. And that does not enable you to speak as to the family?—No; because a man, perhaps, may go away after having been with us for three or four months.

13,221. (*Mr. Holland.*) Is there any peculiar disease among the miners?—No; I cannot say that there is.

13,222. Are they peculiarly liable to any cough or difficulty in breathing?—No, they appear all to be pretty healthy.

13,223. Do they look older than other men of the same age?—I do not think they do; they look fresh.

The witness withdrew.

Mr. JOHN BATEMAN WILSON examined.

13,224. (*Chairman.*) Have you been long the medical attendant of the Parkside mine?—Between six and seven years.

13,225. Very nearly since the commencement?—Very shortly after the commencement.

13,226. Have you other practice in the neighbourhood besides?—Yes, that is only a portion of it.

13,227. Is there any particular illness to which the men at Parkside are liable?—There is no particular illness.

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13,228. By the arrangement with the Parkside managers, do you attend the men alone or their families also?—The men and their families. I do not attend the wives in midwifery, it would be too great a task to undertake that, but I attend in all other cases the families until they are 14.

13,229. Are accidents the principal causes of your attendance being necessary?—There are accidents which I attend, and there are the usual class of illnesses. A good deal of stomach complaints from, perhaps, improper living and intemperance at times. Then again the complaint to which miners are more subject is rheumatism, from the sudden changes of temperature, coming out of a warm mine, and having to walk four or five miles, some of them, to their houses. The change of temperature sometimes in wet weather produces rheumatism, which is the malady to which they are most subject.

13,230. Do they change their clothes when they go in and come out of the mine?—Not till they get home.

13,231. They do not change on the mine?—No; they generally have with them a kind of upper coat as a protection to put on when they come out, a kind of waterproof which they take with them; nearly all of them, I think, are provided with that, which they leave when they are at work. I dare say, that in a general way, if the mine is very warm, they have scarcely anything upon them but their flannel vest.

13,232. Have you ever been down into the mines?—I have not.

13,233. In this neighbourhood, should you say that there is any endemic disease?—No, we are particularly clear of that, but I am afraid that in the course of a few years we shall be subject to it, because there is such inattention to sanitary regulations in the building of new residences. They are nearly all new residences which have been built for the miners, which is quite a new feature in this small locality. There are thousands where there were only dozens before, and there has been so little attention to sanitary regulations, that I am afraid that as we find a kind of cycle of these complaints, in the course of time some of the places will have some very sad outbreakings of cholera and fever.

13,234. Would that be from overcrowding or the ill-construction of the dwellings?—The ill-construction of the dwellings and the want of drainage in front of the dwellings.

13,235. There is no provision for getting rid of the refuse thrown out from the house?—Not any provision; in fact, that seems to be a very great want here, and it will at some time be very serious.

13,236. Is there no sanitary board?—The sanitary board at present is a very inefficient one, it is under the surveyor of highways, and partly the guardians of a country district. These persons do not expend money very willingly; I have experience in that way, because I am a guardian of this union, and have always taken an interest in sanitary matters, and should have liked to have seen these matters carried out, but I find that the law is insufficient.

13,237. Have you represented this?—I have not had occasion lately to do it, but I have done so more particularly as a guardian, not on account of these mines, but in the same locality, when an old Act was enforced, when it was more under the Board of Guardians. Now there is some difficulty in carrying it out.

13,238. (*Mr. Austin Bruce.*) You have stated that on the whole miners are more subject to rheumatism than the rest of the population?—I do not know that there is much difference per cent. if you apply the statistics in that way; it is what nearly all the labouring classes are subject to, but I think that perhaps, if anything, the iron ore miners have a greater proportion per cent.

13,239. Would not the continual exposure of the agricultural labourers to all sorts of weather make them as much liable as the occasional exposure of the miners to changes of temperature?—No, I think not; I have not observed it with that frequency amongst them. An agricultural labourer goes out pretty well protected generally about his feet, and he is not so subject to cold, and he is out for a short time, he comes in, and if he gets very wet, as he is not far from home, he can change directly. The miners perspiring freely for six or eight hours, and having, some to walk four or five miles, and some two miles through perhaps a heavy rain, get wet and chilled before they get home, consequently there is more exposure than in the case of a person working all the day through.

13,240. Have you observed whether a miner is more subject to diseases of the lungs?—No, I do not think that we have had more diseases in proportion.

13,241. In recovering from illness, is there any difference between the mining and the agricultural labourer?—An agricultural labourer in general is a steadier man, his habits are not so unsteady as those of a miner; it is that which makes the difference. I do not think that it is the employment.

13,242. Do you attend any collieries?—I do; I attend the greatest portion of the colliers working in Lord Lonsdale's coal mines here.

13,243. Do you observe any difference in the physical condition of the colliers and the miners?—I think that the iron ore miners as a body are healthier.

13,244. To what do you attribute that difference?—I account for it in this way; that they are perhaps stronger when they begin to work. Some of those who work in coal mines begin to work at a very early age, and their system does not get so well developed. A great proportion of the iron ore miners are persons who have been agricultural labourers before, and they perhaps do not go into the mines until they are 22, 24, or 25, or until they marry. In this part of the country the agricultural labourers live in the houses of the farmers, and they are hired by the half year; there are very few out-door agricultural labourers in this district. It has been a great boon to these men to go into the iron ore mines, and to make much better wages, and their families are more comfortable than if they had remained as agricultural labourers.

13,245. The going into a mine enables a man to set up his separate establishment?—Yes.

13,246. At what age does a collier here go to work?—Most of the boys begin, I think, at 10; I think that that is the regulation fixed by Government in the regulation of mines. They generally go in as drivers.

13,247. Have you observed any difference in the ages between working miners and working colliers?—The iron ore mines in this locality have not been worked to any great extent for that number of years; I know some of them who are above 60, who have been working perhaps for 10 or 15 years in the mines, but I can scarcely bring instances where a person has been working 30 or 40 years as I could in the coal mines.

13,247*a*. Do you know instances in the coal mines of men who have been working 40 or 50 years?—I do.

The witness withdrew.

Mr. GEORGE DIXON examined.

Mr. G. Dixon.

13,248. (*Chairman*). I believe that you have several mines under your charge in Cumberland?—I have.

13,249. What description of mines are they?—Iron ore, coal, and lead mines.

13,250. Can you state the names of the iron ore mines?—The Winder and Yeathouse iron ore mines.

13,251. Where are they?—In Frizington in the district of Parkside.

13,252. (*Mr. Kendall*). All in this county?—All in this county.

13,253. (*Chairman*). Where are the lead mines?—In the Keswick district.

13,254. Will you give the names of them?—Gold scope, Brandelhow, and Force Crag.

13,255. Can you state about the number of men in the iron mines?—I act as mining engineer to the iron mines, and as lessor's agent to the lead mines. In the Yeathouse and Winder mines, which are worked under the same firm, but are two separate and distinct mines, we employ 156 hands underground, and 26 surface men, making a total of 182 men.

13,256. Are those iron mines worked in the same manner as the Parkside and the Cleator mines?—Generally they are.

13,257. Can you point out any difference in the working of those mines?—I could not point out any essential difference. The produce is about 120 tons per day for that number of men.

13,258. How are the bargains made with the men, by ton or by piece work?—By ton.

13,259. They work in parties of how many, generally?—Parties of from three to six. These parties are called companies of men.

13,260. Are the bargain and payment made to one man?—Yes. The depth of the pits is from 30 to 40 fathoms. In each of the mines there are two distinct shafts for the purposes of ventilation and working.

13,261. (*Mr. Kendall*). Connected with the same vein?—Yes.

13,262. And communicating one with the other?—Yes. The lateral extent of working is from 200 to 300 yards, transversly, perhaps, 40 to 60 yards.

13,263. (*Chairman*). What is the highest and what is the lowest amount which the men can earn at the prices which you pay per ton?—The prices paid per ton vary very considerably with the nature of the particular work in which the men are engaged. The average rate of wages may be taken at something like 3*s.* 2*d.* to 3*s.* 4*d.* per day. I think that that is our last fortnight's average.

13,264. Can you tell what was the lowest and the highest?—I cannot; that is about the average.

13,265. Are the wages of the men the same as in the neighbouring mines?—They are about the same.

13,266. Do the men change much from one mine to the other?—The young men do, but the married men with families do not change much.

13,267. Do they reside in the neighbourhood of the mines?—They do.

13,268. What is the furthest distance from the mine at which they reside?—Some of our workmen I dare say travel three miles to and from their work, but not many of them now.

13,269. Are houses being built for them?—Yes; and great numbers have been built within the last 10 years.

13,270. Who are the parties who build them?—Generally independent parties.

13,271. Do you know what rent the men pay?—From 2*s.* 6*d.* to 3*s.* a week.

13,272. Are the houses commodious and well built?—They are generally houses containing two downstairs rooms and two upstairs rooms with small back premises.

13,273. Do they take in many lodgers?—I can scarcely answer that question.

13,274. (*Mr. Kendall.*) I understand from you that you have got two shafts, one at each end of these 300 yards' workings?—Not at each end.

13,275. I am right in supposing that your main working is about 300 yards long?—Yes.

13,276. And that you have a transverse working of about 60 yards?—Yes.

13,277. In the 300 yards you have two pits; whereabouts are they situated?—The extent of workings in one case to the dip of ore pit is 400 feet and to the rise 250 feet from the other pit.

13,278. Are the transverse workings as well ventilated as the long workings?—Yes, we put stops in and carry air boxes which can supply any amount of air. We make use of those when necessary.

13,279. You find that by these divisions and trap doors, and so on, you can convey a draft when you like without any fans?—Yes; sometimes in long drifts, when there is no communication with any other workings, we put in a fan.

13,280. In the course of the year have you a fan working three months?—No.

13,281. How many fans do you use?—We never used more than one fan.

13,282. And perhaps upon the whole you use it one month out of twelve?—No, it is very seldom used at all.

13,283. Generally speaking the ventilation is as good as can be?—It is.

13,284. (*Mr. Holland.*) When did you work the fan last?—Four or five years ago.

13,285. (*Mr. Austin Bruce.*) You have no difficulty with the ventilation?—None whatever.

13,286. Do you conduct it on the same principles as the ventilationof the collieries with which you are connected?—Generally speaking so. Of course we have not the same opportunity in an iron mine as in a colliery; the workings in a colliery are a great deal more regular, laid out with regular boards and headways.

13,287. In the iron mines have you a regular upcast and down-cast?—Yes.

13,288. Does the return air always pass up the same up-cast shaft?—Yes; it cannot get to the other.

13,289. (*Chairman.*) Why?—Because it is occupied by the down-cast air.

13,290. (*Mr. Austin Bruce.*) You have so arranged it that the up-cast shall always be the up-cast and the down-cast the down-cast?—Yes.

13,291. Is that usual in the mines in this neighbourhood?—I can scarcely answer that question.

13,292. What means do you take to conduct the air so as to secure the same up-cast and down-cast in all temperatures of the outside air?—In each of the mines of which I am now speaking, namely, the Yeathouse and Winder mines, we happen to have an underground engine; and the discharged steam is carried to the up-cast shaft in both cases, which of course secures that particular result.

13,293. Do you take much pains to prevent the leakage of air into any other than the proper channels?—We do not find it requisite at all.

13,294. Not to the same extent as in collieries?—Certainly not.

13,295. Is the stream of air which you send through the iron mines equal in volume to that which you send through collieries?—That depends altogether upon the extent of workings.

13,296. I mean supposing other things equal?—I should say that as great an amount of atmospheric air goes into our iron mines as goes into collieries.

13,297. Are there not fewer impurities to struggle with in the mines than in the collieries?—Yes.

13,298. Do you observe any difference between the health of miners and of colliers?—None whatever.

13,299. Are both healthy?—Yes.

13,300. Are your collieries liable to explosion?—Some of them are.

13,301. Any with which you are connected?—Yes.

13,302. Have you had recent explosions at any of them?—About two years ago we had an explosion.

13,303. A fatal one?—Three or four lives were lost.

13,304. Do you trace any difference in wages between the colliers and the miners to the fact of the greater danger of working collieries?—None whatever.

13,305. (*Mr. Davey.*) What is the position of your up-cast shaft; is it higher at the surface than the down-cast shaft?—We do not find it necessary to make it any higher.

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Mr. G. Dixon.

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13,306. In your particular instance is it higher. You have two up-cast shafts; are they nigher at the surface than the down-cast shaft?—In one case the up-cast shaft is higher, in the other it is not.

13,307. (*Mr. Holland.*) Are your lead mines as healthy as the iron mines?—Certainly not. I may state that I am not practically acquainted with the management of any lead mines, but merely as lessor's agent.

13,308. (*Mr. Kendall.*) Do you descend them at all?—Yes.

13,309. (*Chairman.*) Which is the largest of the lead mines with which you are connected?—The Goldscope in the vale of Newlands.

13,310. How do the men enter the mine?—By levels and by shafts.

13,311. Are there many shafts?—Two; they enter by the level, and then they descend a shaft below the adit level.

13,312. Do they go by ladders?—Entirely by ladders.

13,313. What is the width of the vein at the Goldscope mine?—I can scarcely state it; it is an irregular sop or pipe of ore that they work in at present.

13,314. Can you state about the quantity of ore raised?—At Goldscope I should think from 400 to 500 tons of ore in a year, and at the Keswick mines perhaps 300; I am speaking generally.

13,315. Are these mines worked by blasting?—Principally by blasting.

13,316. What is the rock?—Clay slate.

13,317. Are the drifts driven far from the shafts or from the day?—I should think that the extent of drifts and workings may be assumed at from 300 to 400 yards from one extreme to the other.

13,318. Is there any difficulty then in supplying the men with air when they are driving a drift?—I have never seen any myself.

13,319. Have you any artificial means for supplying them?—I think that at the Goldscope mine I have seen them use zinc air pipes in some of their long drifts, and the ventilation is produced by what they call a water blast, the falling of water.

13,320. Do they report to you when anything is necessary in the way of ventilation?—No.

13,321. That is left entirely to the manager?—It is.

13,322. Are the men healthy?—Generally speaking.

13,323. Do you know of any peculiar illness to which they are subject?—They are sometimes subject to some disease in the lungs, I fancy caused by breathing stone dust produced in the process of working.

13,324. There is a good deal of dust?—Yes.

13,325. Do the men suffer at all in the smelting houses?—I am not acquainted with the smelting.

13,326. The ore is taken away without being smelted?—It is taken to Newcastle and into Wales I believe; it is sold to those places to the smelting houses.

13,327. (*Mr. Kendall.*) What is the condition of the lead miners; do you think that it is equally favourable as that of the iron miners?—I do not think so. I do not think that it is so healthy an occupation as in the coal and iron mines.

13,328. Do you see a difference in their looks?—Yes.

13,329. Do you think that they work as old as the others?—You will find occasional cases of very old lead miners, but they are exceptional.

13,330. Taking the lead miners as a body, do you think that they work as old in life as the iron miners?—I can scarcely answer that question.

13,331. Are the wages of the lead miners as great as the wages of the iron miners?—No.

13,332. What is the difference?—I think that the lead miners do not earn more than 18*s.* a week on the average.

13,333. Do you think that the ventilation is as good in the lead mines as in the iron mines?—Yes; I think that in those with which I am connected it is.

13,334. Do they carry on the same system of club money in the lead mines as in the iron mines?—We have no clubs in the mines with which I am connected.

13,335. If the men are sick will they fall on the union?—They will fall on the union I suppose if they have no other means.

13,336. Have you ever tried a club?—We gave the men an opportunity of doing so, and we left it to themselves voluntarily to adopt it, but they did not choose to adopt it; we recommended them to do so.

13,337. Have you got any medical man attached to the mines?—No. Our overmen strongly recommended the men to adopt that system, but they refused; we did not, of course, choose to employ any unnecessary pressure upon them; we left it perfectly free.

13,338. (*Mr. Austin Bruce.*) Are there any special difficulties in ventilating lead mines?—No, none that I am aware of.

13,339. Whence does the dust which you speak of as affecting the lungs of the miners in lead mines arise?—I suppose from the character of the rock, the mineral itself in which they work.

13,340. Is it after blasting?—Not after blasting, but in the picking and the general working in fact. They are breathing an atmosphere charged with a certain amount of heavy dust coming from the rock in which the lead is deposited.

13,341. Is there any vapour or gas?—No, there is no deleterious gas that I am acquainted with.

13,342. To what do you attribute the fact that a miner in lead mines earns less wages than a miner in iron mines or a collier?—I fancy that they have been brought up to that particuler class of work; they have settled themselves in a particular locality, and I do not think that they have a great idea of removing; some few of the young men come here into the iron ore district.

13,343. As a class are the lead miners as well conducted as the other miners?—Yes, I think that generally they are.

13,344-5. (*Mr. Davey*) What effect has the dust, which you speak of, upon the breathing of the men?—I could not answer that question, that is more perhaps a medical question, I am only speaking generally.

The witness withdrew.

Adjourned to To-morrow at Coniston.

CONISTON.

Thursday, 2nd October 1862.

PRESENT :

The Right Honourable Lord KINNAIRD, K.T.
NICHOLAS KENDALL, Esq., M.P.
H. AUSTIN BRUCE, Esq. M.P.
RICHARD DAVEY, Esq., M.P.
P. H. HOLLAND, Esq.

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

Mr. JOHN BARRATT examined.

13,346. (*Chairman.*) In what mines are you interested in this neighbourhood? — The Coniston mines.

13,347. Are they near Coniston?—Yes; and there is another called Tilberthwaite.

13,348. What is the total number of the men employed in these mines?—Of men and boys there are about 350 employed.

13,349-59. How many are employed underground?—I have taken them out, and the number will be shown in this paper.

The following paper was handed in:

Number of men employed at Coniston Mines.

Number of pickmen	-	-	150
„ pitmen, &c.	-	-	7
„ machine-men	-	-	3
„ waggoners, fillers, &c.		-	27
			—187
Employed at surface dressing:			
Number of men	-	-	26
„ boys	-	-	82
„ girls	-	-	18
„ overlookers	-	-	4
			—130
„ carpenters	-	-	5
„ smiths	-	-	7
„ masons	-	-	3
„ carters, &c.	-	-	4
„ agents	-	-	5
			— 24
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13,360. What description of ore does the mine produce? — Copper. The number of men employed shown in the paper I have handed in includes six men who are employed in Tilberthwaite; but it is all one company.

13,361. What is the deepest level at which you are working?—The deepest level is 150 fathoms at the old engine shaft, under the adit, and the adit is about 50 fathoms.

13,362. How many shafts are there?—On the old mine there are two shafts, the new engine shaft is 180 fathoms west of the old engine shaft.

13,363. How many fathoms are there between each of those shafts?—180.

13,364. How do the men descend into the mines?—By ladders.

13,365. Do they go in at the adit level?—Yes, and then they descend.

13,366. How many levels are there?— The levels are driven apart as follows, viz., the 20 fathoms, 35 fathoms, 50 fathoms, and 70 fathoms; and from the 70 to the 150 we go 20 fathoms distant. In Paddy-end there is another shaft further west, and another run of lodes.

13,367. Are these distinct mines?—They are now connected by the adit level. I had better call them all one mine and under the same company.

13,368. How is the ore drawn?—By water wheels, machinery, and kibbles, and chains.

13,369. Is no skip used?—No; the shafts are all crooked, or they have been hitherto; but now we are making them perpendicular.

13,370. Are you altering the old shaft?—It is now perpendicular from the surface to the bottom, 200 fathoms.

13,371. Do you intend to put in any other machinery?—Yes; we are preparing to put in skips.

13,372. Shall you work with a cage or a skip?—We are not decided yet about that; it depends a good deal upon the prospects in extending the 150 fathom level, how far the vein will warrant it.

13,373. Do the men work in shifts, and, if so, what length of shift?—8 hours. We have only one set of men in the last shift or core by night; they go on at 6 o'clock and come off at 2; the hours are 2 o'clock and 10.

13,374. Have you tribute or tutwork-men?—We have only one set of tributers.

13,375. Are all the others tutwork-men?—Yes, stoping by the fathom and driving by the fathom.

13,376. Have you had any accidents from blasting?—Yes.

13,377. Is it your practice to use the safety fuze?—Very little, but we have tried it over and over again. I am determined to insist upon it now, because I am confident of the advantages and safety which result from it; the men have had a prejudice against it.

13,378. Do they use now a pricker and a straw?—Yes, they use a copper pricker.

13,379. When the accidents occurred were you able to ascertain from what cause they arose?—Some of the accidents occurred from boring out the holes, most of them, but it is very difficult to get hold of it, for the law is that the men shall have no relief, and there is no doubt that the last man who was killed lost his life in that way; but in about a month after the coroner's inquest it was ascertained that the accident arose from boring out a hole.

13,380. You say that relief is withheld, from what source does that come?—That is the club.

13,381. Is that a club for the purpose of affording relief in sickness, or in case of accidents?—Merely for accidents.

13,382. If a man meets with an accident from his own fault, as I understand you, he does not obtain any relief?—The rule is that he should not obtain any; but he does, notwithstanding that, get what we can do for him.

13,383. Do you keep a separate account of the club money?—Yes, we keep a distinct account.

13,384. What do the men contribute towards the club?—The men contribute 1*s.* per month, and the boys, who are in receipt of 12*s.* per week, contribute 9*d.* per month. Those boys who receive only 10*s.* per week contribute only 6*d.* per month, and other boys, who receive only 5*s.* per week, pay only 4*d.* per month.

13,385. Relief is given only in cases of hurts?—Yes, and pensions are given; we have several pensioners.

13,386. Do you give a pension to a man who has received a hurt and is unable to work?—Yes, about 5*s.* a week; at the present time we give that to two men, and there are two or three women with families, whose husbands lost their lives five or seven years ago, and we continue to give a pension of 3*s.* a week to those women.

13,387. Are the contributions made to the club by the miners sufficient to meet all the demands upon it?—

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Yes ; there is a balance at the present time of about 70*l.* in hand.

13,388. Do any of the miners belong to benefit clubs ?—All o them.

13,389. Do you make any difference in the allowance made from your club in such cases ?—Yes ; there is one man who was hurt some years ago and he gets 2*s* 6*d.* a week, but he receives 9*s.* a week out of his club.

13,390. From his own benefit society he receives so much, and in that case the allowance made to him from your club is less than usual?—Yes ; we have only one case of that sort. That is the only case I have known.

13,391. Suppose that a man was receiving an allowance from his own benefit society, should you, generally speaking, make any difference in the allowance you made to him ?—Yes, we should after he could walk about, but not before. We have employed two men to wait upon them, and they did so for a month or six weeks in one case. We provide everything that the doctor recommends ; whatever he recommends we supply. It is entirely left to the doctor, and the doctor is not appointed by the men, but by us. He has a fixed salary, not at all dependent upon the club. We found that the other system did not answer, for the men were constantly holding factions meetings, and we then said, "We will appoint "a doctor, and if he does not give you satisfaction it "will be time then to dispute the matter." But the men had repeatedly chosen them, and there was a general feeling among them that we should soon remove the doctor.

13,392. What remuneration does the doctor now receive ?—He is paid 140*l.* a year, and he attends the families of the miners in sickness ; and he attends the men in accidents and provides medicine.

13,393. Does he attend all the families of the miners for that remuneration ?—Yes.

13,394. (*Mr. Kendall.*) Does he also attend the women in their confinements ?—No ; the usual fee in this country is about 15*s.* for attending women in their confinements ; but we say to him, we will guarantee you half a guinea. Very little of that is paid, but nevertheless we guarantee to him the payment of half a guinea in those cases, which amounts to about 20 guineas a year. We do not get half of the money back again, but we take our chance of collecting it. I should mention that the doctor's salary comes out of this club.

13,395. Does the doctor attend the whole of them in cases of sickness ?—Yes. The half-guinea does not come out of the club. We say we will guarantee it, but fortunately for us there are many men who are pretty well off, and they will pay the doctor 15*s.*

13,396. Then the club money does so far provide for the doctor ?—Yes ; in case of accidents. The doctor will receive out of the office about 160*l.* a year.

13,397. Does he attend other families living in the neighbourhood ?—Yes.

13,398. Have any accidents occurred within the last two or three years from anything but blasting ?—Yes ; a man was killed a year and a half ago in consequence of the ground giving way.

13,399. Is that an accident likely to occur from the nature of the ground ?—No ; it is very seldom that there are any faults, and this was seen.

13,400. Do the miners at all complain in this neighbourhood of shortness of breath ?—Very seldom. The fact is that two thirds of them work above the adit level. They go into the adit level, and we have a mine above the adit level 100 fathoms high, 150 now, and those men that we put there are the old men, who of course complain if they are working in the deep mines. They say, "It is time for me to give over," and then such a man is put there. The bargains are not let by auction as they are in Cornwall. It is all done privately.

13,401. Do you leave that matter to the manager ?—Yes. Once in two months the bargains are let. They are merely drawn out on a piece of paper.

13,402. Do the old miners complain of having to climb the ladders ?—Yes, and they object to go down, but not so with young men.

13,403. What is their reason for not wishing to go down ?—The labour is very great for men to descend as low down as 150 fathoms.

13,404. Is that the only reason that is assigned ?—Yes.

13,405. It is not that the air is close there ?—No, because the air is good.

13,406. What is the greatest heat that is to be found there ?—About 70° or 75° in the bottom. There is no water in the bottom, not a drop. We have to send down water to bore with, and we are 200 fathoms deep.

13,407. Is there not water in some of the levels ?—In the upper levels there is very little ; the engine does not work above an hour a day.

13,408. (*Mr. Austin Bruce.*) Is there some kind of stratification which drains out the water ?—No, it is the closeness of the rock. In the very bottom it is very hot, but as soon as a draught is made the agent says that the air is as good in the 150 as it is elsewhere.

13,409. How can he judge ?—From the coldness of the air. We are obliged to put in doors to stop the current, because it is so strong.

13,410. Do you carry that air into the parts of the level where it is hot ?—Yes, if it is required.

13,411. Is there any place where the candles have not burned well ?—No, except in the level perhaps.

13,412. Have the miners ever to slope the candles ?—No, very rarely ; they may in a level when they have advanced beyond a winze or a sumpt ; when they have advanced 20 or 30 fathoms the air becomes close.

13,413. (*Mr. Holland.*) Is it not so close as to oblige the miners to slope their candles ?—Yes, in that case they would perhaps.

13,414. (*Chairman.*) How far should you say you could drive a level from a winze or a shaft ?—At Tilberthwaite, that is now 500 fathoms from the main level and no communication ; it is going on now with six men.

13,415. (*Mr. Kendall.*) How do you manage to send the air in ?—By a water blast through a 6-inch iron pipe. We drive the air in for a distance of 500 fathoms. I was there not long since, and it would almost blow a candle out.

13,416. What is the height of the waterfall ?—About 30 or 35 feet.

13,417. (*Mr. Holland.*) Does the water fall in a jet ?—Yes ; the water falls into a cistern, and a pipe is carried on horizontally.

13,418. (*Chairman.*) It is carried on for 500 fathoms ?—Yes.

13,419. What is the longest time during which a miner can work in air where the candle will not burn well ?—They do not work above six or seven hours.

13,420. How many weeks or months do you think they could continue to do so ?—We never saw any effects produced by it.

13,421. How long would they continue to drive that level where the air was so bad that a candle would not burn ?—The candle will always burn ; but it is necessary to put it a little on one side. We have no such instance as that now, but I have seen it.

13,422. How long do you think a miner could keep on working in that state of things ?—For six or eight hours.

13,423. Do you think he could continue to work under such circumstances for many weeks or months ?—For months or years. If a man does not like a place he will not take it, and another will come and take it ; there is no compulsion used here.

13,424. You say that the miners sometime refuse to take a place ?—Yes, they say that they do not like it, and they will not take it.

13,425. (*Mr. Holland.*) Do they refuse to take it

because the air is close?—Partly on that account; but there is not an instance of that now. We have not an instance in the mine at the present time where the air is so close as that.

13,426. (*Mr. Austin Bruce.*) To what do you attribute that fact?—To the communications, the winzes and the shafts. We never care about the distance to the shafts, but we put winzes through at certain points, and then a rush of air comes to the winze, and then the level advances on.

13,427. (*Chairman.*) Is there one of these shafts which is always an upcast shaft?—Yes, generally so, in the western part of the mine, for there it is the higher ground.

13,428. (*Mr. Holland.*) Does the air never go down that shaft?—Yes, occasionally it does.

13,429. (*Chairman.*) Is is not at all affected by the weather?—I do not know that it is; we have met with instances in which the current was not so slack, or too strong, and we have put a trap door in, the level of the mountain being 50 or 60 fathoms higher than the downcast shaft.

13,430. You have put trap doors in?—Yes, in many places to check the current, because the men have complained of being cold.

13,431. You put trap doors in to check the current, and not to send the air into any other place?—Yes; there is too much air unfortunately.

13,432. After blasting, how long is it before the powder smoke is cleared away?—It goes away directly, or very soon; but that depends upon whether it is a close air; if it is, then the powder smoke lies longer than at other times.

13,433. (*Mr. Holland.*) What should you say was the longest time that the powder smoke hangs about?—I have no idea; but perhaps 10 minutes or a quarter of an hour.

13,434. Is that considered a long time for the powder smoke to hang about?—I do not know, we do not attend to that, we experience no ill effects from it. If I go underground the men will say to me, You had better wait a quarter of an hour.

13,435. Does it ever hang about so long as an hour?—No.

13,436. Never?—No.

13,437. (*Chairman.*) What deductions are made from the men's earnings besides for the club?—Nothing. There is the house rent of those who live in cottages belonging to us.

13,438. Do the miners pay for candles and for powder?—Yes, and smith's cost.

13,439. For weighing the tools?—Yes, they pay for everything.

13,440. What do you charge the miners for candles?—I think they charge the men 7*s.* a dozen pounds; it is a uniform rule. If we departed from it we should have a constant alteration in the price. We buy the candles for 6*s.* a dozen pounds, perhaps, and we charge the men 7*d.* a pound. It is the same as to the powder; we keep to one rule. If we did not, upon every bargain day we should have to calculate, and say, "the men's cost will be so much less, or so much more."

13,441. Could they not get their own candles elsewhere?—No, they could not supply themselves; they have no credit, and they must come to us for the money.

13,442. In paying wages, is it your practice to keep a month in hand?—It is like a month in these bargains, with respect to the men on contract or tut-work; but they have 9*s.* a week subsist if they wish it. A great number do not wish to have it, and they will wait for their balance; but there is a month in the bargains; in the daywork there is only a week.

13,443. Do the men change their clothes when they go underground?—Not in the mines; they change them all at home.

13,444. How far do the men live from the mines?—In the village about a mile or a mile and a half off; the distance does not exceed that.

13,445. Do the girls who are employed work under cover?—Yes; they are smallish girls.

13,446. And do not the men want any changing house?—No. We tried that many years ago, as far back as 20 years ago. We built a place, but they would not change there; and, finding that, what we have done since that has been this, we have made a convenience of most of the cottages, and we have about 70 or 80 in the village. We put a back kitchen, or a pantry in which there is a fireplace where the men can change and dry their clothes; but they are not made wet in the mines, they are all dry.

13,447. (*Mr. Davey.*) What is the annual produce of your mine?—About 250 tons a month.

13,448. What is the per-centage of the produce?—About 9 per cent. now; it varies from 9 to 10 per cent.; about 9 per cent.

13,449. What sale have you for it here?—We have a private contract with Messrs. , of Liverpool, and they smelt it at St. Helen's. We are under a private contract with them, but we are governed by the Cornwall sales.

13,450. What is the state of the health of your miners generally?—Their health, generally speaking, is very good.

13,451. Is there any difference between the health of the miner and that of the agricultural labourer?—Very little difference I think. The fact is that a great many of our miners have been agricultural labourers who have come into the mines.

13,452. Do they continue in good health after they come to work in the mines?—Yes, I think so. We have men working there from 60 to 80 years of age; but I attribute that in a great measure to putting all the men, as they advance in years, to work in shallow levels. But indeed they come as a matter of course and say that they must have such and such a place. They say "it is my time now, I cannot work down any longer."

13,453. And the work being all set by private contract, you are able to do that?—Yes. The bargains are all let in 10 minutes to 150 men. We merely hand out a slip of paper to the effect that they must come on the Monday morning, and say whether they will take it or not; and if they do, the matter is entered in a book.

13,454. Is there no competition among them?—No; they are free to choose their own partners, and if they have a man that they do not like they can turn him off.

13,455. (*Mr. Kendall.*) Have you any other copper mines in the neighbourhood?—No.

13,456. What is the average amount of the wages of the miners?—For the months of July and August the average wages were about 18*s.* 6*d.* a week. This is exclusive of their contribution to the "Club."

13,457. Have you any other mines of any kind; iron for instance?—I have mines below here in Cumberland.

13,458. Within what distance from this neighbourhood have you any mines?—About 18 miles.

13,459. As far as you are able to say are your wages higher or lower here than in other mines?—We are about the same here as at Furness.

13,460. You intend to employ skips provided your new discoveries warrant the outlay?—Yes.

13,461. What are you lord's royalties?—One-fifteenth.

14,462. Will the lords assist you with respect to the skips?—I do not expect that they will.

13,463. Have you made any application to them?—No.

13,464. As I understand you, your drifts, generally speaking, are about 20 fathoms apart?—Yes.

13,465. Have you any intermediate drifts?—No.

13,466. Do you not find that in a long rise of 20 fathoms you sometimes have bad air?—No. We do not rise; we stope from the end all the way on the whole of the vein; this is on a sort of regular bearing lode. The whole of the ground is cut out, and when

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we start in the 20 fathom level we may have a winze before us of 40 fathoms.

13,467. As I understand you, your veins are metal bearing veins almost all the way, and you take it all out?—Yes.

13,468. You stope it away?—Yes; they begin in the roof of the level. A pair of men will take up a stope five fathoms high.

13,469. Is the lode wide enough?—Yes; in some places the lode is narrow.

13,470. What is the average width?—From a foot to 10 and 12 feet; then they must take the country; they must take the rock where it is narrow.

13,471. Have you made any calculations as to the saving of labour to be effected by the use of skips instead of ladder ways?—No. The men have a landing place at every 24 feet, and the ladders are placed at about one in four; and this we find an easy angle to climb.

13,472. Would there not be a great saving of time and expenditure of strength?—I do not think it is worth while for the bottom part of the mine, we care very little about it, we work it only slowly.

13,473. The greater part of your labour is performed above?—Yes, that is going on.

13,474. In the very bottom where there is no water what is the price per fathom for sinking the shaft?—We make a bargain for 20 fathoms to carry the shaft 13 feet long, and six feet six wide.

13,475. What is the amount of the lump bargain?—It will amount to between 400*l.* and 500*l.* Six men will take that bargain, and then again in the stoping we let that sometimes for a bargain, and that will last four men 12 months. We say to them, "We will give you so much for cutting out the ground."

13,476. You deal with them in a large way?—Yes.

13,477. And you find that to answer?—Yes; there was a partnership in an eight months' bargain of four men, and they made 2*l.* a week by six months work.

13,478. Do you allow those men to increase the number of men working under them if they like?—We do not care.

13,479. Then they are contractors under you?—Yes.

13,480. Do they employ whom they like?—Yes. Indeed, we rather encourage it, as they will bring in strong country lads. It is all boring, but there must be one in the gang who has judgment. They will hire these young men for 14*s.* or 15*s.* a week, and they will bore as much as the best men in the mines. Then it comes to this, that in, perhaps, six months, those young fellows will say, "I will now "work for myself. I can cut the rock as well as "you can."

13,481. On the average how much per fathom do you give them?—It varies from 4*l.* to 10*l.* a fathom in levels.

13,482. (*Mr. Holland.*) About what age are these country lads to whom you have just referred?—They are about 15 or 16 years of age.

13,483. At what age do you consider that a miner becomes old?—I do not know. Perhaps 60 or 70.

13,484. Should you consider a miner old at 50?—No. They are able men at that age.

13,485. You do not think that they begin to break up at the age of 50?—No.

13,486. Are you acquainted with the Cornish miners?—Yes.

13,487. Are your miners very decidedly healthier than the Cornish miners are?—Yes; and they are stronger men.

13,488. Have you ever observed the complaint which is called miners' consumption in Cornwall?—Yes.

13,489. Have you anything of that kind here?—No. Very rarely. In fact it is not known.

13,490. It is not remarkable amongst the miners in this neighbourhood?—No.

13,491. When a miner desires to be employed in the upper levels, is that to avoid the climbing?—Yes; they say that it is easier work. We put the young men down into the bottom.

13,492. Are these mines in your opinion quite free from dust?—Yes.

13,493. Are they very free from powder smoke?—Yes, very much so, although our consumption of powder is considerable.

15,494. Are your mines cooler than the Cornwall mines?—Yes, they are cooler; for example, we have to put in trap-doors to diminish the draught.

15,495. Is that to increase the comfort of the men or for the purpose of saving candles?—It is done for both purposes.

13,496. For which purpose chiefly is it done?—I should say for both.

13,497. (*Mr. Austin Bruce.*) At what age do your men begin to work underground?—They will begin perhaps at the age of 15; but there are instances here where a man has three sons, and he will then take a bargain for four men and bring his three sons in with him who are boys.

13,498. At what age generally do they go underground to work?—They put them underground at the age of 15; we object to it, because we require those boys for the surface.

13,499. Have you none working underground under the age of 15?—No, I should think not.

13,500. Have you many between the ages of 15 and 20 working underground?—Not a great many.

13,501. Do you think that those who begin to work at the age of 15 underground last as long as men who come in at a later age?—I do not know that we have paid any attention to that.

13,502. You have stated that your upcast shaft is always the same?—I think it is generally so.

13,503. Does not that depend entirely upon its being higher than the downcast?—I presume so.

13,504. Supposing that it were not so, and that you had not that natural advantage, should you take any trouble so to guide the air as to make the up-cast shaft always up-cast?—I do not know; we have never had an instance to require it, and I do not see how it could be done, except by stopping up the upper parts of the mine to the west of the high ground. The natural cast is up-cast.

13,505. You have so much ventilation that you have no difficulty in supplying every portion of your mines?—That is so.

13,506. Are the miners a contented set of men?—Yes, they are.

13,507. Have you ever known any strikes to take place amongst them?—I have never known an instance.

13,508. There are no complaints at all which you consider peculiar to the miners working in your copper mines?—No.

13,509. (*Mr. Holland.*) Have you ever noticed the temperature of the air in the up-cast shaft?—No; but it would be cold.

13,510. (*Chairman.*) At the bottom of the ladders is it sollered over at each stage?—Yes; and then the next goes behind that. There are bunnings, which means a platform or stage.

13,511. Is that a very necessary precaution in order to prevent accidents?—Yes. We never had but one instance of a man falling, and that occurred some five or six years ago; he slipped down the ladder and there he stopped.

13,512. Have you stated the lowest wages that any man earns?—No. There may be a stranger who may not earn more than 12*s.* or 14*s.* per week for a month or two.

13,513. What are the highest wages that a man may earn?—They have made as much as 30*s.* or 40*s.* a week, but we do not take them into the averages; they are exceptions. If we let a bargain for 500*l.* we do not consider that a fair case for an average.

13,514. (*Mr. Holland.*) What wages do the country labourers receive?—Half a crown or 3*s.* a day.

The witness withdrew.

Mr. WILLIAM MITCHELL examined.

13,515. (*Chairman.*) Do you manage both the mines referred to by the last witness ?—I manage only one of them ; we have two departments ; a nephew of Mr. Barratt's manages one part, and I manage the other. I take the low mine, or the deep mine.

13,516. How long have you been in your present position ?—I have been there for 12 years under this company.

13,517. Are you a Cornish man ?—Yes.

13,518. Have you worked in any mines in Cornwall ?—Yes. I was brought up from a boy as a miner.

13,519. Did you ever work in any mines in Cornwall in any poor air ?—Yes. I have worked in poor air in mines, but not much.

13,520. Did you suffer at all from working in poor air ?—Yes. I suffered from head ache, and weariness or languidness after it.

13,521. How did you discover that you were working in poor air ?—By the difficulty I felt in breathing. I felt a difficulty, and also from the candles not burning (or burning dimly).

14,522. Have you ever seen any place in the mine in which you are engaged where the candles would not burn ?—No.

13,523. Are there any doors in this mine ?—Yes, we use what we call trap-doors.

13,524. Could not they be used in Cornish mines with advantage ?—Yes ; they might be used more than they are from what I have seen of mining generally.

13,525. You think that the trap-doors could be advantageously used for the purpose of dissecting currents of air ?—Yes ; and much better than at present. Oftentimes in mines where there is water that water might be used for throwing the air into the levels when they are exploring the mines.

13,526. Have you ever used a water-blast ?—Yes ; we use a water-blast in these mines, and we throw in the air now for 500 fathoms.

13,527. That is in the mine called Tilberthwaite, is it not ?—Yes.

13,528. Not in the Coniston mine ?—No, we have no occasion there.

13,529. Is there no place in your deep mine where there is bad air ?—No.

13,530. Do the miners receive a certain allowance of candles per week ?—Every man receives 2 lbs. a week.

13,531. What do the miners pay for the candles ?—They pay 7*d.* a pound ; that is the mine charge.

13,532. Do they consume the whole of the 2 lbs. of candles so supplied to them per week ?—We do not know that ; they are allowed to take them if they do not use them.

13,533. Do the men ever complain of having to climb up the ladders ?—Yes, they complain of that ; it is very fatiguing and exhausting after doing a hard day's work.

13,534. Do you think that that prevents any of the older men from going down ?—Yes ; when the miners get old and infirm they are not capable of doing it.

13,535. I suppose you would rather have experienced men to work in the mine than inexperienced men ?—Yes, decidedly ; there is nothing like a man being trained up from boyhood into it as a miner, for they require experience.

13,536. Then the circumstance of having to climb the ladders may prevent experienced miners from being employed in the mine ?—No.

13,537. Have you ever been yourself in a skip or a cage ?—Never in a skip. I have been down by what they call the man-engine in Cornwall.

13,538. Have you never been in a colliery ?—Never. I have been brought up a lead, tin, and copper miner.

13,539. (*Mr. Holland.*) Have you ever seen any iron mines ?—Yes ; I have been down them, but I have only been in Mr. Barratt's mine.

13,540. (*Chairman.*) Do the men ever go down in a cage ?—They do occasionally, but they have a ladder put into the road, and they can go either way ; I went the ladder way, not being accustomed to ride in the cage.

13,541. (*Mr. Davey.*) Do you belong to that department in which they are driving a long cross cut in this mine ?—Yes, I go there occasionally for the purpose of measuring and letting the work.

13,542. What is the object of driving that cross cut ?—To cut copper veins and to open up a new mine.

13,543. Is that done upon speculation ?—There has been a mine wrought that has been worked and sunk down for 25 fathoms, and this level is coming in 87½ fathoms deep from surface, and 25 fathoms below the old working, and it is in order to save the expense of lifting and bringing it out of the tramway and to open up a new mine.

13,544. You will bring it out, as I understand you, to your dressing floors ?—Yes, we shall put in a horse.

13,545. You have stated that you had found some foul air in a mine in Cornwall ?—Yes.

13,546. You also stated that there are many places in which they might improve the state of the air by waterfalls ?—Yes, by water blasts and trap-doors.

13,547. Can you give me any instance of a mine in which you found that state of things to exist ?—At Par Consols and Fowey Consols, where I was brought up, and at South Caradon. I have worked in that as a tributer.

13,548. Do you know whether those matters had been represented to the agent ?—I do not know whether they had been altogether, but it is connected with a little expense ; if it was enforced it might ultimately be beneficial to the men, and I believe also ultimately to the employers.

13,549. Are you expressing merely your own opinion or the opinion of the agent ?—It is just my own simple opinion, judging from experience.

13,550. Have you been down the mines by ladders ?—Yes, and also by the man-engine.

13,551. Have you had sufficient experience to feel justified in recommending anything of that kind to your adventurers ?—It is a very expensive affair, and we know that it is very beneficial, but still it takes a good deal of money to carry a thing of that sort out and it is not every company that can find the means to provide a man-engine.

13,552. Have you any idea what the saving would be to the men ?—It would be a great saving to the men, and I should think to the masters. I think that the miners could do one-fifth more work as compared with climbing the ladders in these very deep mines, if one came to work it out.

13,553. But the principal part of your men do not go to the bottom of the mine and of course they do not suffer from climbing ?—No, they do not ; it is only some part of them that go to the bottom ; some men can walk in and out without climbing.

13,554. Are the younger men employed in the deeper part of the mines ?—Yes, we generally select them for going to the deep works.

13,555. (*Mr. Kendall.*) Have you ever seen a case of close air in any mine which might not be remedied by a small outlay and a little skill ?—No ; in every case that I have seen it might have been remedied.

13,556. It is a mere matter of expense, is it not ?—Yes.

13,557. (*Mr. Austin Bruce.*) You have just answered a question with reference to close ends, do you believe that the air is so well distributed over the mines in Cornwall to which you have referred as it is over these mines at Coniston ?—I think not.

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13,558. You think it is not so well distributed generally throughout the works ?—The mines in Cornwall are not so well ventilated as our mines are.

13,559. In what do you think the superiority of these mines with regard to ventilation consists ?—It is by using trap-doors and pipes more than they do in Cornwall.

13,560. By trap-doors do you mean for distributing the air, or pipes to bring in fresh air ?—Yes.

13,561. Are the trap-doors used for checking the air, or for distributing it ?—They are used to divert the air from one channel into another where it is wanted.

13,562. So that every portion of the mine gets its proper supply of air ?—Yes.

13,563. Do you take any precautions against the leakage of the air before it gets down into the deeper parts of the mine ?—We have got a natural downcast and an upcast in the deep mine ; we have a shaft at each extremity one is downcast and the other upcast ; and then, whenever the air is wanted to be directed to any place, we use these trap-doors in order to direct the air to those places where it is most wanted.

13,564. Could you do that as effectively if you had not a natural upcast and a natural downcast ?—No.

135.65. Supposing you had not a natural upcast and downcast, should you consider it worth while to make them by artificial means ?—Yes.

13,566. Do you think that the ventilation can be complete without an upcast and a downcast ?—No.

13,567. At what age do the boys come into these mines to work ?—We do not take any boys younger than about 14.

13,568. Are there many boys employed between the ages of 14 and 18 ?—We have a few but not many ; perhaps half a score, or perhaps there are 12, working in the mines or in the underground department.

13,569. As a rule, are there fewer boys working in the Coniston mine than there would be in a mine of equal importance in Cornwall ?—Yes.

13,570. To what do you attribute the fact that fewer boys are employed here than in Cornwall ?—It is owing to the system of working ; we have a single-hand system here ; one man holds the jumper or the borer with one hand, and he strikes it also with the other in boring rock. In Cornwall the system is double hand work ; one man strikes, and boys generally are used to turn those holes for drilling.

13,571. Which system do you think answers the best ?—I think that the single hand system is the better system of the two.

13,572. Would not the double hand system drive the borer in more rapidly ?—Yes, it would ; but not in proportion to one single handed.

13,573. You mean not in proportion to the quantity of labour employed ?—Yes.

13,574. What is the weight of the hammer that they use ?—It weighs from 4 lbs. to 5 lbs.

13,575. What is the weight of the hammer ordinarily used in Cornwall ?—It is about 6 lbs. or 7 lbs. ; the average, I think, is 7 lbs. ; sometimes it is 8 lbs. or 9 lbs.

13,576. Do you think that it is any advantage to the workmen to come to work underground at a later period of life ?—Yes, I think that they generally live longer lives.

13,577. What was your age when you left the mines in Cornwall ?—I was 30 years of age.

13,578. Have you yourself sustained any permanent injury from working in bad air ?—Not that I know of.

13,579. Have you ever had any cough ?—No.

13,580. Taking the workmen of 50 years of age throughout the works, do you find that they are more or less capable of working at that age at Coniston than men of the same age were in Cornwall ?—Yes. I think that a man of 50 here, speaking generally of our miners, as far as I have had experience of them, is equal to a man of 45 among the Cornish miners.

13,581. Have you known any cases of men suffering from any complaints arising from working in the mines in this neighbourhood ?—No, not that I recollect.

13,582. Are coughs common among the miners ?—We certainly do not consider that a man enjoys such good health as a miner, that is not at the same age, as an agricultural labourer does, or a working man at the surface.

13,583. You mean in this district ?—Yes ; we do not consider mining to be so healthy.

13,584. Have you had any opportunity of seeing the miners who are employed in the iron mines ?—Yes.

13,585. Do you consider that, in any respect, there is any difference between the iron miners and the copper miners ?—I think that the iron miners are made up of nearly all classes of men. They are not what you would call thorough-bred miners, or men who have been brought up to it as a trade. The iron miners are made up of agricultural labourers, seamen, and shoemakers, and men of all kinds ; and that kind of work does not require the same skill as in copper mines.

13,586. And therefore they come in later in life ?—Yes ; they come in at all ages. A labourer can come in who has not served for any time, and he can be made an iron miner in a week ; but he could not be made a copper or a lead miner.

13,587. (*Mr. Kendall.*) Have you not an advantage over the Cornish mines in your copper mines here by having such great backs to your adits ?—Yes.

13,588. And that conduces more to the health of the men ?—Yes.

13,589. Is your up-cast shaft always an up-cast shaft ?—No, not always ; which is owing partly to the state of the atmosphere, whether it be light or heavy above ; sometimes it is one and sometimes the other. It does not vary in the summer, but it may vary in gusty weather and in strong winds.

13,590. Generally speaking you have a regular up-cast shaft, but there are seasons when it changes ?—Yes ; and is just the reverse.

13,591. Is your up-cast shaft an old one or a modern one ?—The up-cast shaft is what they call a new shaft.

13,592. Have you any communications by workings immediately into that shaft at the different levels ?—Yes.

13,593. Is not that merely as a chimney ?—It is a level driven from one shaft to the other shaft.

13,594. At what depth is that level ?—At the 130 fathoms.

13,595. From that 130 fathoms to the adit level have you any other communication with that shaft ?—Yes, there are levels at every 20 fathoms.

13,596. Do they run into that shaft ?—Yes ; yet still it is an up-cast shaft. We have doors to the shaft. The shaft is wooded at the openings of the levels. We use doors that we close.

13,597. (*Mr. Kendall.*) You do not beat down all the lode close home to the shaft ?—No.

13,598. (*Mr. Holland.*) Have you workings beyond the shaft both ways ?—Yes.

13,599. Is there much ore between the two ?—The greater part is between the two.

13,600. You stated that you were satisfied that if the men were lifted up and down there would be a great saving of expense both to themselves and to their employers ?—Yes.

13,601. Have you observed that the men in the high levels can do more work than those who are employed in the lower levels ?—Yes, they can do one-fifth more.

13,602. Have you ascertained that as a fact ?—Yes.

13,603. Is that because they are saved the trouble and fatigue of climbing ?—Yes.

13,604. (*Mr. Austin Bruce.*) Is not the temperature greater down below ?—Yes.

13,605. Has not that something to do with the

difference of the amount of work performed?—Yes; it will cause more fatigue.

13,606. (*Mr. Holland.*) Have you any workings where the temperature is such as to impede the working of the men?—The highest I think is not more than 75° or 80°.

13,607. The men cannot work so much in 75° or 80° as they can in 50° or 60°?—That is true.

13,608. You have seen men working in very hot levels in Cornwall?—Yes.

13,609. Can the men employed in the mines here do unquestionably more work than in those hot levels?—Yes.

13,610. Can you give any estimate of the difference?—I should think about one half.

13,611. Do you mean to say that your miners here can do twice as much as the others?—Yes, twice as much as in those very deep hot levels.

13,612. Would it not be worth while to expend a good deal of money in order to cool those levels?—That depends certainly upon the state of the mines, and what the prospects of the mines are.

13,613. It would be worth while, would it not, to expend a considerable sum per annum for that purpose while the mines are being worked?—Yes, if you have a good mine.

The witness withdrew.

Adjourned till To-morrow at Derwentwater.

DERWENTWATER.

Friday, 3rd October 1862.

PRESENT:

The Right Honourable Lord KINNAIRD, K.T.	H. AUSTIN BRUCE, Esq., M.P.
NICHOLAS KENDALL, Esq., M.P.	RICHARD DAVEY, Esq., M.P.
JOHN ST. AUBYN, Esq. M.P.	P. H. HOLLAND, Esq.

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

Mr. BENJAMIN PLUMMER examined.

13,614. (*Chairman.*) What is the name of the mine or mines of which you have the charge?—Goldscope is the first, then Yewthwaite, and Castlenook.

13,615. Are they all copper mines?—No, lead mines. Goldscope formerly was a copper mine, but recently nothing but lead has been found; it is on a distinct lode from what the copper was found in.

13,616. How many men altogether are employed in the mines?—On the surface and underground there are 80 men and boys.

13,617. How many of those are employed underground?—Forty-two men are employed underground at Goldscope, nine at Castlenook, and four at Yewthwaite.

13,618. How do the men work, by shifts?—Generally by bargains.

13,619. For how many hours do the men work?—Eight hours.

13,620. Are there any night shifts?—Yes, but we avoid them as much as possible; we merely keep two men by night to look after the machinery; it is principally in the forenoons and afternoons; there are three shifts when we work by night, there are two shifts principally.

13,621. Is there much water in the mines?—Not a great deal.

13,622. How do the men ascend and descend into the mines?—By ladders.

13,623. What is the greatest distance from the surface that they are working at Goldscope?—Seventy-two fathoms below the adit, and 90 fathoms from the surface.

13,624. How do you draw?—With a water-wheel.

13,625. Do you use a skip?—Kibbles.

13,626. Is the work let by the ton or by the fathom?—By the fathom.

13,627. What are the men's earnings?—The average earnings will be from 15*s.* to 17*s.* a week; about 16*s.* are what they are generally allowed.

13,628. What are the highest wages that a man may earn?—I have known them for a single month make as much as 30*s.* or 35*s.* a week, but that is not often the case.

13,629. How often are the miners paid?—They are paid once a month.

13,630. Is there a month's wages kept in hand?—Yes, it is so, or rather three weeks are kept in hand; we let the bargains on the last Saturday, and pay the third Saturday following.

13,631. Are the bargains let by competition or are they let for fixed prices?—They are fixed prices; it is not a public survey the same as in Cornwall or Devonshire, it is so small, as we measure up the last month's work; we let the work for the coming month as we go on, and if the men do not think the price will answer, they refuse it.

13,632. Is there no tribute work in your mines?—No.

13,633. What deductions are made from the men?—For candles, smith's cost, steel, iron, shovels, powder cans, and powder.

13,634. What do they pay now for candles?—They pay 9*d.* a pound at this present time.

13,635. How much do they pay for powder?—8*d.* a pound.

13,636. Do they also pay for the doctor?—No.

13,637. Have you no doctor attached to your mines?—No.

13,638. Have you a sick club?—Yes.

13,639. Is assistance afforded in case of visible accidents or sickness?—For both.

13,640. What do the men contribute to the club?—1*s.* a month.

13,641. What is allowed to them when they are sick?—They are allowed 8*s.* per week for three months.

13,642. Do they then provide their own doctor and medicines?—Yes. There is a reason why we do not insist upon their paying to the doctor; the men here are principally connected with the Odd Fellows' Club which is a universal club throughout the country, and in that club they have a doctor provided, consequently the majority of the men belonging to our mine who join a sick club object to pay the doctor twice, and consequently we have none.

13,643. Do they receive an allowance from your club in addition to what they receive from the Odd Fellows' club?—Yes.

13,644. Is a separate account kept of your club fund?—Yes. The funds belong entirely to the miners. They are looked after by three miners, who are chosen once in six months. I act as secretary, and keep the accounts, and the balance I hand over to the Cumberland Union bank in the name of the acting committee.

13,645. The fund, as I understand you, is managed entirely by the men ?—Yes.

13,646. Are the payments received from the men sufficient to provide the allowances that are made in cases of sickness ?—Yes ; and a balance has accumulated since we started the club.

13,647. The club, I believe, consists of about 70 men and boys ?—Yes.

13,648. Do the boys make a smaller contribution than the men ?—Yes ; that is regulated according to the pay which they receive. A boy pays 9*d.* a month, if he gets 6*s.* a week, and the one who pays 6*d.* a month gets only 4*s.* Then in case of an accident a man receives pay as long as he is ill, provided the funds are not diminished below 5*l.* If they are, then we call the members together, and provide for it.

13,649. Is that done by extra subscriptions ?—Yes ; by every man subscribing something extra ; but that has not occurred yet. We have found that we have had plenty of money for all our purposes, so far.

13,650. Do nearly all the men reside at a distance from the mines ?—Yes. There are a few, perhaps eight or ten, in the village ; but generally they do.

13,651. What distance have they to come ?—From Keswick, five miles, and others three miles and a half ; but there is a lodging house for them.

13,652. What day of the week do they come to work ?—On Monday mornings. They work till Wednesday dinner time ; then they go home, and remain at home for 16 hours. They come back the next day, and work the afternoon shift, and follow on to the end of the week.

13,653. How many men are accommodated in the lodging house ?—About 25, I should think ; but they are never all there at the same time scarcely.

13,654. How many men can sleep there ?—I think about 15 or 16.

13,655. Will you be good enough to describe the size of the lodging house and the nature of it ?—It is on the second floor ; below we have store houses and lead houses. I think it is about 20 feet long by 15 or 16 feet wide. It is slated, it is plastered against the slate inside, to keep out the cold. I think that the extreme height up to the rigging will be 12 or 14 feet, but the sides of it would be five feet six or six feet only.

13,656. Do the men sleep in places like cabins, or one man over another ?—No. The beds have plenty of room. They are all on the same floor on rough bedsteads.

13,657. (*Mr. Kendall.*) In short it is one large dormitory ?—Yes.

13,658. (*Mr. Austin Bruce.*) Where the men sleep four nights a week ?—Yes.

13,659. (*Chairman.*) Do they pay for this accommodation ?—No. The men are provided with the room and firing from the mine.

13,660. (*Mr. Austin Bruce.*) Are they supplied with bed clothes ?—No ; they provide their own.

13,661. (*Chairman.*) Do they cook for themselves ?—They generally bring their food cooked, and warm it at the lodging house. If they have potatoes, of course they dress them there. They have a boiler on the premises, and frying pans, and the necessary utensils if they choose to dress their own food.

13,662. (*Mr. Kendall.*) Is there no matron there ?—No ; the men do for themselves.

13,663. They take care of themselves, and make their own beds ?—Yes ; they have been accustomed to it from boys, and they take to it quite naturally, as their wives do at home.

13,664. What is the greatest length of any drifts in your mines ?—The greatest length of any drifts that we have from day will be 450 fathoms. The first level was driven 200 fathoms before the lead was cut, and at that point we sunk a shaft, and that shaft communicates with the surface. We have driven south of that shaft 250 fathoms ; consequently the level from there would be 450 fathoms long. We have only one shaft, but we have small winzes to effect ventilation, and for the miners to go up and down.

13,665. What means of ventilation have you employed ?—We have used the ventilating fan with zinc pipes 4 inches in diameter.

13,666. How is that ventilating fan worked ?—It is worked by a small water-wheel, and the speed is multiplied very much to force the air in.

13,667. In what part of the mine is that applied ?—We take the air from the shaft, and force it up through those pipes from the shaft that is carried out to day. We take it from that point, and it is perfectly pure there.

13,668. Does the water that works this wheel fall down the shaft ?—It is brought down in boxes through the shaft, and then brought out through the first level that I have described.

13,669. At the bottom of the shaft it drives a wheel ?—Yes, a very small water-wheel, and that water-wheel carries a fan blast.

13,670. Does the shaft go down below the day level ?—Yes, 72 fathoms ; the wheel that works the fan is fixed in the adit level.

13,671. Is the fan constantly at work ?—Yes.

13,672. And do you find that perfect ventilation is effected by that means ?—Sometimes, when the atmosphere is not very clear we find that the air is bad after that even, but there are times when we get a brisk wind outside, and a clear atmosphere, that we get very good air ; for instance to day, when there is no wind, and the weather foggy, the smoke would lie and be very black in the fore-end.

13,673. Would the candles burn well ?—Yes ; it is only the smoke, you find a choking sensation, and it is very disagreeable to breathe.

13,674. By what means does the foul air escape ?—It is driven back through that level, a pipe is conveying up the pure air, and that being heavier than the impure, it is driving it away.

13,675. Does not the impure air find its way up the shaft at all, the return air and the smoke ?—Yes.

13,676. Is there not a danger of its being blown back again at the point where you have a fan ?—No, I do not think there is.

13,677. (*Mr. Holland.*) What prevents the fan from driving in the return air ?—Where the fan is fixed the air is as good as it is here, nearly, under ordinary circumstances, when the atmosphere is clear, and it is nice weather ; but if there is a little impure air mixing with it, it is not felt. There is generally a strong current where the fan is working.

13,678. (*Chairman.*) On such a day as this, how long are the men obliged to refrain from working after they have blasted a hole ?—From 10 minutes to a quarter of an hour.

13,679. Are they ever obliged to cease work altogether ?—No.

13,680. Will the candles always burn well ?—Yes.

13,681. Where do the men go during the 10 minutes or a quarter of an hour after they have blasted a hole ?—They go back into the level before the smoke gets back to them ; they go back to a point where it is dry and sit down, and perhaps get their meat, or smoke their pipes, till the smoke is driven out of the fore-end ; and when it reaches them it has left their working place.

13,682. (*Mr. Kendall.*) Then they are obliged to pass through that smoke before they can get into pure air again ?—Yes, they must breathe it as they pass through it.

13,683. (*Chairman.*) Have you some men who suffer in their breathing ?—Yes, we have a few old men who do.

13,684. Have they been so affected since they have been with you, or were they so before they came to you ?—Before they came they were ill, they suffered from chest disease before they came there ; they came from Alston Moor. Nearly all the miners that I have seen, who have come from Alston Moor,

above 40 years of age, have been affected in their breathing, in fact we have had men who have died, and one of them was not more than 45.

13,685. (*Mr. Holland.*) Of what disease did those men die?—The cause of their death was asthmatical complaint, or short breathing, miners' asthma or decline.

13,686. (*Chairman.*) How do the men working with you who are so affected go down into the mines?—I have always so far provided shallow places for the old men to work in, and those men who are most affected now are working at one of those little mines called Castle Nook, which is only 10 fathoms below the adit level; they go up and down by ladders to that place.

13,687. Do the miners change their clothes when they go underground?—Yes.

13,688. And when they come up again?—Yes, generally; but sometimes they are very indolent, and they do not. When they are going to stop in the lodge they will keep on the flannel that they have been working in; if they are going home they put on a clean shirt and clean clothes.

13,689. Where do they change their clothes?—Generally in a part of the lodging where a fire is kept.

13,690. Have any accidents ever occurred from falling off the ladders?—Never. We have had one accident which occurred from the premature explosion of a hole.

13,691. Were you able to ascertain how that explosion took place?—Yes, we could account for it as near as it possibly could be accounted for; the man had blasted the hole before, and at the first blasting the hole that he put the powder into was perfectly sound; he blasted it and it proved to be too strong, or he did not give it powder enough to throw the burthen in, but it made a rent in the rock, and he put powder in again, and probably did not use sufficient care to clear the powder away on the sides, and in using the stemming bar the powder in the crack became ignited acting as a train to the main charge, he was injured in his arm and very much burned about his face; a lot of stones was thrown into his face, and he was sick for three or four months from it; fortunately his eyes were not injured.

13,692. That accident was caused by an iron stemming rod?—Yes.

13,693. Do you always use an iron stemming rod here?—Yes.

13,694. (*Mr. Holland.*) Do you never use bronze rods?—No.

13,695. (*Chairman.*) Do you use the patent safety fuze?—In some cases we do; where we have wet ground we do, in dry ground the miners prefer a straw.

13,696. Is there any reason why they should prefer a straw?—They have been accustomed to it all their lives, and they say that it makes less smoke than the safety fuze, and is not more dangerous; we have been very fortunate since I have known the mine.

13,697. What is your own opinion with regard to the preference to be given to the safety fuze?—I should prefer using the safety fuze, because I was accustomed to it.

13,698. (*Mr. Davey.*) What is the size of your lead lode generally?—It varies very considerably; in some places it is thirty feet, and in some not more than four.

13,699. Is it of the same continuous richness throughout?—No. There are ribs of what we call veinstone, ribs of stone and ribs of quartz, and greenstone or trap, all mixed up in one large vein.

13,700. Do you excavate all the ground, or do you leave parts of it?—We leave in some places pillars or horses between, that is, large ribs of veinstone and quartz spar, standing where we see it is safe, and we let them remain, and go in between and take out the metal.

13,701. What is your monthly produce?—About 33 or 34 tons.

13,702. Is the mine rich in silver?—No.

13,703. You stated just now that you used zinc pipes; do you find them last as long as pipes made of any other metal?—Yes; they answer much better than tin, which would not do, because the water would deteriorate it.

13,704. Are the zinc pipes cheaper than iron?—Yes.

13,705. What do you pay for them?—We pay 1*s.* 4*d.* per yard for four-inch zinc pipes; No. 10 zinc.

13,706. Has the water no effect upon those pipes?—It has not. I do not know what it would be in a copper mine.

13,707. Do they last much longer than wooden pipes?—Yes; and the friction is not half so great as in wood. A four-inch zinc pipe would convey more air in my opinion than a six-inch wooden pipe.

13,708. Do you lose much air?—There is no necessity to lose very much if the joints are properly made.

13,709. After driving your cross cut from the copper lode to cut the lead, how do you proceed; how deep have you gone under the day level?—Seventy-two fathoms.

13,710. Do you bring up from there all the lead, and go through that long cross cut again to the shaft?—We bring it up the shaft from the 72 fathoms, and then waggon it out with a pony through the level to day.

13,711. Would it not be cheaper to sink another shaft over that?—No.

13,712. What stone have you to carry the shaft through?—It is principally slate.

13,713. Is it very hard?—In some places it is hard. Probably it would cost 12*l.* a fathom to sink a shaft, and we are availing ourselves of putting in a deeper level.

13,714. (*Mr. Austin Bruce.*) At what age do your miners begin to work underground?—About the age of 18.

13,715. Have you any boys employed upon any work underground?—We have but one.

13,716. Do they work single or double-handed?—In some cases they work single-handed and in some cases double.

13,717. Up to what age do miners usually continue to work?—We have men working at the mine now from 50 to 60 years of age I should think. I have only known 2 or 3 to die since I have been here, and they came from Alston Moor.

13,718. Do you observe any difference between the men who have been born and have always resided in this district, and the men who come from Alston Moor?—Yes, there is a very marked difference.

13,719. What is the difference that you have observed?—The difference is in the colour of the face, that is one thing that you will find; the Alston Moor men are principally of a sallow complexion, and suffer from short breathing, you see that in fact from their breathing when they are talking to you.

13,720. Are the men of this district who have not left it but who have worked from 18 years of age in these lead mines as healthy as the agricultural population?—No, I do not think they are.

13,721. Do any of your own men who have not come from a distance suffer from miner's asthma?—I do not know of any.

13,722. What do they suffer from?—They principally suffer I think from rheumatism and lumbago in the back, that is what they principally remain at home sick for, that is the doctor's certificate generally.

13,723. Have the men to work on their sides at all?—No; they are all standing up or sitting down.

13,724. What is the size of the drift in which they work?—Our general rule is to carry the levels seven feet high by four feet wide.

13,725. That is the usual space in which they work?—No; that is, the drifts are that size when

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we take away the ore. It is sometimes much smaller, and at other times much larger, all depends on the nature and size of the lode.

13,726. What would be the height of the place in which they work under those circumstances ?—The height in some cases will be perhaps 12 or 15 feet; they are obliged to put in stages to get up, the breadth being from two to three and four feet, depending upon the width of the ore and the lode.

13,727. Do you carry air up into all these places ?—No ; at Goldscope the mine is naturally ventilated; first we sink an engine shaft 10 fathoms say from the 60-fathom level to the 70 fathoms, and at the time we are doing that we have two companies of men, each of them at 10 or 12 fathoms, or at the most feasible point from the shaft, sinking winzes, and when they are down to the 70-fathom level and the shaft is down to the 70-fathom level, we drive from the shaft out and effect a communication with the bottom of those winzes.

13,728. You have stated that the main difference in the supply of air below arose from the dulness of the atmosphere above ?—Yes.

13,729. Is there any cause besides the dulness of the atmosphere and the powder smoke which effects the air below ?—I do not know of any; I do not see how there can be; to-day it is a dull day, and we should find the air or the smoke lie heavy and black and worse to breathe; when we find that the atmosphere is dull outside we attribute to it all foulness ; if to-morrow we find that the air is poor inside we say that the atmosphere is the cause of it.

13,730. Are you aware whether there are any gases or vapours proceeding from the mine which affect the air ?—I should think not, not in the strata that we are passing through.

13,731. Do the children of the miners all go to school ?—I do not know, they live so far away from the mines.

13,732. Do you find that the men are able to read and write in general ?—I should think that about one half of them can write ; I have had some experience of that in trying to get them to sign their names about one half of them sign with a cross.

13,733. What should you say as to their being able to read ?—Many of them can read, particularly the younger ones, for they are better scholars than their fathers.

13,734. Do you find that they do read in the evenings ?—Yes ; a great many of them read.

13,735. Do some of them read out to the others ?—I really dont know, but I think not; I am sure however of this, that they cannot read with any pleasure, the boys are fonder of play, consequently they would drown the reading of the others, and after the work of the day the boys have no taste for reading.

13,736. (*Mr. Kendall.*) When you say that you think they read a good deal, do you mean that they read in the dormitory that you have spoken of ?—Yes, some of the young men.

13,737. Is there any beershop near to it ?—The nearest is a mile and a half away.

13,738. Do the men go much to that beer shop ?—Sometimes ; not much ; indeed I may say very little, for they are very generally temperate.

13,739. Did you come to this district as an agent or to work as a miner ?—I came here as an agent, I have been here for six years ; I was an agent in North Wales before.

13,740. Did you ever work in Cornwall ?—Yes, at Holmbush near Callington, and at Devon Consols.

13,741. Do you know any Cornish miners who are working in this neighbourhood ?—Yes, one.

13,742. There are not many ?—No.

13,743. When you were at Devon Consols you saw Cornish miners there, I suppose ?—Yes.

13,744. Have you remarked any difference between the Cornish miners whom you saw there and the miners from Alston Moor whom you see here ?—I can hardly tell ; when I was at Devon Great Consols the Cornish miners who came there were principally young men ; I am speaking now of 14 years ago ; they were very strong young men.

13,745. Referring now to Devon men of all ages, do you perceive any difference between the Devon miners and the Alston Moor miners of the same age ?—Yes.

13,746. To which would you give the preference ?—I should give the preference to the Devon men at the same age ; 50 is a great age for an Alston Moor miner, from what I have heard.

13,747. What are the wages of an agricultural labourer in this district ?—I think that the wages of an agricultural labourer in the summer season will be about 18*s.*

13,748. Will the average do you think be more or less than that ?—I fancy from what I have heard that they will not average more than 12*s.* or 13*s.* throughout the year.

13,749. Are you able to express an opinion as to the diet of the agricultural labourers and the food that is consumed by the miners, or which of them lives the best ?—I have no opportunity of judging about that.

13,750. (*Mr. Holland.*) You spoke just now of the wages being from 15*s.* to 17*s.*, are those the net wages after all deductions are made ?—Yes.

13,751. You have spoken of a dormitory or long bed room, is there a chimney in it ?—No.

13,752. Is there no opening for ventilation ?—Yes; there is a window for ventilation in the end near the roof.

13,753. Is the air pure in the morning ? Have you been in it before the men are out of bed ?—I have not been in it before some of the men are up, but I go in perhaps when there are five or six in bed and before the windows have been opened, and I have found the air then pretty good, if they allow the ventilation to remain open, but with 14 or 15 men there are various opinions, and those who cannot stand it will object to its being open.

13,754. Is that room better or worse ventilated than the bed rooms of labourers generally are ?—I think it is as good as any labourers sleep in.

13,755. Are the miners much annoyed by the powder smoke ?—No ; if the air is pure the powder smoke does not injure them much. I have never considered powder smoke of much annoyance if the air is pure.

13,756. If you were to reverse the working of your fan so as to draw the air out instead of forcing it in, the men would not have to pass through the powder smoke ?—That is true, but I never saw it done.

13 757. Do you not think it would be an improvement ?—I do not know.

13,758. Do you see any practical objection to doing that, just to turn the fan round and make it draw the air out instead of forcing it in ?—The fan would not draw ; work the fan which way you would it would force.

13,759. Are you not aware that you may make it draw as well as force ?—Not a fan ; I have proved it ; I have reversed it and turned it all ways, but it always forces ; our fan will not do it otherwise.

The witness withdrew.

Mr. JAMES POSTLETHWAITE examined.

Mr. J. Postlethwaite.

13,760. (*Chairman.*) Do you belong to this district ?—Yes.

13,761. Are you a native of it ?—Yes.

13,762. What is the name of the mine or mines that you are connected with ?—The Keswick mines.

13,763. Of what do they consist ?—They are lead mines.

13,764. Of how many mines are the Keswick mines composed ?—There is Brandley Thornthwaite and Smeltmelbeck ; but these are not working at present ;

we are only working the Brandley mine; still the company is the Keswick Mining Company.

13,765. Where is that mine situated ?—Near Lodore; the one we are working; it is at the high end of Keswick lake; the south-west end.

13,766. What is the ore that is produced ?—Lead; silver lead ore.

13,767. What proportion of silver is there in the lead ?—From 10 to 11 ounces per ton.

13,768. How many men do you employ there altogether ?—Seventy.

13,769. How many of them work underground ?—I believe that forty-four is the exact number.

13,770. How do the men work; in shifts ?—Yes; in 8-hour shifts.

13,771. Do they work for the whole 24 hours ?—Very rarely; we have one place or two where we work all round the 24 hours; but generally we work only two eight hours in the 24.

13,772. Is it a wet mine ?—It is rather wet.

13,773. How is the water pumped out ?—It is pumped out by a steam engine.

13,774. What is the greatest depth at which you are working ?—Fifty fathoms.

13,775. Is that the shaft ?—Yes.

13,776. How many shafts are there ?—We have several shafts ? there is one large engine shaft for pumping and drawing, and three shafts for ladderways, and one for air only; ventilation.

13,777. What is the number of levels ?—Four.

13,778. What is the greatest distance between any one shaft and the other ?—50 fathoms.

13,779. Do the men go down by ladders ?—They go in both ways; some we take down by the engine, just as the men choose; others go by ladder.

13,780. What have you on the engine; is it a skip or a cage ?—A cage.

13,781. A safety cage ?—No, we have not a safety cage.

13,782. You bring up the ore in waggons ?—Yes; it runs into the cage.

13,783. Do you call them bogies ?—Yes.

13,784. Have you ever had any accident from the men going down ?—No; we had one man killed by the cage coming in contact with him; he placed himself in the way of the cage as it was going down some years ago, and it broke his arm, and he fell and was killed; that is the only accident that we have had; we have never had a cage fall.

13,785. (*Mr. Holland.*) Was he in one of the higher levels ?—He was in one of the middle levels.

13,786. (*Chairman.*) How are the bargains let ?—By fathom.

13,787. Are the men paid every month ?—Every month.

13,788. Do you keep a month in hand ?—Yes.

13,789. What do the men generally earn ?—The underground men who are engaged in blasting earn 16*s.* per week; we have a few what we call skilled men who have 1*l.* a week, who look after the timbering and the dressing, but the ordinary men have 16*s.* a week.

13,790. Do the men reside on the mine ?—Not many of them.

13,791. What distance do they reside ?—About four miles the greatest distance, the greatest number of them, and from that to two miles.

13,792. Have you a lodging house on the mine ?—Yes.

13,793. Do the men sleep there ?—A few sleep there, not many; we have accommodation if they choose, but they prefer going to their homes.

13,794. Do they go that distance every day ?—Yes, they would rather do that than lodge away from their homes.

13,795. When they come out of this wet mine, do they change their clothes ?—Yes, all of them.

13,796. Where do they change ?—In the engine-house, and above the boiler, we have a place there for drying their wet clothes.

13,797. Have you ever had a case of men who were going down the ladders, falling from the ladders ?—I have had men fall a little way twice, but they were very little worse. We have stages in the ladders at a certain distance.

12,798. At the foot of each ladder it is sollered over ?—Yes, a man would only fall a few yards or feet, and not be any the worse; they generally stop on the stage.

13,799. If that was not the case, they would fall to the bottom and be killed ?—Yes.

13,800. Have you had any accidents from blasting ?—Yes, we have had two, one rather serious, and the other slight. The men both recovered, and are working again.

13,801. Were you able to ascertain the cause of the explosion ?—Not certainly, but I conclude that it was by stemming the holes too hard, and with too hard material.

13,802. (*Mr. Holland.*) Do you use iron stemmers ?—Yes.

13,803. (*Chairman.*) What is the material which you use for tamping ?—A very soft clay slate; it is a rare occurrence to have a hole explode in the hands of the men.

13,804. Have you a sick club ?—Yes.

13,805. Is that for accidents ?—For accidents and sickness both.

18,806. What do the men pay ?—1*s.* a month, each man.

12,807. What is the allowance if a man is sick ?—They receive when sick, or from accident, 7*s.* per week.

13,808. Is there a doctor attached to the mine ?—We have not one at present, we have had one until lately; there was some little dissatisfaction about it, and the men now find their own doctor, they prefer that.

13,809. Have you any men suffering from shortness of breath ?—We have.

13,810. What aged men are they ?—We have one aged 45 who is quite unable to work; but he did not receive his injury in our mine.

13,811. Where did he work before ?—In Coniston copper mines; he worked for four years at our place, and gradually became worse, and for the last four years he has not worked at all, he is lying upon the club.

13,812. Have you any men working, who are suffering from shortness of breath ?—Very little; our men are very sound and good. I suffer as much myself as any of them.

13,813. Do you suffer ?—Yes, I am a little affected.

13,814. Do you think that that is from working ?—Yes, not in this mine, but in some mines in the neighbourhood, one in Loweswater; that is not working now.

13,815. Was it bad air ?—Very bad; I only worked three months in it, and if I had stayed a little longer I should have been done.

13,816. How did it affect you ?—I had a sensation, a pain in the head, the pain goes right through your head, and before the end of the shift you can scarcely bear your head.

13,817. Is there any place where that is the case now ?—I do not know that we have any in this neighbourhood very bad. In Alston the men suffer very much from it; that is in dry mines, and they have a great deal of dust which rises from the breaking of the stone. We consider a dry mine the worst; a wet mine is more healthy, it keeps down the dust arising from the smoke, blasting and breaking of the stone.

13,818. How do you ventilate your mine ?—By shafts and levels both; we have a main shaft, and then we take levels from it at every ten fathoms in height; for instance, we have a level 20 fathoms deep, another 30, another 40, and another 50, there are only ten fathoms between those levels, and at the distance of about 15 fathoms in length we put a hole through between those levels, for the purpose of ventilation.

13,819. (*Mr. Holland.*) Going to up the surface ?—Yes, but not in a direct line.

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13,820. (*Chairman.*) It is not the whole way to the surface, is it ?—The highest level is ventilated to the surface, the next in depth is ventilated "by rises" into one above it, and so on to the lowest level, but these rises are not always at the same point, consequently not always in a direct line.

13,821. You said that you had one air shaft ?—Yes, but they all serve as air shafts.

13,822. Are they up-cast, or down-cast shafts ?—They are both.

13,823. (*Mr. Holland.*) Does the air always go in the same direction ?—No.

13,824. (*Chairman.*) It changes according to the weather ?—Yes, and according to which way the wind blows ; we are in a hill.

13,825. There is no one particular shaft which is always up-cast ?—The engine shaft, the large shaft, is always up.

13,826. Does that stand on a higher level than the others ?—It is not the highest, it is the largest shaft.

13,827. Why do you suppose that it is always up-cast ?—I should fancy that the pumps have something to do with it, but chiefly because it is the deepest shaft in a straight line.

13,828. To keep a motion ?—Yes ; I never recollect seeing it down-cast in the engine shaft, but the others change.

13,829. Are the wages which you have stated clear of deductions ?—Yes.

13,830. What are the deductions ?—We provide tools, blasting powder, candles, and all material, which is all deducted from the men.

13,831. What do they pay for candles ?—7*d.* a pound.

13,832. And what for powder ?—8*d.* a pound.

13,833. And for sharpening the tools they pay ?—Yes, we have a stated price which we charge for the tools and sharpening as well.

13,834. (*Mr. Davey.*) Do you ever find any difficulty before you communicate these winzes from one level to another ?—Yes ; that is where we have our difficulty.

13,835. How do you remedy that ?—We never go so far but what we can manage it without artificial means. We have a difficulty, but we get through the difficulty ; we put fewer men ; for instance, if I have four men working at the end of the level and I put four more men to rise a winze through, probably before I get that winze through they have not sufficient air, and I am obliged to reduce the men one half, and to leave the place during the nights.

13,836. Do you use any artificial means of forcing in air ?—Yes ; I have had both a little fan blast and a blast caused by water and taking pipes along the level.

13,837. Could not you force in sufficient air to allow you to work the whole of the time ?—Yes, we can do so but we do not like artificial ventilation, we would rather have it natural.

13,838. Would it not be better to use artificial means than to punish the poor man by working in poor air ?—Yes ; but that punishment, if it is punishment is of short duration ; we can easily work from the last rise, 15 fathoms, and the little difficulty is before we get the rise quite through, probably in the last month, so that all this outlay and expense in providing artificial ventilation would only be for the month.

13,839. Would it not be more economical for the adventurers to use that trifling expense than to reduce the force in these levels ?—No, not in lead mining ; we have a need to make these rises or winzes as explorations ; we consider that we never ought to go beyond the 10 or 15 fathoms upon a vein provided it is dead without making these openings between one level and the other for fear we should pass over the lead.

13,840. What is the width of the vein ?—It varies from six feet to one foot.

13,841. As to its richness does it vary ?—It is very irregular.

13,842. What is the monthly produce of your mine ?—Twenty-four tons.

13,843. What is the value per ton ?—12*l.*

13,844. Do the men who work with you come pretty much from this neighbourhood or from other mines ?—Most of them are natives of Cumberland.

13,845. And you consider that those who come from other places do not enjoy such good health as your own men ?—I am not certain as to that. I have seen those men coming from Alston a little affected at an earlier age than the men are here. I have one or two Welchmen and they are healthy.

13,846. When you find one of these miners affected by that disease, if you remove him to a healthier place or give him rest, does he improve ?—They may remain stationary, they never recover.

13,847. Not even if they give up that kind of life and lead another ?—No ; I have not worked under ground myself for the last 12 years and I get a little worse ; a man will not recover, but the progress of the disease will be arrested, or partially so.

13,848. But the men working in this neighbourhood are generally in pretty good health ?—Yes.

13,849. (*Mr. Austin Bruce.*) Is the mine at Loweswater still in operation ?—No, it is full of water, and the machinery is all removed.

13,850. Did other people suffer there as well as yourself ?—I am not aware that there was ever any great effect produced in that respect.

13,851. At what age do the men begin working in your pit ?—About 18.

13,852. Have you any boys younger than that ?—No, I do not put in any before they are 18 ; I use boys on the surface.

13,853. Have you at this moment any men suffering from the miners' asthma ; difficulty of breathing ?—Two, very slightly.

13,854. (*Mr. Holland.*) You have said that there are several a little affected ?—I am a little affected, but my men are very little affected ; they are quite able to do the work, and they do not complain of it.

13,855. (*Mr. Austin Bruce.*) Up to what age do they work with you ?—I can scarcely say. I had two old men who died last year who were 70 years old.

13,856. Had they worked up to the last year ?—Up to the last. My father died two years ago at the age of 65.

13,857. Is there any difference in their appearance and that of the population who work above ground ?—Very little indeed in these mines.

13,858. Are they an orderly well conducted population ?—Yes, our men are very steady.

13,859. Do you ever have any trouble with them about wages ?—No, I do not know that I have, or very little. Once since I have known the mine there was something like a strike, but not on wages, but more as regarded the time of working. The wages are similar all round.

13,860. Can most of them read and write ?—Yes.

13,861. Have you any who cannot ?—Yes, I have.

13,862. Men of this district ?—No ; I do not know that I have any in this district. I have two or three Irishmen who cannot read and write.

13,863. (*Mr. Holland.*) Is it common for miners to work until 60 ?—Yes, I should think it is.

13,864. Is it as common among miners as among farm labourers ?—No, I should think not ; decidedly not. Farm labourers are more healthy.

13,865. Are there as many miners as farm labourers do you think working at 50 ?—No, yet there are many working at that age.

13,866. Are miners more liable to affections of the chest ?—Yes, I should think so.

13,867. Asthma ?—Yes.

13,868. Does it often become very bad ?—Yes. I have seen one very bad, and who can scarcely work.

13,869. There is not much climbing in any of the mines here, is there ?—There is climbing of the ladder.

13,870. How deep is it ?—Only about 50 fathoms.

13,871. And many do not climb so far as that ?—No.

13,872. Many 20 or 30 or 40 fathoms ? — Yes, and then we take the men up by the cage, if they choose it.

13,873. You have spoken of a pain in the head produced by bad air ; is that common ?—Yes. While you are in the place it affects you with a pain in the head.

13,874. Does that air affect the candles much ?—Yes ; they will scarcely burn ; we have to place them horizontally.

13,875. Is it a common thing for you to slope the candles ?—No.

13,876. Is it very uncommon ?—Yes ; something is very far wrong if we have to do it.

13,877. Does the powder smoke hang long with you ?—No. The men retire back after blasting, and they will stay ten minutes or a quarter of an hour, and when they go back most of the smoke has gone away.

13,878. Is it very uncommon for them to stay more than a quarter of an hour ?—Yes. I do not know any place in our mine where it is necessary to stay longer than that.

13,879. Do you speak of mines generally in this neighbourhood ?—Yes ; I am acquainted with most of the mines in this neighbourhood.

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13,880. Would it be considered very bad if they stopped half an hour or an hour ?—Yes, decidedly.

13,881. It does occasionally happen ?—I have seen places where it is scarcely ever entirely clear, but a little smoke is not always an indication of bad air.

13,882. But the stopping is not to such an extent as that they cannot work ?—It is very uncommon for them to have to stop more than a quarter of an hour.

13,883. Do you think it more economical to reduce the speed of the work than to introduce artificial ventilation ?—Yes.

13,884. What is about the cost of putting up a fan and a pipe of 20 fathoms long ?—20*l.* perhaps. There is a long length of pipe to take.

13,885. It would cost very little to shift that from one level to another ?—You would have to shift it, and to lay the piping again.

13,886. That would not cost much would it ? About what would it cost to shift it from one level to another ?—I could not say less than 10*l.*, and I do not know that I could do it for that.

13,887. Can the men work with equal effect in such air ?—I have never seen artificial ventilation so efficacious and complete as that pracured by rises and winzes from one level to another.

The witness withdrew.

Adjourned to To-morrow, at Patterdale.

PATTERDALE.

Saturday, 4th October 1862.

PRESENT :

The Right Honourable Lord KINNAIRD, K.T.	H. AUSTIN BRUCE, Esq., M.P.
NICHOLAS KENDALL, Esq., M.P.	RICHARD DAVEY, Esq., M.P.
JOHN ST. AUBYN, Esq., M.P.	P. H. HOLLAND, Esq.

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

Mr. WILLIAM PHILLIPS examined.

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Mr. W. Phillips.

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13,888. (*Chairman.*) What is the name of the mine or mines of which you have the charge ?—It is called the Greenside lead mine.

13,889. Is that the only mine of which you have charge ?—Yes.

13,890. Is it worked by a company ?—Yes.

13,891. What is the company called ?—It is called the Greenside Lead Mining Company.

13,892. Are there many partners in the company ?—I think there are 14 partners.

13,893. How many men are there employed altogether ?—The total number employed is somewhere about 300 men and boys.

13,894. Do you smelt the ore on the mines ?—Yes.

13,895. How many of these men are employed underground ?—About 150.

13,896. How do the men go down underground ?—They enter the mines by going into a level or tunnel.

13,897. Are there any shafts in the mine ?—There is one.

13,898. How many levels are there ? — There are six.

13,899. Does the shaft communicate with the lowest level ?—Yes.

13,900. Is the shaft used as a drawing shafts ?—Yes.

13,901. Is it used also as a ventilating shaft ?—Yes.

13,902. Is it an up-cast or a down-cast shaft ?—It is a down-cast shaft.

13,903. Is that high up the level ?—No, it is sunk in the bottom of the low level; about 400 fathoms from the entrance.

13,904. How many levels are there above the shaft in the side of the hill ?—There are five.

13,905. Are the mines all worked by levels from the day ?—Yes.

13,906. Do the levels communicate with each other by winzes ? — Yes ; they communicate with each other by winzes and stopes, or headings, and roofing, as they term it here.

13,907. Is there much water in the mine ?—Not much, about 1,000 gallons in every 24 hours.

13,908. Which is the wettest level ?—The bottom or the deepest ; the 36-fathom level, sunk from the present Low Horse Level.

13,909. Is the water pumped out by a water-wheel ?—It is pumped out by a hydraulic pumping engine.

13,910. Is the work let to the men by tut-work ?—Yes ; so much a fathom.

13,911. Is it let to them quarterly or monthly ?—Quarterly. Occasionally we let bargains according to circumstances.

13,912. But is the work generally speaking let quarterly ?—Yes.

13,913. Is it let to one man ?—No, generally to two and to four men ; we have three companies of six men working three cores.

13,914. Do you work much by night shifts ?—No ; there are only three companies working night shifts or cores ; they are driving levels on the lower level, necessary work that we have to force for the

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general working of the mine; we do not work much by night-work; it is eight hours a day, two shifts; sometimes they work all one time; if they are in a wide part of the vein, perhaps four are employed at the same time.

13,915. The work being let for three months at a time, may the men go to their work just as they like and at what hours they like?—Yes; and work longer if they think proper, they are not compelled to time, but expected to work 8 hours per day.

13,916. Do you make the agreements with one man?—No, with all the partnership.

13,917. Does each of the partners sign?—No, they are all present, but one signs.

13,918. Do they live at some distance from the mine?—Some live at Keswick, and some at Penrith, and some in the neighbourhood, and in different parts.

13,919. What is the greatest distance that any of them live away?—I should say that some of our men will come 16 or 18 miles, I think that is the greatest distance.

13,920. Have you any lodging-house on the mine to accommodate the men?—We have several.

13,921. How do the men manage?—They have beds in those places, and the company provide them with coals. They come on Mondays about 12 o'clock, and leave again on Fridays at 12 o'clock, and they calculate to work five eight hour shifts or cores during that period; they stay at the mines from the Monday till the Friday.

13,922. How many men generally sleep in each of the lodging houses?—Some of the shops would hold perhaps 40; they are large shops.

13,923. What is the size of the room where these 40 men would sleep?—Our new shop I should think is, although I never measured it, above 60 feet long; it is a very high house, and the room stands 12 or 14 feet high.

13,924. Do the men sleep one above the other?—They have iron bedsteads and some wooden, like hammocks on board a ship, one above the other.

13,925. How often are the men paid?—We sub every month and pay the balance up every three months; the sub is 2*l.* per month.

13,926. Do you not keep a month in hand?—No; we balance up at the three months end; they will work a week or so with a new bargain; but that does not interfere with it.

13,927. What is the highest amount that any man can earn, or any set of men?—25*s* a. week.

13,928. What is the lowest sum they can earn?—That depends upon how the bargain turns out? sometimes not more than 10*s*.; but I have known them to come as low as 8*s*.; not lower than that; sometimes the bargain goes against them, and at other times they get 20*s*. or 25*s*. or 18*s*.

13,929. Are the men principally young or old men?—There are both classes of men; those receiving low wages are generally older men; the young able men do not come so low as that.

13,930. From what depth have they to climb the ladders?—Scarcely any at all; there are no ladders; it is all worked away by stopes.

13,931. There is nothing then to prevent the old men from performing their work?—No; they can walk right to it.

13,932. How far have you ever driven any of these drifts from the day or from the shaft?—The low horse level is about a mile driven from the entrance.

13,933. At the far end how is that ventilated?—It is ventilated by the north part of the mine.

13,934. Does it join the north part of the mine on the other side of the hill?—Yes.

13,935. Have you any level driven from this side that has not reached the north side of the mine?—No; we have no other one.

13,936. What is the greatest distance that you have ever driven a drift from the day without being a through drift?—Three hundred fathoms. We use a blast generally for such levels; about 300 fathoms we use a waterfall.

13,937. How do you ventilate it?—By a waterfall; the pipes are cast-iron pipes of five inch bore, six feet long, each with spigot and faucet joints.

13,938. Are those carried to the end?—Yes.

13,939. How near are they carried to where the men are driving?—Sometimes within nine feet; but it depends upon circumstances; sometimes they are perhaps three or four fathoms behind; but generally speaking they are within two or three fathoms.

13,940. Does that give perfect ventilation?—Yes.

13,941. Have you some men who are affected in their breathing?—There may by chance be one, but not generally.

13,942. Have you none now working in your mine who are at all affected in their breathing?—No man who is disabled is employed to go inside or who is affected in the lungs.

13,943. How long have you had the management of the mine?—Going on three years.

13,944. Was there not some disaffection before you came?—Yes.

13,945. Had that anything to do with the measuring of the work?—It was on account of that; and as to a manager who was here before I came here; that was the cause of it I suppose.

13,946. In what way was the mode of measuring different from the plan you introduced?—I do not know; I never saw it measured.

13,947. But it was not measured I suppose as you measure it?—I do not know; I never saw it measured; I measured my own.

13,948. Are the men satisfied with your mode of measuring?—They are at liberty if it is not right to prove it.

13,949. Is there no dissatisfaction felt now?—No; they are all satisfied with the measurement now.

13,950. What quantity of candles do you allow to the men?—Any quantity that they require; sometimes four men will burn perhaps six dozen pounds and sometimes seven dozen pounds in a quarter; but that just depends upon the work or time which they may work.

13,951. What do you charge them for the candles?—7*s*. a dozen pounds; sometimes 6*s*. 6*d*.

13,952. According to the contract price which you pay for them?—Yes.

13,953. And what do they pay for the powder?—That is the same; we charge them 14*s*. for a quarter of a cwt.

13,954. What other deductions are there from their wages?—There is for the powder and candles.

13,955. And the tools?—The tools.

13,956. Do they pay for sharpening the tools?—No; they pay only for putting on the steel and repairing.

13,957. Are the tools weighed?—Yes; they are all weighed.

13,958. Have the men to pay for the wear and tear of the tools?—Yes.

13,959. Do they ever dispose of the candles, or take them home?—I do not know anything about that.

13,960. As they pay for them, you are indifferent about it?—We supply them with candles and powder and charge them for them, and whatever they do with them is for themselves to look to; we give them a fair valuation for cutting the ground.

13,961. Have there been any accidents in your mine lately?—Not of any consequence; sometimes they might nip a finger, but there have been no accidents since I came here.

13,962. Is there no particular kind of accidents that the men are liable to from working in the mines?—The men are liable to accidents in all mines.

13,963. Do you mean from blasting, or from the falling of the ground?—There have been no accidents from either of those causes since I came.

13,964. There have been no accidents from powder blasting?—Not since I came.

13,965. Do the men use the patent fuze or a straw?—They use a straw.

13,966. Do they use a copper pricker?—Yes.

13,967. What kind of tamping rod do they use?—A long soft iron rod.

13,968. Have you a club in your mine?—Yes.

13,969. Is it a sick club or an accident club?—An accident club.

13,970. Is there no sick club?—Not that I am aware of.

13,971. What do the men contribute to the accident club?—I think they contribute 1*s.* a quarter.

13,972. Is there a separate account kept of that club?—Yes.

13,973. Do you know how that stands?—Not exactly; but I think they have a good deal of money in hand, perhaps above 250*l.*

13,974. How many men contribute to it?—Generally all the men are requested to pay to it.

13,975. Including those who are employed in the blast furnaces?—Yes; wherever they are employed.

13,976. Do the boys make a smaller contribution than the men?—Yes; some pay 6*d.*; some pay the price of men, according to their size.

13,977. What is the youngest age of the boys employed in your mines?—We have none in the mines, but on the workings; perhaps nine or ten years of age the youngest.

13,978. Do the men work double or single-handed?—Double-handed all of them; that is the general rule.

13,979. Is there any provision made for the education of the children?—Yes; we have a labourers' school at the mine.

13,980. Do the men pay for it?—No; the company generally provides them with books.

13,981. Who supports the school?—Mr. Marshall and Mr. Howard, Lords of the Manor, sometimes give a trifle; there is no schoolmaster fixed; the miners do it themselves.

13,982. Do you mean an evening school?—Yes, or during the day when it is wet.

13,983. (*Mr. Kendall.*) Were you a working miner before you became an agent?—I was.

13,984. Where did you work as a miner?—I worked in this neighbourhood; in Furness.

13,985. What countryman are you?—I am a Cornishman.

13,986. Have you worked in any Cornish mines at all?—Yes.

13,987. Where?—At Wheal Buller and Tresavean United mines.

13,988. Are the men in this neighbourhood very healthy?—Yes; they are above the average.

13,989. Do you perceive any difference between the miners in this neighbourhood, particularly those employed in the blast furnaces, and other miners?—No; I see very little difference in their health.

13,990. You think that the one class is as healthy as the other?—I do not see any difference in them.

13,991. Is there any difference in the amount of wages which they earn?—Of course the one gets standing wages, and the others work by contract.

13,992. Are the average earnings of the smelters the same as the wages of the others?—That is 20*s.* a week; the roasters earn 17*s.* 6*d.*, and the separators have 18*s.*

13,993. What are the average wages of the working miners?—About 16*s.* a week, from that to 17*s.* a week.

13,994. You have had a good deal of experience in Cornwall and in this district; in your opinion are the miners in Cornwall as healthy as they are here, or not?—They are not so healthy.

13,995. To what do you attribute that difference in the comparative health of the miners?—It is owing to the deepness of the mines and the mines not being so well ventilated.

13,996. In Cornwall they have not the same means for ventilation as you have here?—Of course they have not; they have not the same advantage, that is, not without going to enormous expense, and of course the mines could not be worked, that is a point of calculation.

13,997. Do the parties all sign when you set the bargains?—No; one of the partnership does it; they are all present.

13,998. Has the one who signs the power of dismissing any of the members of the party?—No; they have no power to dismiss any man.

13,999. They must first of all consult with you?—It belongs to me to say whether a man shall be discharged or not.

14,000. If one man displeases his comrades, can you take him out from them?—Yes, I can take out one and put in another, and separate them.

14,001. Is there any one or more appointed to take care of the dormitory where the men sleep, and to superintend?—The men themselves do it; there is a rule written up, there are so many chosen by the parties there, and they do it in their turns; one does it one week or a fortnight, and so on.

14,002. Do they choose a superintendent among themselves, and does he make all the necessary arrangements for them as to sleeping?—Yes, and then I go through the place, and if the things are not kept properly clean, I turn round upon the parties who have had charge of the shop, and I either fine or caution them.

14,003. What proportion of silver do you find in a ton of lead?—There are from 12 to 17 ounces to a ton.

14,004. Do you use much powder?—We use a great deal; about 10½ tons per year.

14,005. How much do you use in the course of a month or a quarter?—One company of four men will use from eight to nine quarters of a cwt. of powder in a quarter or three months, sometimes seven, and sometimes eight.

14,006. Is your ventilation so good that the powder smoke does not lie long?—It does not lie at all; it cannot stand because the draught is very strong.

14,007. It does not hang about so as to hinder the men from going to work almost immediately?—No, the men go right to their work as soon as the hole goes off.

14,008. (*Mr. St. Aubyn.*) Have you any Cornish miners working under you in your mine?—No, I think not one, there are one or two Devonshire men working there.

14,009. Are they men who have worked in the Devon mines near Tavistock?—I do not know anything about that.

14,010. You speak from your own experience when you say that the men in this neigbourhood are more healthy than those who work in the Cornish mines?—I speak from my own experience of course in the other country.

14,011. You ascribe the difference to better ventilation?—Yes; this is a mountainous district, and so is Cornwall, but it is table land. The mines are sunk down below a great depth; but here they are driven through the mountains. There are natural advantages here.

14,012. Do you think that the amount of disease is as great here as amongst the Cornish miners?—No, it is not so much by 10 per cent., and more.

14,013, Is there no climbing in your mines?—Nothing of any consequence, perhaps a few fathoms just over the stope in the footways; no such climbing as they have in Cornwall.

14,014. (*Mr. Davey.*) You did not allude to the mines that you had been working in in Cornwall that were so unhealthy?—Yes, the mines that I have worked in generally.

14,015. You spoke of the Tresavean mine?—Yes, and that was a very deep mine. I worked at the 236 under adit.

14,016. Did you work in that mine before the man-engine was introduced?—Yes, I worked before, and when I was working there it was down at the 248.

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14,017. What is the size of the vein in your mine here generally ?—The vein is from 20 to 60 feet wide.

14,018. How is the ore distributed in it ; do you find it in masses ?—It is in masses, and sometimes in strings, sometimes you find a mass two or three fathoms long, and a foot or two wide, then it becomes split up into a lot of strings, and it is mixed with quartz, pyrites, hornblend, and mica, and zinc, and several other things.

14,019. (*Mr. Austin Bruce.*) You have stated that there are 14 partners in these works ?—I believe so.

14,020. Are they gentlemen resident in this country, or strangers ?—Mr. G. M. Mead is the principal shareholder, and Mr. John Jamieson of Penrith is another.

14,021. Generally speaking, are they connected with this district ?—I believe they are generally ; the principal parties are connected with this district.

14,022. At what age do the miners begin to work underground ?—About the age of 21.

14,023. Have you any boys employed underground ?—No ; on the ground we have what are called washers. We have one little boy in the mines turning the points.

14,024. How are the miners usually employed before they go underground ?—They are employed at washing I presume.

14,025. Or in some way on the outside ?—Yes, sometimes we take men in from the farms, they come here when out of employment.

14,026. Do you think that the circumstance of their coming to work in the mines so late has anything to do with the good health that they enjoy ?—No, the men in this country are not worked in their youth as they are in many districts.

14,027. And you think that that has something to do with it ?—Yes, the boys are trained up upon farms, and they come to the mines when they become men to obtain employment.

14,028. After they have worked in the mines for some years, do you observe any difference between them and the men who work in the open air ?—Of course a miner generally has a different countenance from a man who is in the habit of working in the open air, the miner is not exposed to the sun.

14,029. I mean with regard to their health and strength ?—The miners generally are very strong.

14,030. Up to what age do they continue to work in your mines ?— We have some of them who are nearly 70 years of age, above 60 a good bit, at any rate.

14,031. Are they able, generally speaking, to read and write ?—I think they are generally.

14,032. (*Mr. Holland.*) Do the miners in this district look as young as other men of the same age ?—Yes, they have rather paler complexions.

14,033. Are they in your opinion as muscular as other men ?—They are.

14,034. Is disease of the lungs at all prevalent among them ?—It is not so here ; there may be a chance case or so for anything I know, but you do not see anything, it is not prevalent.

14,035. Among your men, how many of them are at all affected in that way ?—I do not know of anyone ; there may be one.

14,036. Of course there are many miners whom you know besides those employed in your mines ?—Yes, many hundreds.

14,037. Can you state positively that it is not the fact that these miners break down in health when they reach 40 or 50 years of age ?—I do not think they do in this country.

14,038. You are aware that they do in Cornwall ?—Yes, but it is quite different there.

14,039. Is there any disease here like that which you have seen in Cornwall ?—No.

14,040. Do the candles always burn freely in your mine ?—Yes.

14,041. Have the men never to slope them ?—No, we have no poor air.

14,042. Does the powder smoke clear away quickly ?—Yes.

14,043. Does it hang about for more than a quarter of an hour, so as to stop the men working ?—Not so as to impede our working at all.

14,044. (*Chairman.*) Are your men generally speaking temperate ?—They are pretty well in that respect upon the average ; there are good and bad in all places.

14,045. (*Mr. St. Aubyn.*) Do you think they are as temperate as miners are in the west ?—There are exceptions among them the same as among other people.

The witness withdrew.

Dr. JAMES RUMNEY examined.

Dr. J. Rumney.

14,046. (*Chairman.*) I believe you are the medical man of this district ?—Yes ; but I am not engaged in the mines.

14,047. Are you consulted by the miners ?—Yes, frequently.

14,048. But you are not regularly engaged to superintend them ?—No.

14,049. Is there any particular disease to which the miners of this district are subject ? — Asthma generally accrues.

14,050. Do you think that that complaint is more prevalent among miners than among other classes ?—Yes ; but the Greenside mines are very nearly as healthy as any agricultural district.

14,051. Are the men working in the Greenside mine subject to asthma ?—Yes.

14,052. What do you consider that arises from ?—From the carbonic acid and the want of oxygen or pure air.

14,053. That is what produces the effect ?—Yes.

14,054. Do you think that they have become troubled with asthma from working in the Greenside mine or in other mines ?—I think that the Greenside mine causes it as well, but at Alston it is far worse, those who come here are generally diseased.

14,055. Have you ever made a post mortem examination to ascertain how the lungs were affected ?—I have only had one since I have been here.

14,056. Was that a case of disease of the lungs ?—Yes.

14,057. Do you think that that was brought on by working in the mines ?—Yes, but not here, it was brought on at Alston.

14,058. What was the effect produced upon the lungs ?—Distention of the air-cells of the lungs.

14,059. (*Mr. Holland.*) Was there any contraction of the bronchial tube ?—No ; it was quite chronic.

14,060. (*Chairman.*) Was there any matter to be found ?—None whatever ; it just came on spasmodically.

14,061. Was it a disease quite different from consumption ?—Yes ; there is no bronchitis or consumption here ; no positive tubercles.

14,062. If the miners once become so affected they do not get rid of it ?—No ; this man to whom I have referred was obliged to get up three times at night to put his head out of window.

14,063. (*Mr. Holland.*) Was there any disease of the heart in that case ?—None.

14,064. (*Chairman.*) Are there any cases that could be seen now ?—Yes ; I know four or five cases of men who do not think of seeking for advice.

14,065. But you think that they are affected ?—Yes ; the lower lobes of the lungs are generally very much affected.

14,066. (*Mr. Holland.*) Have you noticed this di-

sease among the Alston men and not among the men of this district ?—I have not noticed it much among the men here ; lead paralysis is more common here, and dropping of the hand.

14,067. Among the miners ?—Among the smelters.

14,068. Not among the miners ?—No ; it is accompanied with lead colic.

14,069. Is there any excess of rheumatism among them ?—No ; except among the lads who are employed at the washing ; not among the miners.

14,070. Have you met with cases of asthma accompanied with great expectoration ?—Not so many ; they are very rare up here.

14,071. Is it rare for the miners to have asthma at all ?—No.

14,072. Do you mean that simple asthma is common ; but asthma with great expectoration is uncommon ? —Yes.

14,073. At what age have you noticed asthma to commence ?—It commences at any age.

14,074. When they are very young ?—About the age of 45.

14,075. Does it seldom come on before ?—Seldom before 40 or 45 ; that is about the average.

The witness withdrew.

Mr. Jacob Johnson examined.

14,076. (*Chairman*). Are you manager or captain of a mine ?—I am a workman.

14,077. In what mines ?—The Eagle Craig mine, which is about three miles from here.

14,078. Is that one of the Greenside mines ?—No.

14,079. Do you manage it ?—Yes, with the widow ; I have the management part for the widow ; her husband and I were partners, and he wished me to take the management at his death.

14,080. You are only working it on your own account ?—We have a grant from Mr. Esdaile.

14,081. Is it a lead mine ?—Yes.

14,082. How long has it been worked ?—It is an old mine, a very old one.

14,083. How long is it since the workings have been resumed ?—We have had the take of it since the 7th of January last.

14,084. How many men are there working in it ? —Four.

14,085. What quantity of lead have you been able to obtain since you came ?—I cannot say just now.

14,086. What is the length of the drift in which you are working ?—It will be about 60 fathoms long from the day where we get our metal.

14,087. Have you long worked as a miner ?—Yes ; I have wrought in mines all my life.

14,088. In what mines ?—I belong to Alston moor ; there were only three men at Greenside when I came and it was then but little wrought ; I have been a deal in Patterdale, ever since I came from Alston moor, about 37 years ago ; there were three workmen at Greenside when I came, and I made the fourth.

14,089. Did you suffer at all from any complaint at Alston Moor ?—I wrought for the London Company, and I thought it was going to injure me ; that is, the bad air ; and I saw a captain from Greenside, and I told him that I would work with him, and he said that he would set me on.

14,090. Had you worked in bad air at Alston ?— A very great deal.

14,091. In what mine was that ?—The mine was called Nenhead.

14,092–3. Is that working now ?—Yes ; it is.

14,094. Is that a mine belonging to the London Lead Company ?—Yes.

14,095. Are there any men working here now who are affected from having worked in bad air ?—There are some, but not many I think. I do not know any that have been affected from working in the Alston mines. There are not many men from Alston here at present.

14,096. I suppose that at the 60 fathom level the air is quite good ?—As fine air as it can be.

14,097. You would not work in air if it were bad ? —I am getting to that age now that it would soon kill me. I am now 64 years of age, and that is when it affects people, when they become aged.

14,098. They are more affected then than earlier in life ?—Yes. Their nature is gone. They cannot stand it so well as the young men can stand it ; the old people cannot.

14,099. (*Mr. Austin Bruce.*) Did you ever work at Greenside ?—Yes. There were only three when I came, and I made the fourth.

14,100. How long did you work at Greenside ?— I have wrought for 35 years at the Greenside mines. I washed a great deal at Greenside.

14,101. Did you ever work in bad air at Greenside ?—Yes ; until we holed to the other, between one level and the other.

14,102. How long have you ever been working in bad air altogether ?—From my coming to Greenside it was about three years before we got the hole, and got a lead for good air.

14,103. Were you breathing bad air all that time ? —Yes ; all that time. We had as many as 14 or 16 candles to keep in to get to the work.

14,104. Did you ever find yourself the worse for breathing that air ?—No ; if it only kept from my knees. It used to affect my knees. I am weak in my knees.

14,105. Did any of the other miners who were working with you suffer from the bad air ?—They are dead.

14,106. But did they suffer from breathing the bad air at the time ?—Not that I can tell you. They never complained to me any further than I have just told you of, a little weakness in the knees.

14,107. Did that weakness in the knees go away when you began to work in good air ?—To be sure it did. It just affected the back side of the head sometimes.

14,108. Have you known any men in this district suffer from working in the Greenside mine ?—No ; I do not suppose there is. I never heard them speak and say that they had suffered anything. There is not such a mine in the north of England that is calculated to have so much air in it as Greenside mine has.

14,109. Do you speak of that mine as it is now or as it was when you were first working there ?—It is different now. She was not ventilated when I came to her first.

14,110. You speak of the mine as it is now ?— Yes. Until the place be ventilated from one hole to another there cannot be good air. We had no drifts then ; only just a close place going in from the day, 40 fathoms in.

14,111. Where were you born ?—At Alston Moor.

14,112. Do many of the miners who are employed at Greenside come from Alston Moor ?—There is only one that I know of that lives at the company's new cottages.

14,113. Is he any the worse for having worked there ?—No. He is a young man.

14,114. What wages did you get, one week with another, at Greenside ?—16*s.* or 17*s.* or on to 18*s.* a week, taking the year round ; not one quarter.

14,115. Do you mean that you earned as much as that after paying for powder and for candles ?—Yes ; after all the charges were paid.

14,116. Can all the boys and girls in this district go to school if they like to do so ?—Yes. There are plenty of good schools. Mr. Marshall has one below.

14,117. Do all the boys and girls go to school ?— Yes.

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Mr. J. Johnson.

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14,118. Do many of the workmen save money?—No; there is little of that I doubt.

14,119. Do they ever build houses with their own money?—I have never seen any that they have built yet.

14,120. Did you make your money as a workman?—Yes; I made it, the bit I have, it is not much, but I have made a good use of it.

14,121. Have you known many men as provident as yourself?—Not many, not that I have seen.

14,122. (*Mr. Holland.*) Was the air very bad where you worked during the three years you have mentioned?—Yes; very bad.

14,123. Would the candles burn?—Some days they would, but we used sometimes to have 14 standing back burning; we were watching for fear one should go out.

14,124. You might have been caught in the bad air?—It was to get a light when we wanted it, or we might have been left in the dark; the candles were lying down as back as could be, and when we had one standing in the better air we could go and get a light.

14,125. Did not that cause you to perspire very freely?—Yes.

14,126. Did you experience a trembling in the knees while you were so working?—Only then.

14,127. When you came out into the fresh air did you feel all right again?—Yes; but sometimes it just touched you at the back side of the head.

14,128. Did it affect your breathing at all?—Not mine.

14,129. Did the other men suffer in their wind at all?—No; they were old men, they never suffered anything that I ever heard of.

14,130. You say that the men are all dead who were then working there?—Yes.

14,131. At what age did they die?—At about 60 or 70.

14,132. What do you call an old age among miners?—That is a long age among miners, 60 or 70.

14,133. Did they suffer from cough?—I did not hear them complain of cough at all.

14,134. Were they particularly short winded?—No.

14,135. The miners do become old rather earlier than other men do they not?—Yes.

14,136. How much earlier do you think they become old?—I think there is 10 years difference.

14,137. For example does a miner of 50 look like a labouring man of 60?—Yes.

14,138. Without having any particular disease upon him?—Yes.

14,139. You would say that he is an older man of his years?—Yes.

14,140. As much as ten years older?—Yes, in appearance they look like it.

14,141. Are the miners particularly liable to rheumatism?—Yes, they are.

14,142. Have you heard them complain very much of that?—I have heard them complain very much of rheumatic pains.

14,143. So much as to lay them up?—Yes; it will lay them up.

14,144. Are many of the miners permanently disabled by rheumatism?—I have never seen any so bad as that, but you know sometimes it will lay them up for some time, until it goes off again.

14,145. They are not permanently disabled by it but only temporarily?—Yes.

The witness withdrew.

WILLIAM MARSHALL, Esq., M.P. examined.

W. Marshall, Esq., M.P.

14,146. (*Chairman.*) Are you one of the proprietors of the Greenside mine?—I am joint proprietor with Mr. Howard of Greystoke; we are proprietors as Lords of the Manor of an overleap, or piece of ground in dispute, a lease was made to that company by us jointly.

14,147. You have leased the mine to the present company?—Yes.

14,148. What is the company termed?—The Greenside Company.

14,149. Is the chairman of the Company Mr. Head?—Mr. Head and Mr. Jamieson are the principal parties.

14,150. In leasing the mine did you make any special conditions as to the working of the mine?—The condition of four men to keep the forehead open, and other usual conditions.

14,151. But you made no condition with regard to the men employed?—No, because we could not do so without interfering with the management of the mine; I may add that we have adopted along with them some means for the better management and comfort of the workmen.

14,152. How long has the mine been let to the present company?—Nearly 30 years.

14,153. Has there been any change in the management during the time?—There have been several managers.

14,154. Has there been any disaffection among the men at any time?—Occasionally, on enquiring into it, especially with the present manager, who is a very good one; I find that the chief cause of complaint has been that men of a mature age do not earn so much wages as they used to do when they were younger, and when they have accidentally what is called a bad bargain.

14,155. But there is no just cause of complaint as far as you know?—The complaints have always been greatly exaggerated; on examining into the matter and taking the rate of wages I have found by the books of the company that the wages have been 2*s.* or 3*s.* higher than have been represented by the men.

14,156. To what extent are the wages higher than those of the agricultural labourers of the district?—They earn 18*s.* a week, the work is constant; agricultural wages are higher in summer and lower in winter.

14,157. Should you say that the men are healthy?—Mines always shorten human life; they are tolerably healthy; they are healthy as far as ventilation goes.

14,158. Do you think that the description of work underground even with good ventilation is likely to shorten life?—A doctor will tell you that it is certain to do so; you own investigations will give you a better answer than I can.

14,159. Are you aware of any cases of what is termed miners' disease with the miners in this locality?—I am not; there is none; asthma is necessarily produced from breathing bad air, and human life is first weakened and then shortened.

14,160. Is there any deduction from the men's wages towards the support of schools?—Nothing: and with regard to schools, the mining company have not contributed anything to schooling, which I think they ought to do. There is a parish school and a school which I have set up for very young children. I think that they will contribute to it, but they have not done so hitherto.

14,161. Many of the miners reside at a distance, do they not?—They do; I do not think it desirable that they should all live here, nor does the agent think so.

14,162. He thinks it better that they should not all be congregated together?—Not all; it will be seen that the valleys are very narrow and that there is very little convenience for their living.

14,163. Have you visited the shops of the mine?—Frequently. In the case of the last shop which was built, which some of the Commissioners I understand have gone to see, a portion of the expense was contributed by Mr. Howard and myself in order that

the young men might have a room for reading, and occasionally to be used as a school room.

14,164. Is there an evening class held at the mine?—There has not been, and for this reason; a few years ago all the washings of the mines were let to an undertaker who hired the boys, and the directors had no control over their employment, as many of them lived at a distance. They worked 13 and 14 hours a day in the summer months in order that they might go home to Keswick or Penrith on the Friday evenings; this of course left no time for their instruction, they were wearied with their labour and went to bed; and on this point Mr. Howard and I beg to call the attention of the Commissioners to the only system of overwork which we are aware of in the mines.

14,165. (*Mr Austin Bruce.*) You mean that connected with the washings?—Yes; boys of from 10 to 16 years of age are employed, and for a number of hours which it is apparent to anyone is beyond their strength.

14,166. (*Chairman.*) Is this in order that they may get back to the places where they reside?—It is; and as the miners go away on Friday afternoon, the boys, especially if they are the sons of those miners, are naturally perfectly ready to over-work on the other days that they may go home with their parents or friends.

14,167. And that is occasioned by the boys as well as their parents residing at so great a distance?—With regard to those boys who do live at a distance it is, but with regard to the boys who live in the immediate neighbourhood it is not necessary.

14,168. But if one set of boys are obliged to work long hours on account of their residing at such a distance, must not the others necessarily work the same length of time?—I believe you will find that the washing could be carried on by a portion of the boys working the proper hours for six days in the week; the other portion would have to work longer hours to make up their work.

14,169. Are the workings of the mine carried on with regard to ventilation and other means so as not to be injurious to the men?—The management of the mine has been gradually improving. With regard to ventilation it is very good, and I will go on with some remarks on the management of the mine. Mr. Howard and I have recently employed a practical miner to give us reports as to the working of the mine; the one whom we employed was Mr. William Barrett, he has made very valuable suggestions as to the working of the mine, which I need not go into. The company have adopted them, and so satisfied are they with his recommendations that they have now employed him themselves as a supervisor of the mine; not that they are dissatisfied with their present manager, on the contrary, he, Mr. Phillips, has adopted immediately all the suggestions made by Mr. William Barrett. As to the working of the mine with regard to any effects on the public, some years ago there were no slime pits or very insufficient ones, and Mr. Howard and I pressed on the company to erect them, which after a certain delay they have done.

14,170. (*Mr. Austin Bruce.*) Will you be good enough to explain what slime pits are?—When the what is called bouse comes out of the mine, which consists of lead ore imbedded in stone, it is broken first by hand, and then by a crushing mill, and then the larger portions of it are washed by the boys of whom I have spoken. A considerable quantity of mud is produced, which is caught in shallow level places called pits, in which is a system of using the power of gravity to divide the mud from the heavier lead; that lead, which is as fine as dust, is retained in these pits, falling of course to the bottom of the pits. The sand being on the top is scraped off, and this is some of the most valuable produce of the lead. At the period of which I speak, from 10 to 7 years ago, these slime pits being very insufficient in number, a great portion of the lead was carried down into the lake of Ullswater, so much so that there was a film spread over the whole lake in calm weather, and all medical men say that that is most injurious, and occasionally when the miners have washed in that water, they have been more or less affected by it. This is now put an end to, and the mud which any one may see, which is thus carried in, consists almost entirely of sand, and therefore is not prejudicial to anything.

14,171. (*Chairman.*) This improved method is carried out at Greenside at present?—It is, and has been for some years. The plan of these slime pits was made by an agent who came from Alston Moor.

14,172. Do you suppose that in other lead mines, the same system is generally adopted?—I have no doubt that it is.

14,173. Is it carried out to such a full extent as to prevent what flows away becoming injurious to health?—In some mines I have no doubt that it was carried out long before it was adopted here, for they have been slow in adopting improvements.

14,174. (*Mr. Austin Bruce.*) You say that on the whole you think it a good thing that all the workmen should not live near the scene of their labours; do not you think it is an evil that a man should be separated from his family from Monday to Friday night?—I think I rather said that the agent did not think it necessary that all the miners should live here, and I added that the difficulty was that the valley here was so small, that it would be difficult to find houses for the men.

14,175. With respect to the employment of boys, would there be any difficulty in having gangs of boys just as you have gangs of workmen, working their eight hours per day?—I am not so well able to answer that question as a mining agent would be; it certainly would be prejudicial to the health of boys to work at night, and to work in eight hours shifts.

14,176. There might be two shifts a day, which would not involve, strictly speaking, work at night?—I should think that that would be a very good plan.

14,177. You have been I dare say acquainted with the mining population of other districts than this?—I have known something of the population of Alston Moor.

14,178. Have you had such a knowledge of the mining population of any other district, as would enable you to make any comparison between the relative health and condition of the miners here and of those elsewhere?—I have not.

14,179. Do you consider them on the whole as a healthy class of men?—I repeat a former answer, that the working underground, with the air which there is in a mine however well ventilated, makes men prematurely weak and old, and also shortens their lives.

14,180. I suppose that in your opinion mere absence from the light and the air of the surface, is itself an evil which cannot altogether be remedied by any amount of ventilation?—Certainly not, and the change from a temperature such as that of a mine to the cold and rain of winter, necessarily brings on either affections of the throat or rheumatic affections.

14,181. Are you aware whether there are any gases escaping from the lead, and mixing with the air in the mine?—There are not any, and in that my steward, who has been frequently in the mines, agrees with me.

14,182. With respect to the general intelligence and good conduct of the men, do you consider them an average population?—There I can speak to the purpose. The mining population both here, and also as I am informed at Alston, is much better behaved and more moral than it used to be.

14,183. Then a great improvement has taken place in them, they are better than they were formerly; are they equal to the rest of the population?—All occupations in which there is any difficulty call out among clever men more exercise of their intellect than mere farming operations, and that is the case with the miners.

PATTERDALE.

W. Marshall, Esq., M.P.

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14,184. Do they show a desire to have their children well educated ?—Yes, they do.

14,185. Do they show much eagerness about it as in Scotland ?—Moderately so.

14,186. What proportion of the whole mining population resides in the neighbourhood of the mines ?—The steward tells me between half and a third.

14,187. So that you would only have to provide education for the children of that portion of the workmen ?—Just so.

The witness withdrew.

Adjourned to Monday next, at Alston.

ALSTON.

Monday, 6th October 1862.

PRESENT :

The Right Hon. Lord KINNAIRD, K.T.
NICHOLAS KENDALL, Esq., M.P.
JOHN ST. AUBYN, Esq., M.P.
RICHARD DAVEY, Esq., M.P.
P. H. HOLLAND, Esq.

The Right Hon. Lord KINNAIRD, K.T., in the Chair.

Mr. TINNISWOOD MILLICAN examined.

ALSTON.

Mr. T. Millican.

6 Oct. 1862.

14,188. (*Chairman.*) Are you the agent or manager of any mines in this district ?—I am the district agent for the Lead Company, and Mr. Watson is the mining agent. I have the outdoor department.

14,189. What are the names of the mines which are under your charge ?—There is Long Cleugh and Small Cleugh, Middle Cleugh and Cow Hill, Ramp Gill, Scaleburn, Cow Hill, Gudam Gill, Hanging Shaw, Carrs Bridge, Brown Gill, Tynd Bottom, Hundy, and Fletcheras.

14,190. Are the royalties under the charge of one person ?—They are; they all belong to Greenwich Hospital.

14,191. Do the men enter all these mines from the Horse level, or do any enter from the shaft ? — Some enter from the shaft.

14,192. Which is the largest of these workings where most men are employed ?—Long Clough.

14,193. Do you know how many men altogether the London Lead Company have in their employment in this district ?—They have about 330 I believe at present ; sometimes we have 340.

14,194. Are those all miners ?—Yes.

14,195. Are they all working underground ?—Yes; the 330 are pickmen working underground.

14,196. Whereabout is Long Clough ?—It is about half a mile beyond Nenthead, further on the south.

14,197. Is it near any town or village?—It is about half a mile from Nenthead.

14,198. Is it in the valley ?—Yes ; it is in the valley.

14,199. How do you enter it ?—We enter it by the level ; the underground level.

14,200. What are the principal operations carried on in that mine ?—Principally blasting.

14,201. Are they sinking shafts or driving drifts ?—They are driving drifts. First, we drive a level ; we open up by driving a level 6½ feet by 4½ feet ; then we blast it ; and then after that, when we get as large a place as we want, we put in a stone arch.

14,202. Is that cheaper than wood ?—Yes ; and it is more lasting, and it makes a firmer job of it.

14,203. Do you know what the comparative expense of the two modes is at first ?—I should think that there is somewhere about 10*s.* a fathom difference.

14,204. Do you mean that the stone is 10*s.* a fathom dearer than the wood ?—10*s.* a fathom cheaper; when we can get stones at 8*s.* per fathom, and have easy access to the place we wish to arch, the stone answers the best.

14,205. In the first construction, is it cheaper ?—Yes ; in a place like this where we drive a level and cut it down about 10 feet, and we keep the refuse to put upon the arch, and sometimes require more to be brought from some other place in the mine to keep the working more secure.

14,206. You get rid of the refuse in that way ?—Yes, as much as we can in that way, and it keeps the mines more secure.

14,207. The men enter by the driving ways into the mine ?—Yes.

14,208. For what number of fathoms is the drift carried ?—About a mile, as near as I can tell you in this mine where the workings are.

14,209. In that distance are there any shafts going to the surface ?— Yes ; there are two shafts, and several rises from the low level, and some from the high level for circulation, &c.

14,210. At the end of the mine is it opened up into another working ?—Into another level communicating with the foremost shaft.

14,211. Is there no special ventilation in that distance ?—Several communications, as stated above,

14,212. Do the men go in waggons to their work ?—Generally.

14,213. Are there waggons employed to take their tools in ?—Some of the men ride in waggons along with the tools occasionally, and the others push forward the waggons.

14,214. You say that that is not general throughout the country ?—It is not so.

14,215. Where it is not so the men have to carry their tools ?—Yes.

14,216. When you are getting to the end of a level do you drive below or above this horse level ?—We generally work above the horse level, and we still aim at getting our horse level in as low as we can, we find that of advantage, it answers as a drain, and the work comes better and cheaper.

14,217. Are you liable, from the nature of the soil, to crushes ?—Sometimes.

14,218. Have any accidents occurred from that ?—Occasionally.

14,219. Do you use plenty of timber to shore up with ?—Yes ; we give the men the choice of what timber they think proper, in the wood yard ; and an opportunity to choose the best timber.

14,220. Do they put it up themselves ?—Yes, generally.

14,221. Are they supplied with the timber free of expense ?—Yes.

14,222. Does it rest with the men or with the manager to say where timber is required to be put up ?—Men ; we let them judge for themselves ; sometimes we press it on them, and think that they ought to have more. With a mine that requires much timber, it is our consideration whether it will pay us to let the men work that mine or not ; sometimes it will cost us more than it ought, and it will not pay, and in fact then we do not allow them.

14,223. Therefore, if the ground is of such a character as to require a good deal of timber you would probably abandon it ?—When we allow them to work

they are supplied with as much timber as they think necessary.

14,224. Is that abandonment of a mine of frequent occurrence or not?—No, it occurs very seldom.

14,225. Is the timber periodically inspected by any one in order that they may see it is properly put up? Yes, it is periodically inspected by the overmen and the agents.

14,226. Do they report to any one as to its efficiency or inefficiency?—No, they do not, but they see that it is done in the way that it should be done.

14,227. Do the men descend into the mines by means of cages?—No, we have none, we have very little of that kind of work now; what we call shafts or sumpts; formerly this country was wrought a great deal in that way in winzes and shafts; we find it a great advantage if we can get a level in, it answers for a drain.

14,228. When you are inside you must have winzes or shafts to get at a lower or higher level?—Occasionally, but very little.

14,229. Suppose that a vein extends upwards, how do you reach it?—Then we rise up.

14,230. By ladders?—Yes.

14,231. When you rise up in that way, or sink down, how do you manage for ventilation?—We have hand airing machines, and generally blast pressure down another shaft.

14,232. Will you be good enough to give a description of the water-blast that is used?—The water-blast is a pressure blast with a small hole near the end of the lowest pipe, and we sometimes attach an airing machine to it.

14,233. Which do you think answers the best?—I can scarcely tell; it is a good while since I have seen them much tried. Mr. Watson will give you more particulars about the blast.

14,234. Are the men who are working in these mines healthy?—We do not consider mining a healthy thing at the best.

14,235. How are the miners affected?—In their breathing.

14,236. What in your opinion is that occasioned by?—I should think it would be from the smoke and dust, the dust gets into their lungs.

14,237. Is there a great deal of dust in these mines?—Yes, in some of the dry mines.

14,238. Is it small dust?—Yes; we consider the wet mines the more healthy, generally.

14,239. But several of these mines are dry, are they not?—Yes, several.

14,240. How long is the powder smoke, after blasting, in clearing away?—It just depends upon what kind of air it is, and what kind of current there is.

14,241. Are there any men whom you could point out who are at all affected in their breathing?—We have some at Nenthead and Garrigill.

14,242. Is there any doctor who is connected with the mine?—Yes, we have a doctor; the lead company find a doctor for all their workmen free.

14,243. What do the men pay a month in the shape of club money or for the doctor?—They pay nothing to the doctor, but they pay 30*s.* a year to the fund.

14,244. Is it a fund for affording relief in case of sickness or of accident?—It is for sickness or accidents either.

14,245. Is there a separate account kept of that fund?—Yes.

14,246. What is a man allowed when he is out of employment on account of sickness?—He is allowed 7*s.* a week.

14,247. Is the fund sufficient to meet all claims that are made upon it?—Yes.

14,248. Do you happen to know what balance there is in hand?—It does not strike me at present.

14,249. Are there any Odd Fellows clubs here?—Yes, there are some at Alston, but there are none at Nenthead. Some of the lead company's miners are in some of the clubs.

14,250. Do the men subscribe to them as well as to the mine fund?—Yes.

14,251. Are they all obliged to subscribe to the mine club?—It is a condition, all who wish to become regular workmen.

14,252. What is the youngest age at which boys work underground?—14 I believe; we allow them to go in, but not until they are about 18 years of age, to work regularly; they wash in the summer on the surface, and we let them go underground in the winter at 14 years of age, when they cannot wash outside.

14,253. They work underground in the winter?—Yes, they just help to get away the work, they work in the different partnerships: we allow them to go along with the men, so that they take care of them; their work is to wheel to certain parts, and to separate the work, and teach them how to strike and beat.

14,254. Do the men work double or single-handed?—Double-handed generally; very few single-handed.

14,255. I suppose that a miner may take his son down, although he is younger than the age you have mentioned?—No, several do not go in till they are 20.

14,256. Are there any washing floors at your mines?—Yes, at all the mines.

12,257. Do any females work there?—No, we have not one; formerly we had some, but the company discontinued to employ them 40 years ago.

14,258. Do men now do that work?—Yes.

14,259. Do they work under cover?—Yes, in some places, not in all; we have some of the washing places covered.

14,260. Do the men reside near the mines, or at a distance from them?—Generally, I think, they are near our mines. At Nenthead they are not far off, about $\frac{1}{6}$ of a mile perhaps, and some of them three quarters.

14,261. Do the miners change their clothes when they come out of the mine?—Not until they go home.

14,262. Have they no place to change in?—No.

14,263. In wet mines, do not the miners get wet?—They go home to change them; they go home in their wet clothes; but we allow them, when they have worked in a very wet place, a waterproof suit to put on.

14,264. There are, I believe, some very wet places in the mine referred to?—Yes.

14,265. What allowance of candles do you make to the miners?—They use what they require.

14,266. What do they pay per pound for the candles?—We pay about 8*s.* I believe it was 7*s.* 10*d.* a dozen last year.

14,267. Are the men charged the same price as you pay for them?—No, we take an average of the price.

14,268. Do you mean an average over 12 months?—We have different districts belonging to the lead company; there is the Teesdale mining district, and the Westmoreland mining district, and we strike an average of the rates, and charge the men accordingly.

14,269. At that average price the men are supplied with candles?—Yes, on that average price we fix the rate at what we think they ought to pay.

14,270. How often is that average struck?—Once a year.

14,271. Do they pay for powder in a similar way?—Yes.

14,272. Do they pay also for sharpening their tools?—No, they buy their new tools first; we supply them and charge them so much for them.

14,273. Then the tools belong to the miners after that?—Yes.

14,274. If they should happen to leave the mine,

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would they take them with them?—No, they return them, and we give what they are worth.

14,275. Are they weighed then?—Yes.

14,276. Is no reduction made for wear and tear?—Yes, they generally get worse; we often repair the tools for the men, but we do not charge them for that.

14,277. Have any accidents occurred from blasting in your mines?—Sometimes.

14,278. Do the men use the patent safety fuze or a straw?—The men do not like the fuze, it has such a bad smell. We have several times got it for them, and wished them to use it, but they do not like the smell of it at all; they prefer the squib.

14,279. Have they any other objection to the patent fuze?—I do not recollect any other.

14,280. How are the accidents from blasting occasioned?—In charging the holes generally, it strikes fire.

14,281. Do you use iron tamping rods?—No, we use copper, we think that they are safer.

14,282. Do you mean iron coppered over?—Yes.

14,283. How far up does the copper reach?—I should think perhaps half an inch or three quarters.

14,284. Are the prickers made of iron or of copper?—Of copper.

14,285. If the tamping rod is of brass and they only use that how would an accident happen then?—Sometimes there may be some unsound holes, and they may hit a corner with the driver and strike fire unexpectedly.

14,286. (*Mr. St. Aubyn.*) Does the nature of your occupation bring you much into personal contact with the miners?—Yes, I am constantly moving about, and meeting with them; they have to attend our reckonings, and I am in the office when we reckon with them generally.

14,287. You have stated that they begin to work generally about the age of 14, have you any knowledge of the average age at which they leave off work?—I cannot speak to that.

14,288. Do the men work in your mines until they reach what you would call a good old age?—They work some of them up to the age of 55 and even to 60, but that is a rare case.

14,289. It is rare is it to find a man working in the mines at the age of 60?—Yes.

14,290. Do you think that they leave off working before that age from being incapacitated by the labour they have undergone in the mines?—There is no doubt of it.

14,291. Do you ever hear the miners complain of the nature of their work?—That sometimes happens.

14,292. To what cause have you heard them ascribe their failing condition?—Sometimes the mines are not so good for air as we would like to see them.

14,293. Is there bad ventilation?—Yes, on this account; sometimes when we are holing to a place we have to change the men and not to let it depend altogether on one partnership. We wish to change them and let every person have a share, and in cases of that kind it is unavoidable; as soon as we can get them ventilated we do so.

14,294. That is one cause?—Yes.

14,295. Is there any other cause that you have heard the miners mention?—No; it is the want of ventilation and the dusty places, that is what they complain of; when we happen to have anything of that kind it is unavoidable, there will always be some places of that kind in mining.

14,296. Can you give the commissioners any information as to the average number of men or thereabouts who are under the doctor's hands at a time; for example, suppose you have 100 men working how, many of those would probably be under the doctor's hands?—We have, say, 330 or 340 pickmen, sometimes we have fewer and sometimes more; I should think that 20 would be as many of those that we have at present, or 15, as are under the doctor's hands, but I think we scarce have that number.

14,297. Are they under the doctor's hands from causes connected with their work?—There are other causes besides that.

14,298. Can you at all specify what proportion of the causes are connected with their work?—I cannot speak to that at all; I think there are about 10 or 15 under the doctor's hands, from various causes, besides being affected by the mines.

14,299. Can you state what proportion of that number are suffering from causes connected with their work?—I cannot.

14,300. (*Mr. Davey.*) What is the general health of your workmen?—It is about like others parts I believe.

14,301. Do they suffer more or less than the agricultural labourers?—They are not so healthy as the agricultural labourers.

14,302. I believe your men have small farms or small holdings on which they work and cultivate them?—Yes; and it does them good a little working at the surface.

14,303. Do men come from any other districts to work in your mines?—Not many.

14,304. Do you perceive any difference in the health which those men enjoy as compared with those of your own immediate neighbourhood?—No.

14,305. How much lead per month, or annually, do your mines produce?—Last year we had somewhere about 6,000 bings, 8 cwt. is one bing.

14,306. Do you smelt it?—Yes, the whole of it; we smelt it ourselves near the mines.

14,307. You stated just now that you occasionally heard complaints; to whom ought they to be made, to you or to the manager underground?—The complaints are generally made at the quarterly review when we have our bargains made. We have them thrice in the year, and then if they wish to have a place changed that does not suit their health we contrive to change it.

14,308. Are you generally present at these quarterly takings?—Generally.

14,309. Not always?—Yes, always when I am in health. But our superintendent, Mr. Banebridge, is present always, and he lets the bargains.

14,310. The complaints would be virtually made to him?—Yes.

14,311. What is the manner in which you let your bargains?—We have what are called viewing agents, and they all go into the mines and take a view, and make their statements of what they think a place ought to be worked at per fathom. They give that to our superintendent, and he fixes the rate.

14,312. The miners work within a certain limit; you fix the price, and they have the opportunity of changing a place if they like?—Just so. We have three districts, and when the mines are viewed the agents come from the other two districts, it keeps us clear from having any corruption amongst us. And we all give independent opinions, so that we cannot cheat anyone.

14,313. (*Mr. Kendall.*) If I understand you rightly you are a district agent; your business is not to go underground?—No; I have not been underground for 14 years, excepting two or three times.

14,314. Do you look after the interests of Greenwich Hospital alone?—No; I have nothing to do with that. I am agent for the lead company.

14,315. Do any of the arches of which you have spoken ever give way?—Not often.

14,316. Have you ever known some of them to give way?—Occasionally.

14,317. With regard to the woodwork, you say that sometimes it becomes a question whether a working should be continued, although the ore may not be scarce, in consequence of the very great expense to be incurred for timbering, and that sometimes you resolve to abandon it?—Yes.

14,318. Just prior to abandoning a working do the miners become careless, which makes it necessary to be very cautious, or, in other words, do they use less timber than they ought to do?—We look to that so as to get them to use plenty of timber.

14,319. They will, I presume, have to bear the cost of putting up the timber ?—Yes; but we let them have what timber they have a mind to have.

14,320. But is there anyone who superintends that matter in order to see and to report ?—They view the mines generally once or twice a week, the overmen do.

14,321. Would it not be advisable if danger sometimes does arise to have not only one person to superintend but also to report upon the dangerous places ?—I do not think that is necessary. There is an overman in the mines, and Mr. Watson is the agent; it it is his place to see that the overman does what is right.

14,322. There are some dry mines and some wet mines; have you ever had occasion to observe whether the miners are most healthy in the wet mines or in the dry mines ?—In the wet mines.

14,323. You are of opinion, I suppose, that the dust is more injurious than the damp ?—Yes, I am.

14,324. From what does the dust arise, from the boring ?—There is the boring and the blasting, and they cause a deal of soft dust to fly about.

14,325. Is it a sort of impalpable dust that lies about the side also ?—Yes; but we can see it.

14,326. Do the miners put anything over their mouths like gauze to keep the dust away ?—Seldom. I have seen them have it, but only a few.

14,327. In the wet mines do you lend the miners waterproof clothes sometimes ?—Yes.

14,328. Do they work in them underground ?—Yes.

14,329. Must not the perspiration while wearing the waterproof clothes be very intense ?—It is a very rare case. It is so sometimes in very wet places, just for a time.

14,330. When they come to the surface do they leave their waterproof garments there ?—They leave them inside generally till they go back again.

14,331. Do they walk home ?—Yes.

14,332. Have you any sleeping places on the mines?—Very little of that; we have very few houses of that kind.

14,333. Have you any ?—Yes, there are three at our place, but they are very small places.

14,334. How many men can sleep in one place ?—There will be 12 men in our largest place; the Teesdale mines have more lodging houses, and good ones there. Our men live near their homes here, but in Teesdale the mines are at a greater distance from their houses.

14,335. (*Mr. Holland.*) About what age does the miners' complaint come on ?—That depends a good deal upon the individual.

14,336. But, generally speaking, about what age should you say, 40 ?—Yes, I should think so.

14,337. Do many men reach the age of 45 without it ?—I should think that they would be affected mostly.

14,338. You mean, I suppose, that very few of them of that age would be without it ?—Not many. I think that the greater part of them would be affected before they reached 45.

14,339. That is pretty generally so, is it ?—Yes.

14,340. Do not a very large proportion of those who get above 45 die of it ?—Yes, if they get above 45.

14;341. Do they die of it chiefly?—Yes.

14,342. Is it much the same complaint in them all, shortness of breath and spitting ?—Yes, I should think so.

14,343. Do they appear to suffer much pain from it ?—Sometimes they seem to suffer very little, just from shortness of breath, with no pain.

14,344. Do they become weak ?—Yes, generally.

14,345. And gradually waste away ?—Yes, but if they are kept quiet they have no pain.

14,346. At what age do you consider a miner an old man ?—We consider a miner an old man at 50 or upwards, 52 or 53.

14,347. Do you mean that when he reaches the age of 50 he is nearly done ?—Yes, he is nearly done then.

14,348. Does he look a great deal older than an agricultural labourer of the same age ?—Yes.

14,349. What difference should you say there was?—The cheeks of the agricultural labourer are far healthier in appearance.

14,350. I have been informed that an agricultural labourer of 60 looks as young as a miner of 50; is that correct ?—Yes, I think it is.

14,351. Do the same men continue for a long time working in the dry and in the wet levels, as the case may be, or do they frequently change ?—We leave it a good deal to their own choice.

14,352. Are the same men constantly changing ?—Occasionally.

14,353. As the same men would be exposed to the operation of both causes if they are constantly changing from the wet to the dry mines the effect would not be so evident upon their health ?—It is not so evident; we give them a choice of a dry mine or a wet mine.

14,354. Do the miners work for one month in a dry mine and the next month in a wet mine ?—It is generally once a quarter that we change them.

14,355. Does a man work for two or three years in a dry mine or in a wet mine ?—Yes, he works more than that sometimes in one continued place.

14,356. Can you say whether or not the men who work for a long time in dry mines suffer more from these complaints than those who work in the wet mines ? Have you noticed that ?—Yes.

14,357. It happens but seldom, I suppose, that they do work only in one kind of mine ?—Some of them work a good deal in a sort of damp mine, and others work a long time in a dry mine. I remember some who worked in a dry mine and died sooner than they would have done had they been working in a wet mine, so far as I was capable of judging.

14,358. Are any of your mines so badly ventilated that it is difficult to keep a candle burning upright ?—I should think they are scarcely so bad as that, but it may be so for a day or two.

The witness withdrew.

Mr. THOMAS WATSON examined.

14,359. (*Chairman.*) You are the underground agent for the lead company's mines ?—Yes.

14,360. Have you charge of the whole of them ?—Yes, in the Alston district.

14,361. What is the longest distance that any drift has been driven from the day ?—I cannot say exactly the distance from the day; we generally call them levels. I should think that the longest is about two miles.

14,362. In which mine would that be ?—In Caple Cleugh mine.

14,363. Does that communicate with any old workings ? — Yes, it communicates with the Garrigill mines, and it communicates with the Long Cleugh mine as well.

14,364. In the course of that distance are there shafts going to the surface ?—Yes.

14,365. Do you know about how many there are ?—There are a great number of them closed now, the old shafts; and the current passes right through the mountain on to the Garrigill side, a distance of fully three miles.

14,366. You say that the shafts from the surface are closed ?—Yes, a number of them, but we have about half-a-dozen that are open.

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14,367. Do any of these act as up-cast shafts ?—Yes.

14,368. Is one constantly an up-cast shaft ?—Yes.

14,369. Where is that situated ; is it high or low down ?—It is just about the summit of the fell ; it is the moss shaft.

14,370. That is always an up-cast shaft ?—Yes.

14,371. Does the powder smoke always make its escape in that way ?—Yes.

14,372. Do you employ any artificial means for making that an up-cast shaft ?—No, it is just natural.

14,373. How far have you ever driven from either of these shafts ?—It is an old shaft ; the fact is that it is just situated about half way down the summit of the fell from the Nenthead side and the Garrigill side ; but there have been several openings, and there are openings connected with the old works both on the west and on the east side of that shaft.

14,374. Have you ever driven any level where, when the men have been working, the candle would not burn upright ?—Sometimes when a place has yielded a considerable quantity of foul air we have met with it in that way, in the great limestone there are a great many crevices ; it sometimes happens when the weather is going to be bad, that out of these crevices the foul air is blown.

14,375. The foul air you think comes out of the crevices ?—Yes, I think there is little doubt about that ; I think at least that it comes from there, there is no opening from the surface or from any other quarter that we are aware of ; it just comes in from some place lodged in the rock ; at what distance it may be from where we are working we cannot tell.

14,376. What do you consider to be foul air ?—We call it foul or bad air. We commonly use the words foul air for bad air or impure air ; but, perhaps, strictly speaking, it is carbonic acid gas that comes out of the limestone.

14,377. How do you discover it ?—It nips the candle out.

14,378. Do the men feel it before the candle is nipped out ?—Yes, they feel a difficulty in breathing, and the candle burns dimly. If the working is not sufficiently impregnated with gas so as to extinguish the light, then in order to test the quantity that is coming into the working they apply a candle to a crevice, and then if it be powerful it at once extinguishes the light as it comes out of the crevice. We have had hundreds of instances of that kind in the great limestone. And there is another thing, what comes out of the crevice always takes the bottom ; it flows at the bottom, and the candle is extinguished there when it would burn quite easily at the roof.

14,379. (*Mr. Kendall.*) Will it flow without mingling with the other air ?—That depends upon how far it is to the point of ventilation.

14,380. What is the greatest distance, or have you ever noticed that ?—Perhaps 100 fathoms in some instances.

14,381. (*Chairman.*) When you find this to be the case do the men leave off their work ?—Sometimes they do and sometimes they do not if they think that they can manage ; it is just left to their own judgment for the most part ; but in many instances when we have gone to view them, and we have found the air to be bad in that way, we have advised them to leave off.

14,382. Although the men were working on ?—Yes.

14,383. Do you find that by taking the men off for a certain time the air improves, or do you use any artificial means for the purpose of ventilation ?—There is a certain change in the atmosphere when these crevices supply none of this sort of thing into the working ; there seems to be a current in a contrary direction, so that it either confines it or takes it away in the other direction.

14,384. The men in that case must wait for a change of weather before they can go back to their work again ?—Yes, unless they go back through the level in the same state.

14,385. How long have you ever kept the men idle for this reason ?—Very seldom for above a day or two.

14,386. Do you never in such a case apply any means to get rid of this bad air ?—Not when it is coming out of the rock in that way. We sometimes apply a more powerful ventilating apparatus. If a place supplies a great deal then we adopt means just according to the circumstances, that is, we set on more ventilating power.

14,387. Do you sometimes find that although there is plenty of air above and the atmosphere is clear, the carbonic acid gas puts the candle out ?—Yes. Sometimes when we have had an old sumpt when all is good at the random of the level, three feet below the level it is filled with that sort of vapour, and life would soon become extinct if you were to go down.

14,388. What means have you adopted besides removing the men from their work, to supply fresh air ?—We have used pressure blasts, and hand-airing machines ; we have both small water-wheels and pressure blasts, and hand-airing machines, and trap-doors.

14,389. Is the air taken in by iron pipes ?—Yes.

14,390. Do you prefer iron pipes to wooden ones ?—Yes ; they last longer.

14,391. Is there any other reason why you prefer them ?—No.

14,392. Do you think that the air is better conveyed in an iron pipe than in a wooden one ?—Not at all ; we have sometimes conveyed it in that way in wooden boxes.

14,393. Do you find any difference in the air by so conveying it ?—Not the least when the boxes are made as they ought to be, but if the men are rising a long way, boxes are a great deal easier to the men ; the iron pipe is a very heavy thing to take up.

14,394. That is when they are working at a rise ?—Yes ; and we frequently just adopt a wooden box for the sake of giving the men ease.

14,395. Do you apply the wooden box at the end of an iron pipe that is running along the level ?—Yes ; we fix it in.

14,396. Have you had any accidents from blasting ?—Very seldom.

14,397. When any accident does occur what do you think it arises from ?—It sometimes arises from this : In the great limestone there are several crevices, and in putting the powder into the holes, which are bored at the trials, some of the powder sometimes gets lodged in those crevices, and it may be that when the men are charging it, the iron on the driver, as we call it, sometimes catches the edge of the crevice and strikes fire.

14,398. That is at a point above where the copper is put on ?—Just so.

14,399. The driver is copper pointed ?—Yes, on the mouth of the driver.

14,400. What is the reason that the men do not like the patent fuze ?—Just because of the disagreeable smell.

14,401. Is more smoke caused by it ?—Yes, I think there is. I do not think there is any more from the powder, but there is from the fuze itself, and that is disagreeable.

14,402. Is there any other reason why they should not be used arising from the nature of the work ?—I do not know that there is. There is the habit of the men ; they have always been accustomed to their own mode of charging their holes.

14,403. Do they take the powder down into the mines with them in bags ?—They used to take it down in bags, but we do not allow them to do so now.

14,404. Do you let the works quarterly ?—Yes.

14,405. Are they called pairs or shifts of men ?—They are called partnerships.

14,406. How many are there in a partnership generally ?—Four is the most common number ; but we have them consisting of from two to eight.

14,407. What are the hours during which they work ?—Eight hours per day.

14,408. Are there shifts ?—Yes ; five eight-hour shifts for a week.

14,409. And is there another shift in the second eight hours ?—Yes. When there is a great partnership and they cannot get all on conveniently together, if the place is, for instance, a level, and if there is a quantity of work that it has been inconvenient to get away, then they just go on as it seems best.

14,410. Otherwise the others work eight hours in the course of the day ?—Just so.

14,411. Do they work at all at night ?—Not when they can all get on in the day.

14,412. What are the highest and the lowest wages that miners can earn in these mines ?—Taking it for a quarter it sometimes happens that some of these partnerships speculate, and for three months they may make nothing, just for a trial ; and in the next three months they perhaps may make 3*l.* a week.

14,413. During the first three months when they make nothing are they allowed anything ?—We make them advances if the viewing party considers that the place is worth a trial and that the men are justified in making such a speculation, and if it lasts 12 months they continue to them their advances.

14,414. What are the allowances that are made to them under such circumstances ?—2*l.* 4*s.* per month to each man.

14,415. Do the allowances take place regularly ?—Yes; when the young men go in we generally give them 35*s.* a month during the first quarter; and from the end of the first quarter till they are 21 years of age, or until they are 20, we generally give them 2*l.* a month, from the age of 20 to 21, and 2*l.* 4*s.* for two out of every three months, and 2*l.* the third month ; that is our general way ; of course there are exceptions ; some men are working with their friends.

14,416. What do the miners generally pay per pound for candles ?—We always deduct the price of candles annually, when we settle the annual accounts.

14,417. The charge for candles and powder is all settled annually ?—Yes.

14,418. I believe the miners do not lodge on the mine ?—Very few of them ; they are just the exception ; but they generally live in the neighbourhood of the mines.

14,419. Do the men go into the mines in waggons, or do they walk into them ?—We have small hand waggons, and each partnership has one of those ; they divide the distance into what they call stages, and each man takes a stage, and they carry their tools, powder, and candles and other things in that way.

14,420. (*Mr. St. Aubyn.*) What, in your opinion, are the principal causes of the unhealthiness of the miners ?—I think that part of it arises from the dust that comes from the rocks similar to what a stone mason is exposed to from the stone he is building with, or when hewing such rock ; very likely another part of it comes from the smoke that arises from the gunpowder, and in addition to that another cause will be the impure atmosphere, because it cannot be considered that a mine can be ventilated like the surface ; no mine is in that way, and then there is this carbonic acid gas that flows out of the rock as well, and all these added together make a considerable total.

14,421. Then the want of ventilation, speaking generally, is the principal cause of their unhealthiness ?—Just so.

14,422. Do you believe that the best means are now adopted for the purpose of ventilating your mines ?—They are with us ; we do everything that we possibly can.

14,423. Do you mean by that that you do everything that you possibly can, consistently with carrying on the mines, with reference to the expense ?—No ; I mean with proper regard to the men's health ; suppose, for example, that a mine is a losing bargain we would just do the same thing ; it is not a question of profit and loss when the men's health is concerned, we set the loss aside altogether.

14,424. Do you mean that you would work a mine at a loss in order to adopt such means as would preserve the men's health ?—No, not for any great length of time ; but suppose we are making a trial, and we see that there are little hopes of success, and, in order to keep down the expenditure, we were to punish the men, and not ventilate properly, we should consider that decidedly wrong. If a place could not be worked properly, with a due regard to the men's health, we should at once abandon it on humane principles.

14,425. Can the present system of ventilation, as employed in these mines, be improved ?—We do not think it can.

14,426. With regard to the safety fuze, you say that the men dislike it ?—They do.

14,427. Do you consider that it is more safe than the other plan ?—We do not think it is, except in a wet place ; we generally use it in sumpting in wet places, but that is the exception.

14,428. Do you leave it to the option of the miners to use the safety fuze, or not, as they like in wet places ?—Yes.

14,429. And yet you consider it more safe in wet places than the other place ?—It is more safe in this way, not on account of accidents, but there is a greater probability of a hole not missing fire, as we say, or not going off, should the least quantity of water get into the hole in the way that they are commonly charged, then of course that will damp the powder, and it will not go off.

14,430. You mean that the safety fuze is not so liable to damp ?—Just so.

14,431. You do not think that it is less dangerous ?—No, but it is not so liable to damp.

14,432. When the fuze misses fire, and the hole has to be worked out again, then there is danger, is there not ?—Yes ; there is.

14,433. Do you consider that the danger is more or less with the safety fuze than with the other ?—It is more ; because the hole would have to be bored out again.

14,434. Do you consider that the safety fuze is less dangerous to human life than the other, or more so ?—I do not suppose there is much difference in that way ; the only danger that I spoke about was stopping the work.

14,435. You mean that it is less effective ?—Just so.

14,436. Will you describe to the Commissioners how the blasting is done ?—I presume that the drilling of the hole is well understood when the gunpower is deposited in it ; we have then what we call a pricker, with a sharp point made of copper, and it has a round eye to put in the article with, and to bring it out after we have got it fixed ; then we put this pricker into the hole, and we have a driver that is in that shape (*describing it*), and we put that under the pricker in that way (*describing the same*), and put the stemming down on the top, and that makes it all hard round the pricker.

14,437. What material do you stem with ?—We stem with shale commonly ; when the hole is properly filled up with the stemming, we just draw out the pricker, and put what we call a squib into the place ; but coal miners for the most part put in a straw.

14,438. (*Chairman*). Who makes the squib ?—The men make it ; it is a roll of paper with powder inside.

14,439. (*Mr. Davey*). You stated just now that it sometimes happened that the men took a bargain and got nothing by it, is there no competition in that way ?—No, not in letting a bargain.

14,440. One man may not say, "I will do it for "less ?"—Never, the price is fixed. It sometimes happens that one partnership will not take it at that price ; they sometimes think it too little, and sometimes the men are not suitable, and sometimes one thing and sometimes another.

14,441. Then another partnership will take it ?—Yes, but there is no competition in the price, one

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man never takes it for less money than another man would take it for; the price applies equally alike to all the men, good and bad.

14,442. (*Mr. Holland.*) They chose their own takes?—Yes.

14,443. (*Mr. Davey*). What are the average wages in your mines?—A good man, taking it for 12 months, would make from 18*s.* to 20*s.* a week.

14,444. During a year?—Yes.

14,445. You stated a short time back that you had one level that was driven for two miles; is there any level driven from that that is any considerable distance from a communication with the surface?—Not in that mine.

14,446. Do you use any ladders?—Yes.

14,447. How are they made?—They are made just like what is called in this country common stay ladders, they are just cut out and tenoned in; they are merely pieces of wood put in, and they are tenoned in.

14,448. What is the greatest depth from which the men have to climb?—About 30 fathoms; that is in the whole district, including Garrigill and Nenthead.

14,449. That is the greatest depth at any one place?—Yes, 30 fathoms. It is far more from the surface right down to the lowest level.

14,450. Is there a continuous ladder for the 30 fathoms?—No, separate ladders about 12 feet long, with landings at the foot of each.

14,451. What is the inclination?—That altogether depends upon the hade of the vein; in this place it is, perhaps, one foot in six.

14,452. Have you any stages in the course of the 30 fathoms?—Yes; we have a drift or cross-cut about half way.

14,453. What size is the shaft?—At that point it is 8 feet long and 6 feet wide.

14,454. Is there any partition between the ladder and the working?—Yes.

14,455. What is the kind of space in which the ladders are placed?—We generally make them 3 feet 6 long.

14,456. Are they square?—They are 3 feet 6 long and 4 feet 6 in width.

14,457. I think you said that the ladders were placed according to the inclination of the lode?—Yes, that is it.

14,458. Have you any perpendicular shafts?—We have a few, but not a great many.

14,459. Do you observe any difference in those men who have to climb those ladders and the other men who have not?—Yes, of course it is very exhausting to climb ladders; but it is so little that the young men do not find a great deal of inconvenience from it, the old men, whose breathing has become bad, are put to the greatest inconvenience.

14,460. You do not place old men, I presume, in that position?—Not generally so.

14,461. Do you give them lighter work?—Just so.

14,462. Do you not think that if they had changing houses close to the pit, they would be a great benefit to the men who work in cold and wet places?—Yes; when the men are living at a great distance from the mines, but in Nenthead the men are close to their own homes, and they have their families, their wives or daughters, just as the case may be, being their housekeepers, and they have their clothes already warmed when they go home in order to change at once.

14,463. I understood that they did not change?—Not at the mine, but when they get home they change at once, and put on warm clothing. We have some waterproof clothes with which we supply the men when they go into wet places.

14,464. Are they able to work in waterproof clothes?—Yes, what we call waterproof clothes the greatest quantity of the water goes out, they are similar to what keelmen use on the rivers.

14,465. Would not the perspiration be very oppressive to the miners?—That is one thing that sets them against them very much; the men that wear them can never stand long shifts, for they are very exhausting.

14,466. Are these air cracks frequently found in your levels?—Yes, but it is chiefly in the great limestone, in the mountain limestone, not so much in the other strata.

14,467. How often do you inspect the workings?—I am going almost every day to the different parts.

14,468. It has been mentioned that a certain portion of the workings requires a great deal of timber?—Yes.

14,469. Is that a matter that is left to the men or to the agents to inspect it?—The agents inspect it. I have prepared a paper, showing the cost per fathom of timbering the mines, and the cost per fathom of arching the mines, which I will hand in.

The same was handed in as follows:—

The Lead Company's mines, Nenthead.

Cost, &c. per fathom of timbering the mines:—

	£	*s.*	*d.*
To 9 pieces of larch timber 6 feet long, each containing $1\frac{1}{4}$ cubic feet, at 1*s.* 6*d.* per foot	0	16	$10\frac{1}{2}$
To 12 pieces of larch timber 6 feet long, each containing 3 superficial feet, at $1\frac{1}{2}$*d.* per foot	0	4	6
To carriage of timber from wood yard to the mines, 47 feet, at $\frac{1}{2}$*d.* per foot	0	1	$11\frac{1}{2}$
To carriage of timber into the mines, 6 waggons, at 4*d.* per waggon	0	2	0
To fixing timber, 2 days, at 3*s.* per day	0	6	0
To filling and drawing work produced in fixing timber, 3 waggons, at 8*d.* per waggon	0	2	0
Total cost per fathom	1	13	4

Cost, &c. per fathom of arching the mines:—

	£	*s.*	*d.*
To winning and leading stones to the mines, 1 fathom, at 8*s.* per fathom	0	8	0
To taking stones into the mines, 6 waggons, at 4*d.* per waggon	0	2	0
To walling and arching levels, 1 fathom, at 11*s.* per fathom	0	11	0
To filling and drawing work produced in fixing arch, 3 waggons, at 8*d.* per waggons	0	2	0
Total cost per fathom	1	3	0

THOMAS WATSON (Tees)

4th October 1862.

14,470. Are there any levels which are extended very far from the level you have spoken of, or extended to a great distance?—No, not what we call a great distance. We had one, and that was about some 60 fathoms from the air communication; but, of course, we had water there and ventilation. A fortnight ago we brought it nearer to it still, so that we are working in comparatively good air in that way. We have not a place in all the district where it is a long way from good air.

14,471. Before you made this communication had you good air or air in which the men could work comfortably?—They could work comfortably on the whole; but at the same time we considered it injurious for any length of time; the men had been working there and in that neighbourhood for the last two years and a half.

14,472. Now the defect is remedied?—Yes.

14,473. (*Mr. Holland.*) How near to the mine are

the dwellings of the miners ?—Three hundred yards or so, some of them.

14,474. So that they can get under shelter in a few minutes ?—Yes.

14,475. Do they come out of the mines very hot ? That altogether depends upon the nature of the work.

14,476. But are they very hot, generally speaking, when they come up ?—No.

14,477. Are they generally pretty cool ?—Yes.

14,478. They are not very wet with perspiration ? —No, and we have not much water.

14,479. Are their clothes wet with perspiration ? —Not to a very great extent, they generally take care of that.

14,480. What effect has the carbonic acid gas upon them, except to make them breathe badly ?—It makes them exceedingly bad in the head when they come out.

14,481. Like a very bad headache ?—It is a severe pain just as if you were nipped up in your head, and in addition to that you begin to feel as if you were almost intoxicated. Your head grows heavy, and you are like to fall when you come into good air. You feel as if you were intoxicated, but in a few minutes you come round again.

14,482. Do they feel cold ?—No.

14,483. Are they hot ?—Just about as usual ; there is never much difference that is perceptible.

14,484. Do they very soon recover themselves ?— Yes.

14,485. Are your lodes all in limestone ?—Yes, it is the chief stratum. We have that, but they are not, of course, all productive in that.

14,486. Are there lodes in the shale as well as in the limestone ?—Yes.

14,487. Does a lode cut several strata ?—Yes.

14,488. Do the crevices yield more carbonic acid gas when they are first cut then afterwards ?—For the most part they are original openings, and when it does come the current sweeps it away.

14,489. Have you noticed that the crevices yield less carbonic acid gas after they have been cut some time than they did when they were first cut ?—I cannot say that I have observed that.

14,490. Is it not likely that there may be an accumulation of carbonic acid gas in a crevice ?—I have not particularly observed that.

14,491. You have stated that the men worked eight hours a day ; is the mine idle during the other 16 hours of the 24 ?—Yes, and then all the smoke gets swept away, and the atmosphere is more pure for the next.

14,492. You seem to attribute a large portion of the disease to which the miners are subject to the dust they breathe ?—It is partly that.

14,493. Is that in your opinion the chief cause ?— Yes, it undoubtedly is, for there have been instances of individuals who had worked for a considerable length of time in this shale, and have then gone to some watering places, and have sometimes vomited what has been a collection of that dust.

14,494. Or coughed it up?—No, vomited; coughing is a common thing, but I mean vomiting ; it has gone down, and having been made sick ; there have been instances, of course they are rare, but I have known two or three where men have vomited up what was just like a collection of dust.

14,495. Would not a certain amount of ventilation carry away that dust ?—It can no more carry away the dust than you could carry away the dust from a stonemason who is hewing the stone.

14,496. Could not the dust be kept down by water, and keeping the holes wet ?—I do not know, but perhaps it might ; there is a great difficulty in it, and in addition to that it would make the place damp, and the men might be more subject to take cold.

14,497. Would it be very expensive to get water for such a purpose ?—It altogether depends upon circumstances.

14,498. Is there not water generally within easy reach in most mines ?—Yes, but it would be difficult perhaps to get it so as to work it ; you must have a machine of some kind to carry it there.

14,499. Has it never been done ?—No ; it has never been done in the country, at least, I never knew of it.

14,500. Should you not feel more sanguine of keeping the dust down by water than by any reasonable amount of ventilation ?—No ; I think not.

14,501. Do you think that ventilation is the best ? —I do.

14,502. I thought you stated that ventilation had been carried now as far as it well could be ?—Yes, to meet all ordinary cases.

14,503. And yet the men are subject to very great annoyance from the dust ?—Yes, and they always will be; where there is a drilling of holes, and striking against the stone with a hard substance as in a quarry, there must be dust as the natural consequence.

14,504. Do you see no remedy for that ?—No, I do not see my way very clear for it, at least, to make it practicable.

14,505. Suppose that a respirator could be invented to keep the dust away out of men's mouths, do you think they could be induced to wear it ?—I cannot say.

14,506. Do you think there would be much difficulty about it ?—I cannot say ; we have sometimes thought that if the men would let their beards grow, it might be some advantage to them.

14,507. Do the great majority of the miners who reach the age of 40 suffer from lung complaints ?— Yes, the greatest majority.

14,508. Is it at the age of 40 when they begin to be affected ?—They begin to feel the effects of mining generally at about that age.

14,509. Have the Commissioners been correctly informed when they have been told that a miner of 50 looks as old as an agricultural labourer of 60 ?—I cannot say, this is not an agricultural district, it is generally all in mines, and for one agricultural labourer I know 100 miners.

14,510. (*Mr. St. Aubyn.*) You have stated that in your opinion the ventilation of the mines is so good that it cannot be improved upon ?—Yes.

14,511. You have also stated that one of the principal causes of disease amongst the miners is the dust, and I would ask you whether the possibility of inventing a mechanical contrivance to get rid of the dust by means of water has ever been considered? —I do not know that it has ever been fairly considered, at least it has never been brought into use, the thing may just have been the subject of conversation and thought, but it has never become the subject of general discussion.

14,512. (*Mr. Kendall.*) How long have you been the agent of these mines ?—15 years.

14,513. Before that were you a practical miner ?— Yes ; I was about nine months in training before I came here.

14,514. In the course of those 15 years, have you been principal agent here ?—No.

14,515. Are you now principal agent ?—Yes.

14,516. For how long a period have you been principal agent ?—About a year and a half.

14,517. Have the mines been profitable during the last five years ?—No.

14,518. Have they been profitable in the last 10 years ?—I should think so, stretching over that period.

14,519. Do you mean to say that it is probable, when the mines are not paying the cost, that the same amount of care and attention would be paid to the ventilation as if the mines were being worked at a profit ?—Yes, I mean to say so in our own ; if the thing cannot be fairly done the company will not do it at all.

14,520. The company are so liberal that rather than a man should run the slightest risk they will lose money ?—Yes.

14,521. (*Chairman.*) You have no bunnings in your mine ?—Not stopping bunnings.

The witness withdrew.

Mr. Thomas Wilson Crawhall examined.

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14,522. (*Chairman.*) Of what mine have you charge ?—Rodderup Fell. It belongs to the Rodderup Fell Company.

14,523. Have you charge of any other mine ?—Hudgill Burn

14,524. How many men have you working underground ?—We have at Rodderup Fell about 110, and at the other mine about 27.

14,525. How do you enter the mine ?—By levels entirely.

14,526. Not by shaft ?—No.

14,527. From these levels are you now sinking or working rises principally ?—The principal mode of working is by rises. We are now at Rodderup Fell sinking below the level, but only within this last two years, as we cannot get a lower level. We are therefore obliged to sink ; we have only got down a few fathoms. We have not completed any explorations there yet ; we have not more than 10 fathoms.

14,528. Is there water there ? — A considerable quantity.

14,529. How deep shall you go before you drive ? —We shall drive off in the course of another fathom or so ; it will depend upon the sill. We shall very likely drive off for a short exploration in another fathom.

14,530. Would the mine be drowned with water there ?— We have a good deal of water but we have two hydraulic engines, one of which we find at present quite sufficient to keep out the water.

14,531. Is that worked from the surface ?—No ; the engines are underground.

14,532. In sinking or rising have you ever found the air bad ?—Occasionally, while we are rising.

14,533. What means do you adopt in that case ?— We make a communication through to the level above, which gives us a good circulation.

14,534. Is there any means of obtaining air till that communication is made ?—We just take extra precautions to close up the back rises so as to bring air forward until we get a new communication made.

14,535. Is that by closing up with wooden doors ? —Yes ; we generally close up all round and put trap-doors either into the drifts or in the rises, so as to close all communication excepting along one air drift, which we always have. About four fathoms above the level we have an air drift which we drive up, so as always to keep up with the level.

14,536. What is the size of the air drift ?—About five feet high and three feet wide.

14,537. And that is driven above the level ?—Yes.

14,538. (*Mr. Holland.*) Are your two drifts parallel to each other, one above the other ?—Yes ; the air drift is about four fathoms above, and we have frequent rises between the two.

14,539. (*Chairman.*) How frequently do you communicate ?—Generally about every 15 or 20 fathoms. We may occasionally have it as far as 40 fathoms, but only at a chance time, owing to the mode of working. We sometimes may have been able to do without an air drift by cutting a vein above and closing it up, which will form an air drift of itself ; also commencing from the level where we have good air we form the rises as we go on, and that saves the necessity of putting up rises.

14,540. How do you judge whether there is bad air ? —Simply from the difficulty of the candle burning and the greater heat; but that rarely occurs. And then we put a rise up to the level above, it is 30 fathoms above. We have what we call the middle level, 30 fathoms above our present workings, and we immediately make a communication with it.

14,541. But till that communication is made, and when you find that the candle will not burn, what means do you adopt ?—We have never had a place in that level yet that I have known where the candle would not burn.

14,542. But you have to put it on one side ?—Yes, occasionally.

14,543. What means do you adopt for supplying air ; is it either by fewer men working or by stopping the working, or by artificial means ?—Principally by putting on trap-doors when necessary, so as to force the air round the workings.

14,544. Do you find that sufficient ?—Yes, generally sufficient.

14,545. How long will the powder smoke be in getting away in a case where the candle will only burn on the side ?—I cannot tell exactly.

14,546. Is it a long time in getting away ?—Occasionally. It will depend entirely upon the amount of air, and that varies considerably with the weather ; the weather often has an effect.

14,547. How do the smoke and foul air escape ; is there an up-cast shaft where they go out ?—Yes ; we have one communication from the surface by means of these other levels.

14,548. Does the shaft which communicates with the other levels and to the lower level always act as an up-cast shaft ?—Yes ; the middle level is the principal airing source.

14,548*a*. Is it for taking the air out or for bringing air in ?— It will act both ways, according to the state of the weather ; sometimes what is a down-cast one day may be an up-cast another day, but more commonly the middle level is the upcast.

14,549. And the bad air, and powder smoke pass out through the middle level ?—Yes, they may come out of the level mouth; there are several modes by which they might escape, but that is the principal.

14,550. Are the men ever obliged to leave the work for a time on account of the air being close ?—We have no such places at present, we have had isolated places where we have been sinking or rising (generally rising) where they have had difficulty in working and where they have had to leave, especially in the month of August, we generally find that about our worst time in the year, but those are almost invariably places which we are rising to get fresh air to the workings, and of course it is worst just at the top of the rise.

14,551. Until that is completed the air is bad ?— Yes, there is rather a deficiency of air, a want of circulation.

14,552. Is there any carbonic acid from fissures in the rock ?—I do not think that there is any worth mentioning in either of these mines, there may be a little occasionally.

14,553. Have you ever seen any place where it was so bad that the candle would go out ?—There is one place and one place only, but that is a level where there were never more than four men working, and there we some years ago made a communication with the level above which caused it to be as good for air as anywhere else.

14,554. Did those men suffer while they were working there ?—If they suffered at all they came out at once.

14,555. Did they complain at all ?—No, I never heard them make any particular complaint.

14,556. Have you ever yourself felt the effect of that air ?—I have been in it occasionally when it was so bad that I could not get into the forehead, but that was just at change times, it was a place which depended very much and more than usually upon the state of the weather ; and I have known the men on some days work with great ease and comfort and on other days they would go in and have to come out immediately ; we were in the course of putting up a rise and having communication. What made it worse was that we had water in this part and had great difficulty in getting it holed, but there were never more than four and often only two men, it being a place of no great importance, if there was any difficulty we let it stand ; it is a considerable distance from the main workings of the mine, it is not near them at all.

14,557. Are the bargains let quarterly or yearly ?— Quarterly.

14,558. How are the men paid?—We advance them 2*l.* a month and they are paid off annually.

14,559. How much do the men earn; what are the highest wages?—Perhaps some partnerships may make 70*l.* or 80*l.* each man in the year, that is amongst the highest; we generally have some who make about that.

14,560. And what would be the lowest?—Some of them might be as low perhaps as about 20*l.*, but that is rare, because those are the extremes; our men will commonly make about 40*l.* to 50*l.* a year clear.

14,561. From 18*s.* to 1*l.* a week?—Yes.

14,562. Have the men any climbing from one level to another; how do they go from one level to another?—They do not require it unless for their own objects; there are frequent communications between these two levels, but we have no one working in the middle level; if they like it they can go in by the middle level and descend by ladders, it is by ladders entirely.

14,563. What is the greatest depth from one level to another?—30 fathoms, but nearly all of them go in at the low level, and then they have simply to climb up to their place of working, which may be close to the level, or they may have to climb up nearly the 30 fathoms if we have got out nearly to that point.

14,564. Are the men allowed a certain amount of candles?—They get whatever they require, they pay for the candles.

14,565. What do they pay a pound for the candles?—We generally put a fixed price of about 8*s.* a dozen, and we keep a stock at the mine, and they come every Monday and get whatever candles they may require.

14,566. May they bring their own candles if they like?—Yes, they may get them anywhere they like.

14,567. (*Mr. Holland.*) Is that about the retail price in the district?—Perhaps a trifle more, we generally put such a price as not to have to vary, the men prefer that and then they know exactly what they are paying; if they like to get them elsewhere there is nothing whatever to prevent them. In reckoning for the men we deduct the candles or the gunpowder which they have.

14,568. (*Chairman.*) For tools how do you manage; do you supply tools, or do they supply them?—We partially do so; we sharpen the tools, and they get some portions of tools from us and partly they get them elsewhere.

14,569. Are they charged for sharpening the tools?—No.

14,570. Is there a doctor attached to the mine?—No.

14,571. Is there a club?—There is no special club attached to the mine; most of the men are in some of the benefit clubs in the neighbourhood.

14,572. There are no deductions for club money?—None whatever; there are no deductions excepting for school; they pay 6*s.* a year each workman.

14,573. Whether married or unmarried?—Whether married or unmarried, and the children go for a penny a week; all our children are charged for.

14,574. Do they avail themselves of the schools?—Yes, generally; many of our men are living at considerable distances; some live at Alston, and some up at Garrigill, which is in the opposite direction, but we have a rule that if they live more than a certain distance from the mine they must lodge either at the mine or in the neighbourhood.

14,575. Have you lodging-houses at the mine?—We have some lodging-houses, and there are also several houses belonging to the company which have been built larger than they would have been; they are better houses, in order to facilitate the taking in of lodgers; a good many get in in that way.

14,576. Do you charge them so much?—The lodging is free, and we find coals.

14,577. Do they find their own bedding?—Yes; if required we put up a few bedsteads.

14,578. How many should you suppose that you have generally lodging in your own houses?—I can scarcely state the number; it varies considerably.

14,579. How many do you allow in one room?—Just as many as they can get the beds put in for; they generally have two in a bed.

14,580. Do they stay there for the whole week?—They generally come on the Monday morning and leave on Friday night; sometimes rather early; they will sometimes perhaps go home say on Wednesday night, coming back on Thursday morning, and then finally leave on the Friday night.

14,581. Do the men who do not lodge there change their clothes when they come out of the mine?—No, they generally go direct home as they are.

14,582. Do they get wet at all?—No, there are very few wet places.

14,583. (*Mr. Holland.*) Are they wet with perspiration?—I wish they were a little more so. I do not think that they suffer very much in that way.

14,584. (*Chairman.*) Are there men who suffer from shortness of breathing?—Yes; the men have complained of it; they suffer very much in course of time from that.

14,585. At what age does it show itself generally?—I think that a great many get to be old men at 40 or 50.

14,586. To what do you attribute that?—I think that in course of time it is the quantity of small dirt and mineral which they inhale into the lungs, small particles of spar, and no doubt the powder smoke, and, perhaps a little deficiency of air occasionally help it materially; but I believe that it is more the fine particles of spar which they get into their lungs than anything else.

14,587. (*Mr. Davey.*) Where do you take up your air from which you are going to communicate from one level to another? Do you take it up from the shaft or from the last winze which you have communicated? You use a blast, I presume?—No, only in cases of great difficulty.

14,588. I am taking the case which you mentioned just now, where there were 40 fathoms distance from one winze to another. In that case we would put in a fan blast; we always have a few fan blasts on hand.

14,589. Where do you place that fan blast; is it from the last winze?—From the last place where we have good air, wherever it may be.

14,590. When that is communicated would you have sufficient air there?—Yes, sufficient to blow a candle out.

14,591. Although it is 40 fathoms distance?—Yes, quite sufficient.

14,592. What size is your lode generally?—It varies; it is very often about 14 or 15 feet wide; sometimes not more than six or eight.

14,593. And what is about the produce?—It varies so greatly that I can scarcely state.

14,594. Are you obliged to take away the whole of the lode?—Where it is good we do.

14,595. But are there many poor parts which remain in arches?—Yes, we have merely drifted through them.

14,596. Do you ever use stone arches?—We generally put stone arches into the levels.

14,597. Do you find them more economical?—I consider them in the long run much more economical than wood, though in the first instance they cost a little more.

14,598. Was there any particular reason why you should go 40 fathoms before having any communication?—None, but that we had no deficiency of air; we would not do it unless it was good enough for air.

14,599. You had a sufficient blast to work for that distance?—Yes; if there are no other men working in there, there is no difficulty whatever in four men going 40 fathoms.

14,600. In two shifts?—Yes, two men at a time.

14,601. (*Mr. Kendall.*) Are your miners as a whole a sober set of men?—Generally speaking, they are a sober class of men.

ALSTON.

Mr. T. W. Crawhall.

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14,602. You do not think that any of their ill health arises from intemperance ?—Occasionally there are some who are intemperate. but generally, until they get broken winded, as they call it, I think they are rather a healthy set of men.

14,603. Do you think that the quantity of dust which they inhale creates thirst ?—I do not think that they are great drinkers. I have noticed a great difference between the miners and the pitmen in that respect. While the pitmen are enormous eaters, and drink a great quantity, the lead miners are generally small eaters, and do not, I think, drink nearly so much as the pitmen.

14,604. What are the average wages among your men ?—They make about 18*s*. or 20*s*. a week.

14,605. Are there a large number of proprietors in the mine of the Rodderup Fell company ?—Not a very great number ; a large portion of it is in two or three hands. My father and uncle are the largest owners in both these mines.

14,606. What royalties do you pay ?—At present we are paying one tenth.

14,607. Did you ever pay a higher royalty ?—Until quite recently we paid a seventh.

14,608. Are you making profits now ?—At Rodderup Fell we are making profits, and have been for very many years, but at Hudgill Burn we are losing money.

14,609. What is your return at Rodderup Fell per month ?—We do not make up any monthly produce at all, we have annual produce, that is perhaps, about 3,000 bings, a bing is 8 cwt.

14,610. What are the first symptoms of the miners being what you call broken-winded ?—There is a difficulty in breathing.

14,611. What do they complain of, any weakness ?—No, it is more a difficulty in breathing, and perhaps they first find it when they are climbing.

14,612. Is it a sort of asthma ?—It is a sort of asthma.

14,613. If they change localities do they recover ?—I do not think that if they once get bad they will ever entirely throw it off, they may be fit for several employments, but they will never be entirely well.

14,614. If you removed them to the surface, do you think that that would check its progress ?—We often do so ; if a man comes and makes a well-founded complaint of feeling rather broken-winded, if we have any vacancy at the surface, we give him perhaps, a quarter or half a year or a year, as the case may be, at surface work.

14,615. And do you send him down again ?—If he is fit for it.

14,616. (*Mr. Holland.*) Do they become fit for it afterwards ?—If they are not very bad. I have no doubt that if men are at the proper time of life they will last another dozen years in the mines by that means.

14,617. (*Mr. Kendall.*) Still they are more susceptible than other miners ?—Means should be taken to stave it off almost before they begin to feel it themselves.

14,618. (*Mr. Holland.*) I suppose it comes on very gradually ?—Yes.

14,619. (*Mr. Kendall.*) Do the medical men ever report to you when a man is becoming so, and advise a change ?—No.

14,620. (*Mr. Holland.*) What is your explanation of the miners eating less than the colliers ?—I do not know, unless it is something in the nature of the coal pits which makes them such enormous eaters.

14,621. I suppose the colliers work harder ?—While they are at it the colliers work much harder.

14,622. But I suppose the miners work as hard as they can ?—Yes ; it is of a different nature. In the pits it is principally pick-work.

14,623. Is pick-work harder than beating borers ?—It requires quicker work in the time. I do not think it is harder work, but it is quicker work, and it will make the pitmen perspire very much more than the miners.

14,624. They drink more ?—Partly they do drink more, and the pits are very much hotter than the mines. Many of our mines are cool, and on an average in fact they are cool.

14,625. Do you think that the air in the mine is so close as to injure the appetite ?—No, I do not think so ; even those men who are very little in the mines are also small eaters in proportion to pitmen.

14,626. What difference of level is there between the adit and the workings ?—30 fathoms.

14,627. What is the difference of temperature ?—I never took the temperature, and therefore cannot say.

14,628. Does the lower level feel like summer heat ?—No, it is quite cool and pleasant to go into in summer.

14,629. In August is it bad ?—We have generally noticed that in any bad places August is about the worst time of the year.

14,630. Is that because August is warmest outside ?—I suppose so. There are greater fluctuations probably from that circumstance, that the current of air will become stagnant and perhaps reversed.

14,631. Do nearly all the miners become broken winded when they get to 40 ?—It is perhaps hard to say that, but a good many do.

14,632. A very large proportion ?—A considerable proportion, say at 50, at any rate. I would not say 40, but by 50 they do.

14,633. You consider a miner when he gets to be from 50 to 55 an old man ?—Yes, if he has been all his life in the mines.

14,634. Is that a general observation ?—Yes.

14,635. (*Chairman.*) What length of level have you driven at Hudgill Burn ?—I suppose that we may have about 600 fathoms at our principal level, but we have an immense number of old levels.

14,636. It is in connection with the old levels ?—Yes ; all crossing each other in every direction.

14,637. How many men have you working there ?—At present we have about 27 men under ground.

14,638. Is the air there all good ; have you no difficulty there with the air ?—None whatever; we have so many old levels, that through the old workings there is always a circulation of air.

14,639. Do the men ascend from one level to the other by ladders ?—We have none at Hudgill Burn. At Rodderup Fell they generally ascend by ladders, or in temporary cases what are called stemples; we put in strong pieces of wood about as thick as your arm, one on each side, one here and at a foot or two another on the opposite side, and so on. In the small rises, I think that stemples are much better than ladders, they are easier; they are better, I think, in the very small places.

14,640. What is the greatest height by means of stemples that you would let the men climb ?—We have not generally places very high, it may be 20 fathoms.

14,641. In going the 20 fathoms, is there no soller across ; is it one continuous rise ?—There is generally some break in it.

14,642. Is not a man more likely to fall ?—He cannot fall ; they are too small.

14,643. Do the men take their tools in waggons into the mine, or do they carry them in ?—They partly carry them in, and they partly go in by waggons.

14,644. They have to carry them in sometimes ?—Occasionally.

14,645. That is a long distance ?—Yes, it is a considerable distance.

14,646. What is the longest distance at either of the mines ?—At Rodderup Fell, if they carried them into the west end it would be nearly a mile.

14,647. Are there any wet shafts at Rodderup Fell?—Down below level we have a great quantity of water, and there it is wet.

14,648. Is that pumped ?—We have an hydraulic engine to pump the water.

14,649. Do the men get very wet working there ?—Yes, and they work shorter hours down there at present.

14,650. Do they change when they come up ?—They do.

14,651. Where do they change ?—In the shops close to the level mouth.

14,652. So that though the men live at a distance they can change in the shops ?—Yes.

14,653. Do you give them waterproof clothes ?—For the sinking we have got a few suits.

14,654. Do the men like to wear them ?—Yes, if they make an application for anything of that sort, I always get it for them.

14,655. Is it not hot for them to wear them ?—We leave it entirely to their own discretion ; if they like to wear them I never hesitate to get them.

14,656. (*Mr. Holland.*) Have you noticed whether the miners frequently catch cold ?—I do not think they do particularly ; they are perhaps rather liable to consumption in this neighbourhood.

14,657. As well as the miners' complaint ?—Yes.

14,658. Is it the younger miners who are liable to consumption ?—Yes; I think that five or six may have died during the last dozen years belonging to Rodderup Fell, who have gone off in consumption at about 24 or 25.

14,659. Out of what number ?—About the number which we generally have. I do not think that more than about six men have died from common consumption in perhaps the last 10 years.

14,660. Out of how many men ?—Say an average of 100, and we have always a large proportion of young men in our mines. They are principally young men. I think that we have generally more young men in our mines in proportion than they have in most of the others. We do not take any men underground under 20.

The witness withdrew.

Mr. Jonathan Walton examined.

14,661. (*Chairman.*) You are the manager of Dowgang mine ?—Yes.

14,662. Have you the charge of any other mine ?—There is another mine, but it is only just a temporary sort of thing. Nattras mine.

14,663. How many men have you working underground altogether ?—Somewhere about 18 to 20 on an average.

14,664. How far is the level driven in ?—About three-fourths of a mile.

14,665. Are you sinking from that level or are you rising principally ?—It is upon a level and above the level.

14,666. In those workings have you ever found any air when the candle was obliged to be put on the side to burn ?—Not often. There are different times in the season when it is the case. Autumn is generally a bad time, but when the air is in a proper condition we generally find the candles good.

14,667. But in autumn that is occasionally the case ?—Yes.

14,668. What do you then do ?—We examine our air courses, and sometimes they are not in a good condition and we improve them. We open them out and then the thing goes right again.

14,669. If the air courses are in good condition you have no fault ?—No fault.

14,670. How do these get filled in ?—The stuff falls down sometimes and stops the course.

14,671. Have you an air course driven above your level ?—Yes.

14,672. How far above your level ?—Some two or three fathoms above.

14,673. At the end does it communicate with a shaft ?—Yes ; it communicates with a shaft about 150 or 160 fathoms from the level forehead.

14,674. Does that shaft act as an up-cast or a down-cast ?—It changes ; sometimes in fine weather it is a downcast.

14,675. Sometimes the air shaft is an out-cast ?—Yes.

14,676. And sometimes it is the reverse ?—Yes.

14,677. Have you ever used any artificial means for ventilation ?—Never.

14,678-9. When you find that the air shaft has got stopped up, have the men complained to you about it or do you ascertain it ?—We ascertain it immediately in the working ; by the candles not burning bright.

14,680. Is that the only way in which you judge ?—We see that the smoke does not go from them ; it hangs round them.

14,681. How long does it hang ?—When the air course is right only a few minutes.

14,682. But when the air course has been stopped up how is it ?—Then it does not get away for some time.

14,683. (*Mr. Holland.*) How long ?—It is possibly half an hour or so before it gets away.

14,684. (*Chairman.*) How long are the bargains ?—Generally quarterly ; sometimes half-yearly.

14,685. Have you four men in a party ?—Sometimes four and sometimes six. We have six just now in our level fore-head, generally four.

14,686. Are those six men working in shifts ?—No ; we consider five eight-hour shifts to come in a week.

14,687. Do they work any night shifts ?—Not often. It is a wide working ; 16 or 18 feet working.

14,688. Then the whole of the men very often work together ?—Yes, generally altogether.

The witness withdrew.

Dr. Charles Arnison examined.

14,689. (*Chairman.*) Where do you reside ?—In Alston.

14,690. Have you charge of any mine especially ?—I have not.

14,691. You are the medical man of this district ?—Yes : one of the medical men of the district.

14,692. How long have you been a medical man ?—I have been practising in Alston for the last 20 years.

14,693. In your experience are there many now working in mines who are affected with what is termed the miners' disease ?—There are a great many in this district.

14,694. At what age should you say that it first shows itself ?—It varies considerably ; but I think for the most part at about 30 it manifests itself ; but persons of robust constitutions resist it longer.

14,695. Have you any cases now under treatment ?—I have none but some chronic cases. Being a general practitioner, there is a medical man appointed for the miners in this district, and of course he has the greater part of the practice ; he resides at Nenthead.

14,696. But still you have many cases ?—Yes ; I have several cases.

14,697. Do you ever have a post mortem examination ?—No ; we have no post mortem examinations in this district ; there is a great objection to that sort of thing here. I am very sorry that it should be so, as I think that that might throw considerably more light upon the subject.

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14,698. By what do you think that this miners' disease is occasioned?—The impure atmosphere of the mine, bad air, powder reek, aggravated by particles of dust constantly floating. Cold predisposes to an attack.

14,699. (*Mr. Holland.*) Do you mean catarrh?—Yes. Then there is often a sort of irritation of the mucous membrane of the bronchial tubes; the dust irritates the air cells, and of course one attack after another keeps up a constant irritation, and it ultimately settles on the bronchial tubes.

14,700. (*Chairman.*) Do you think that bad air predisposes them to it in any way?—I think that it has an effect most decidedly.

14,701. Have you ever observed the expectoration of the men?—Frequently.

14,702. Is it much impregnated with dust?—It is.

14,703. Have you ever advised the men who have come to you not to go back to the mine?—Frequently. In some of the mines they are in the habit of taking them for out-door work, and after they are in a certain stage I recommend them to be employed as out-door labourers, which has a beneficial effect upon them.

14,704. Have you ever known a man when once affected recover completely?—Never.

14,705. Then should you say that they die earlier than other labourers in consequence of this disease?—They die considerably earlier. If you were to take 60 or 70 of the miners in the district, I should think that 17 of them would die before they were 50 years of age; of course I cannot speak with any degree of accuracy to that.

14,706. (*Mr. Holland.*) Is it rare for them to survive 60?—Yes; it is not common for them to survive 60.

14,707. And they are old men at 50 I suppose?—They are.

14,708. Do you consider this disease completely distinct from phthisis?—It is different from phthisis I think in many cases, inasmuch as there is generally considerably more difficulty in breathing, although the pain is very trifling; there is merely a stitch in the side, and a common blister or mustard plaster removes it. I often find a gentle emetic and mild expectorants beneficial to them in the early stages; they do not bear active treatment at all.

14,709. Is the expectoration very adhesive?—It is.

14,710. Like that of asthma?—Of much the same character, I think.

14,711. Is it ever purulent?—Occasionally, in the latter stages.

14,712. In the earlier stages also?—Not generally.

14,713. Is hœmoptysis common?—You meet with it occasionally, but it is not very common.

14,714. Is it uncommon?—I cannot say that I have met with it often.

14,715. What do you mean by hœmoptysis; merely a streaking of blood?—Yes.

14,716. Is there any liquid blood with it?—I cannot say that that is common.

14,717. Can you say that the spitting of liquid blood is uncommon?—I cannot say that it is common.

14,718. Do you ever find cavities?—Yes.

14,719. Where?—In various parts, but I think under the right clavicle.

14,720. Is that common in men of 40 and upwards?—I think it is.

14,721. You have cases of consumption, of course?—Yes.

14,722. Is there much noise of respiration of the bronchial tube?—Yes.

14,723. As if it were contracted?—Yes.

14,724. Is that common?—It is common to have a wheezing or something of that kind.

14,725. Is it universal in miners' complaint?—Seldom if ever without a wheezing.

14,726. The disease is very slow in its progress, is it not?—Very slow, but there is a difference in cases. In some cases they run their course rapidly, in others they linger on for two or three years.

14,727. Is it not a common thing that they linger on for years?—It is.

14,728. If a man changes his employment and works above ground, may he continue ailing a long time without getting worse?—They do.

14,729. A very long time?—Yes.

14,730. That very rarely happens in common consumption?—No, it does not happen in common consumption, but in miners' cases it does; there is not nearly so much warning in common consumption.

14,731. Do you think that they suffer much from the powder smoke?—I think that that renders the air still more impure.

14,732. That has not come much under your observation, perhaps?—No, I have not been much in mines. There is one thing I think with regard to the miners here, that a little more attention to ablution would be very much in their favour.

14,733. (*Chairman.*) Is there any provision for washing for the men coming up from the mine?—I am not aware of any, but I would suggest that something of the kind should be adopted, which would be very beneficial to them.

14,734. (*Mr. Holland.*) Do you mean to recommend washing the whole body, bathing in fact?—I do most strongly. It would be a most important protection.

The witness withdrew.

Dr. RAILTON GILL examined.

Dr. R. Gill.

14,735. (*Chairman.*) Are you a doctor of medicine?—Yes, and likewise a surgeon.

14,736. Residing at Alston?—In the neighbourhood close by.

14,737. Have you the special charge of any mines as medical man?—No.

14,738. Do the miners consult you?—Frequently.

14,739. Have you observed any disease peculiar to miners?—Yes, I have observed a form of bronchitis, with a pigment or secretion from the lungs, and that pigment which they secrete from their lungs seems to increase with the time that they have been working in the mines.

14,740. Do you observe that in young men; at what age have you first observed it?—I have observed it after they have been from 20 to 30 years in the mines, sometimes they may expectorate earlier, but the disease to which they are subject appears not to be fairly established until they have been from 20 to 30 years in the mine.

14,741. At what age, at 40?—40 frequently, and sometimes before that.

14,742. At what time do they go to work in the mines here?—Some as early as 15 or 16 years of age, before they are half grown.

14,743. Do you think that those who go earlier to work are more liable to that disease than others?—Decidedly so; they have not the power of resisting it as much as men would do whose constitutions are more formed. Some men have the power of resisting disease far more than others.

14,744. What is the first symptom with which it developes itself in your observation?—Weakness of the frame, debility, attended with more or less of dyspnœa, difficulty of breathing, cough with expectoration, in fact a form of bronchitis.

14,745. By what do you think that that is occasioned?—I think it is occasioned by the deposition of carbonaceous matter in the lungs.

14,746. Is there any from dust?—Yes, black dust,

dust mixed with carbonaceous matter, the consumption of gunpowder. They blast all their rocks here, and form a great deal of dust, besides what is the residue of the burnt gunpowder, and candles as well. Lamp black, very likely, is another of the articles mixed with the dust.

14,747. Is there anything in the air to affect them?—There is an atmosphere deficient undoubtedly, in oxygen, and loaded very probably with carbonaceous matter or carbonic oxide.

14,748. Have you ever seen a case where a man has been affected completely cured?—Yes, I saw an old man to-day in the workhouse who was willing to come down here and show himself as a perfect case of cure; he wrought for 30 years in the mines, and he is now living, being above 80. I asked him how it happened that he had lived so long; he said that he had not done anything for the last 20 years, but he said "I got rid of it all about 20 or 30 years ago." I said "You got rid of what?" "I got rid of a great deal of that black spit." In fact, instead of its combining with the tissue of the lung, he got it expectorated, and then he got rid of the true source of the disease.

14,749. Had he gone back to the mine to work?—No, he is now in the workhouse, and has been for 20 or 30 years.

14,750. Since he has been in the workhouse he has got rid of that expectoration?—He has got perfectly clear of it. He has had a slight attack of cold or bronchitis lately; he has been under my care, but there is no expectoration of the black pigment, and I was rather surprised, he being an old miner.

14,751. Would that expectoration appear for some time after a man has left the mine?—It sometimes does not make its appearance for 20 years after they have been working in the mines, and then when their vital power becomes deficient they begin to get the bronchitis, and the exudation of this black pigment from a diseased mucous membrane.

14,752. So that after they have left working in the mine for 20 years they still spit up this black pigment?—Yes, if they lived 100 years they might spit it; it is what is united with the tissue of the lungs.

14,753. Supposing this disease shows itself after 20 years, how long will that black spit continue after that?—It may continue during the whole life.

14,754. Have you any case which you could show where a man is spitting that black stuff?—There is one man who I believe is not able to come here. He is spitting up occasionally that black spit, but mingled with three or four other secretions from his lungs, and he has likewise for the last two years been subject to hœmoptysis, consequently there is very probably a good deal of hepatisation or solidification of the lungs.

14,755. How long is it since he has been working?—He has been working in the last two or three years in the Rodderup Fell low level, which I beg to tell you is a very serious place indeed.

14,756. Have you any cases in that low level where the men are now affected?—I cannot quote the cases, but when they consult me I frequently ask them where they have been working. I lose sight of them for the time being from an attack of bronchitis, and it is only when they are dying that the thing perhaps becomes sufficiently notorious to attract one's attention. But I have had repeated cases of even young men before 40, and in fact before they have really got you may say, to their full growth, dying from that low level in this neighbourhood; a place called the low level at Rodderup Fell. Sometimes it brings on tubercular disease before a spurious form of melanosis or the black degeneration takes place; they die sometimes of tubercular disease by its concomitant effects on a weak constitution.

14,757. (*Mr. Holland.*) Is there any doubt that miners' bronchitis is quite distinct from phthisis?—It is quite a distinct disease.

14,758. In fact with hardly any resemblance except cough expectoration and wasting?—No resemblance at all, excepting some cases of consumptive individuals, and then they may have both, as in the case which I mention, where a man has had hœmoptysis and spitting of blood, and hepatification; he has likewise the black spit, which I believe is the primary cause of the disease.

14,759. Have you noticed whether true consumption is more or less frequent among miners than among the other population of the neighbourhood?—I do not think that it is more frequent.

14,760. Is it not less?—I think that it is less.

14,761. When miners are able to get work above ground who are suffering from this bronchitis is the disease suspended?—It prolongs their life a while.

14,762. You attribute the disease, I think, chiefly to candle smoke and powder smoke?—Yes.

14,763. And dust?—And carbonaceous matter.

14,764. Do you not think that the gritty matter has to do with it?—I do not think that it has as much as the carbonaceous matter.

14,765. You think that the carbonaceous matter from the imperfect combustion of candles and the powder smoke are more irritating to the bronchial membrane than the gritty matter of the stone?—I do not think that perhaps they are more irritating, but I think that the two together are highly irritating, more especially when they get combined with the tissue of the lungs. This immediately irritating matter is expectorated, but the carbonaceous matter forms a black pigment in the lung and you cannot get rid of it, whilst the irritating matter is often expectorated.

14,766. Do you know the black spit of colliers?—I have seen it; it is nearly similar to what we have here.

14,767. But colliers very frequently escape any permanent injury?—They do.

14,768. How do you account for that?—I cannot account for it except that the atmosphere which they breathe is different. A collier has a good appetite whilst a lead miner has a very poor one.

14,769. How do you account for that difference?—I cannot account for it excepting that the colliers have better ventilation.

14,770. Is not that a very satisfactory way of accounting for it?—Very likely, I cannot say, I have had no experience in the interior of coal mines.

14,771. If you knew as a fact that the collieries were very well ventilated, and we know what these mines are, would not you say that the difference of ventilation satisfactorily accounted for the difference of appetite?—I think so, the colliers get more oxygen to breathe and that is one reason why they have a better appetite, when men have a bad atmosphere to breathe their whole frame is depressed.

14,772. Are there instances of the black spit continuing for many years after the men have left their work?—Yes, many years.

14,773. Where does it come from?—It comes from the mucous membrane of the lungs.

14,774. Is it a secretion?—It is a secretion undoubtedly from the black lung.

14,775. Is it a stock of carbonaceous matter which they have laid in while they were working?—It may be a spurious form of melanosis which is capable of secreting this black matter; we have all forms of expectoration in some of those miners, I have sometimes seen three or four tinges or different kinds of expectoration, but the black is the most important and the most permanent.

14,776. Have you had any post mortem examination of a miner?—No; the people here are prejudiced against it.

14,777. Can you suggest any remedy to prevent the production of the disease?—Any suggestion which I could make would be to improve the ventilation—to let them have better ventilation in their mines, and to drive away this matter which they are breathing.

14,778. The avoidance of smoke?—The avoidance of dust from the combustion of gunpowder.

14,779. Do you attribute it chiefly to gunpowder?—Yes. They work all their mines here with gun-

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powder, and after they fire a shot they go back to work in this atmosphere charged with gunpowder smoke.

14,780. Do they use very smoky candles?—They use candles.

14,781. Do they smoke very much?—I believe so. They are used in my own house and I have noticed them smoke.

14,782. Would not the employment of some light which did not smoke so much as a candle be an important improvement?—Very great, I have no doubt of it. If you could prevent lampblack mixing up with other forms of carbonaceous matter in the mine, the consumption of gunpowder, and if you could get ventilation at the same time, a current of air through the mine, you would get rid of the cause of disease to a great extent.

14,783. Are the miners liable to catarrhs?—Very liable to coughs.

14,784. What is the reason of that; going home in wet clothes?—I suppose that one cause of their catching cold would be coming out of a heated atmosphere into cold air very often with wet clothes, but likewise from the irritation.

14,785. But it is said that it is not a heated atmosphere, that the mines are very cool?—I mean to say that there is a great deal of difference between the temperature of the mines and of the external atmosphere. The men come out of mines perhaps at 60° (I do not suppose they are ever much warmer or colder than that) to breathe an atmosphere 20° or 30° of Fahrenheit below that and at freezing point, and I have known it here sometimes down to zero.

14,786. But not often?—Not often. I know that they must come out of an atmosphere of from 50° to 60° to an atmosphere frequently down to 12° or 13° of Fahrenheit; therefore they must be liable to catch cold.

14,787. Do you know as a fact, from your own observation, that they do catch cold very frequently?—Yes.

14,788. Do you not think that that has something to do with the production of this bronchitis?—No doubt about it; it brings on catarrh.

14,789. Dr. Arnison has suggested much more frequent washing, baths, as a great protection against that; do you concur in that opinion?—They are a particularly clean set of men.

14,790. I do not think that he meant so much for the sake of cleanliness as of tempering the skin, and rendering it less susceptible of cold and damp?—I cannot say about that.

14,791. (*Mr. Kendall.*) You have never been underground yourself, have you?—I have been occasionally, but never much in the mines.

14,792. Not enough to offer an opinion of what you saw there; you only hear that the ventilation is bad?—I hear that the ventilation is bad, and I see the men who consult me.

14,793. And you hear that the powder smoke lies a good deal?—I hear it and I see it myself. They tell me that they sometimes have to sit a good while before they can go up.

14,794. All that you can judge of is the effects, but the causes you cannot speak of except from hearsay?—I cannot judge from my own personal observation.

14,795. From what you have seen you have no doubt that there is an unhealthy breathing of powder smoke and other carbonaceous matters?—Yes. I would refer the Commissioners to a very important paper by Professor Virchow, on the pathology of the miner's lung, also one by Dr. Thomson, of Perth, on melanosis of it; both those papers are published in the Edinburgh Medical Journal, for January to June 1859. I would likewise refer the Commissioners to a letter by myself on the same subject, published in the same work for July to December, 1858. In that letter I state "In the lead mines of Alston "Moor the work is almost entirely blasting with gun-"powder, and the effects on the lungs are such as "invariably produce dyspnœa, with occasional attacks "of bronchitis, with expectoration of mucus tinged "with carbonaceous matter. This tint varies from a "grey to a black colour, and the symptoms vary in "severity, according to the time spent, generally from "20 to 30 years. On approaching the latter period "however the vital power is weak, the pulse fre-"quent, more or less anorexia, dyspnœa, asthenic "bronchitis, with the usual signs of emphysema are "present; the expectoration when advanced, grey or "black, but mixed with muco-purulent secretion "from the congested mucous membranes, the strength "rapidly declines, and death occurs almost in the "same way as in tubercular consumption with the "exception of the symptoms arising from the fre-"quent complications of the latter. Such was likely "to occur in the case now to be mentioned."

The witness withdrew.

Mr. JOSEPH MICHELL PAULL, examined.

Mr. J. M. Paull.

14,796. (*Chairman.*) You are the agent for Greenwich Hospital?—I am.

14,797. Do you often visit these mines?—Yes, occasionally; perhaps twice a year; the larger mines oftener. I go through the mines in Alston.

14,798. Is that merely as regards the interests of Greenwich Hospital?—Principally as regards the interests of Greenwich Hospital.

14,799. Have they anything to say in the management of them?—Nothing; I do not consider that I have a right to interfere in the management of the mines, but merely as far as the hospital interests are concerned.

14,800. It is merely as to the produce and to collect the royalty?—The royalty in kind is collected by the clerk of ore deliveries, an officer appointed for that purpose. I merely inspect them to see that they fulfil the conditions under which they are let from the hospital.

14,801. (*Mr. Kendall.*) What is generally the length of time that they are let for?—The smaller mines are sometimes let for six months, but they are renewable at the end of every six months. We have some mines that have been working for a considerable time upon a take-note of six months. I renew them at the end of every six months. They are first granted by the receiver, but if the parties wish, they can have a lease of 21 years.

14,802. Do they pay for the take-notes?—No; the take-notes are, generally speaking, granted to working men; they apply for a take note, and they get a length of 1,200 yards on a certain vein, and 40 yards on each side.

14,803. I suppose that if they make discoveries they call a stronger party with regard to money to aid them in the undertaking?—Yes; and they generally apply for a lease afterwards.

14,804. Does the revenue vary very much?—Formerly not very much for years. They have, under certain conditions, reduced the duty lately in a great number of the mines, and of course that has made a considerable difference to the revenue of the hospital.

The witness withdrew.

Mr. JOSEPH RODAM examined.

Mr. J. Rodam.

14,805. (*Chairman.*) What is the name of the mine of which you are agent?—Bentyfield.

14,806. Have you charge of any other?—Yes, Grassfield and Nentsberry Greens.

14,807. About how many men have you working under ground ?—We have in the Nentsberry Greens eight, we have 13 in Grassfield, and 26 in Bentyfield.

14,808. What is the extreme length of any level driven from the day ?—I should think about 800 fathoms.

14,809. Is there any shaft communicating with it ?—It is driven until it is communicated with another level which comes in from the day.

14,810. So that there is a thorough ventilation ?—Yes, a regular ventilation through.

14,811. Is that an air level ?—It answers two purposes, an air level and taking out work.

14,812. Are you now working below that level or above that level ?—About the level.

14,813. Are there any shafts to the surface ?—Yes, but we have some of them closed on account of carrying the current of air forward.

14,814. In which does the air come in, and out of which does it go ?—In droughty weather the air generally soaks out of the level, and the shaft draws down, and when the weather changes there is of course a change there.

14,815. Have you ever the air so bad that the candles are obliged to be put on the side to burn ?—I have not been much troubled with it for the last 8 or 10 years, but I have seen such places.

14,816. Are they mostly young men who work with you ?—There are both kinds.

14,817. Are there any men working with you who are affected in their breathing ?—Yes, there is one.

14,818. Is he able to work at all ?—Yes, he can work quite well, but still he is a little affected.

14,819. Have you had any accidents in your mine ?—We had one.

14,820. What was it from ?—A man fired a hole.

14,821. It was from blasting ?—Yes.

14,822. Did you ascertain the cause of its going off ?—Yes, from charging the hole.

14,823. Did he use an iron tamping rod ?—No.

14,824. Was it brass tipped, or copper ?—It was copper ; I think that he had not been careful of the material which he had put in ; it was from his own neglect.

14,825. From using bad tamping ?—He had put in a bad material.

14,826. Are the men supplied with any special material, or is it left to them to choose the material ?—They have been particularly cautioned about that several times ; they have it lying by their sides, it may be two or three yards off ; I have seen a good deal of that.

14,827. Have you yourself ever worked in a mine ?—Yes ; I wrought about 15 years.

14,828. Where ?—At Brownyhill a good deal of my time.

14,829. Have you ever worked in poor air ?—Yes ; where we had to put two candles together in this way (*describing the same*).

14,830. Did you suffer from it at all ?—Yes ; it is very injurious to health.

14,831. Is there any mine now where one could see that ?—I do not know that there is one at the present day.

14,832. You do not feel the effects of it now ?—No ; I feel very little effects of it.

The witness withdrew.

Adjourned to To-morrow at Hexham.

HEXHAM.

Tuesday, 7th October 1862.

PRESENT :

The Right Honourable Lord KINNAIRD, K.T.	RICHARD DAVEY, Esq., M.P.
NICHOLAS KENDALL, Esq., M.P.	P. H. HOLLAND, Esq.
JOHN ST. AUBYN, Esq., M.P.	

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

Mr. JOSIAH REMFRY examined.

14,833. (*Chairman.*) Will you have the goodness to state to the Commissioners the name of the mine or mines of which you have charge ?—The Derwent mine, that includes all the mines in the county of Durham, although there are various names ; the company have another mine in Northumberland, called the Shildon mine.

14,834. Then the Derwent mine is the Derwent company's mine ?—Yes ; there are different parts of the mine, such as Jeffrey's Ramshaw, East Whitcheaps, West Whitcheaps, Smithey Clough, and Grindstone Clough ; those are in the county of Durham. Shildon mine is in the county of Northumberland.

14,835. Will you state the nature of the ore ?—They are lead mines.

14,836. Do you smelt your ore ?—Yes ; on the works.

14,837. About what number of men do you employ ?—265 below ; there are a few labourers in that number.

14,838. Does that number of men working underground refer only to the mines in Durham, or also those in Northumberland ?—That number includes all that we have under the company.

14,839. Working the mines both in Durham and in Northumberland ?—Yes ; we have 8 in the Shildon mines ; the 265 include the whole number.

14,840. Are the mines entered by means of shafts, or from levels ?—The greatest number of our men enter through the adit level, which takes off some portion of the depth of the shaft.

14,841. The shaft is sunk from the adit level ?—Yes.

14,842. How far from the adit level is the deepest shaft ?—About 95 fathoms.

14,843. About how far is any one level driven from the day ?—The level probably is 300 fathoms in length ; I should say about that.

14,844. Is there more than one shaft sunk from the level ?—Yes ; in the level that I speak of, namely, in the eastern part, there are several shafts, which, if you saw the section, you would see at one view. (*The witness produced the same, and explained it to the Commissioners.*)

14,845. There are three shafts on that plan ?—Yes ; the eastern shaft is Taylor's. The main pumping is Jeffrey's.

14,846. How many shafts are there on that working, communicating with the surface ?—There is one to the east of Jeffrey's, which is Taylor's. Those two are the principal shafts for ventilating, and they are 375 fathoms apart.

14,847. Is either of them an up-cast and the other a down-cast ?—One is an up-cast.

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14,848. Is that constantly an up-cast?—It is constantly an up-cast.

14,849. Are there any artificial means to make it an up-cast?—Not at all.

14,850. It is natural?—Yes.

14,851. Is not that affected by the weather?—Yes, it is affected by the weather.

14,852. But is it so affected as to make it become a down-cast instead of an up-cast?—No; because the elevation of one shaft is so much greater, being 34 yards above the other; that makes it an up-cast.

14,853. But it does not act so efficiently on a calm day, I suppose?—I never knew it to act on a calm day or on any other day in any other way than as an up-cast.

14,854. How do the men enter the mine?—Through the adit level first generally. Some leave at the shaft top; but the main bulk of them go through the adit level first.

14,855. How do the men who enter by the adit level afterwards enter the shaft?—By ladders.

14,856. How do the men descend who go down by the shaft?—They do not generally travel in the shaft; sometimes they do. But there are footways on the working of the vein; there are ladders put in this, and the principal part of the men travel in that way in preference to going down the engine or any other shaft.

14,857. Why?—Because the footway is not continuous. Perhaps we go down for four fathoms, and then we may walk.

14,858. The shaft or shafts which go down from the adit level have continuous ladders I suppose?—Yes; the principal shafts, as shown on the section, the engine shafts; they are continuous and perpendicular from the surface down.

14,859. What length is each division of the ladders?—Some are $3\frac{1}{2}$, and from that to 4 fathoms.

14,860. At the end of each ladder is it sollered over?—Yes, with a man-hole and a guard at the foot of each ladder. We always keep a guard, or a hand-rail.

14,861. Have the ladders iron staves or wooden ones?—Wooden staves.

14,862. Are they round staves or the four-inch square staves?—Four inches by three-quarters, made of larch.

14,863. Have you any man specially appointed to look after all the timber work?—Yes, whose sole business it is to see it is kept in proper repair.

14,864. Is the ore drawn by cages or how is it brought to the surface?—By buckets.

14,865. Is it brought out to the day by the horse level?—Occasionally, but the main bulk of the stuff is taken in buckets to the surface.

14,866. Is the place where this ore is drawn bratticed off from the footway of the shaft?—The drawing shafts are separate ones altogether; there are not footways in the drawing shafts.

14,867. Do the men generally reside near the mine?—Most of them.

14,868. Are there any shops or lodging houses?—We have no lodging-houses, that is to say we have no shops, because those who bring their wallet, non-resident men, lodge with other parties in the neighbourhood.

14,869. When the men go in and come out of the mine do they change their clothes?—They all change.

14,870. Is there a place for changing?—Yes.

14,871. Is it provided with hot water and means for drying the clothes?—There are means for drying the clothes, but there is not hot water, the people in this country do not avail themselves of those privileges, most of them prefer changing at their own houses.

14,872. But if they choose they have the means of changing at the mine?—We have many Cornish men and Devonshire men, those change at the changing house and not at their lodgings.

14,873. What is the mode of drying?—We have a stove with a pipe running through the house, an ordinary dry.

14,874. Is it a pipe running through above?—It is above the floor, perhaps six feet.

14,875. Do you observe any difference in the men who change there and the others who go home to their houses, in getting cold or in getting off work from illness at all?—I do not.

14,876. How many boys and others have you working on the surface, washing and so on?—We have 108 at the wash.

14,877. Are many of those boys?—Most of them are boys.

14,878. Are any women employed?—Not at all.

14,879. Do they work under cover?—Most of them.

14,880. Do those boys work in the winter the same as in the summer?—When we are able to wash the ores, sometimes we are prevented from frost and boisterous weather; we employ them if possible on other work on the mines, either in or out of doors, so as to keep them employed when we are hindered in that way in the winter.

14,881. To what description of accident should you say the men are most liable in the mine?—That is a difficult question; we have had very few accidents, they have been very trivial, perhaps a cut finger, or a bruised hand, or anything of that sort.

14,882. Are the men liable to accident from the falling away of stone?—We never have had an accident from falling off the ladders or from the footways.

14,883. Have you had any accident from the roof giving away?—I do not recollect that we ever had.

14,884. Do you use wood at all?—We do a good deal, but some of our levels are walled and arched with stone.

14,885. Have you any accidents from blasting?—We have had slight accidents but not serious ones.

14,886. Do the men use the safety fuze?—They are prejudiced against the safety fuze; we have it and we are anxious for all to use it, but they have been so accustomed to the needle, or what they call the pricker in the north, that they prefer it.

14,887. Do they use a copper pricker?—An iron one.

14,888. And an iron tamping-rod?—Yes.

14,889. What material do they tamp with?—Shale or the borings from the hole.

14,890. Within the last three years do you know of any accident having occurred?—Since I have had the management, which is now nearly seven years, we have had no accident from blasting but one, that I recollect, and there the man lost the sight of one eye.

14,891. Have you a sick club or an accident club?—An accident club.

14,892. Not a sick club?—Not a sick club.

14,893. It is for visible hurt?—Yes.

14,894. What do the men pay towards that?—6*d.* a month per man.

14,895. Is a separate account kept of it?—No separate account is kept, the company pay the man 7*s.* per week and also pay the medical man; it is not conducted as it is in Cornwall, for instance, where the men pay to the doctor.

14,896. Is there a medical man specially appointed?—Yes, and he has a salary of so much per annum.

14,897. And the men do not pay anything beyond the 6*d.*?—Nothing beyond the 6*d.*; the company provide the medical man and pay the men 7*s.* a week.

14,898. So that there is no separate account kept?—There is no separate account.

14,899. Do the men ever object to the doctor who is appointed?—No.

14,900. Do you consider that the 6*d.* which the men have paid has been sufficient to meet the expenses of the club?—On the whole perhaps it may be sufficient, but I think that it would be bare enough.

14,901. Are the men generally healthy ?—Yes.

14,902. To what particular disease can you say that they are subject ?—The disease to which they are subject I believe is caused by their own carelessness or mode of working in a great measure.

14,903. What is the nature of that disease ?—They are in the habit of working the pick point when they ought to apply the wedge and consequently making more dust ; and they are in the habit of boring their holes dry when they ought to apply water ; the consequence is that they make more dust and from inhaling dust I believe that they get more harm than from any other cause in mining either in ventilation or in any other way.

14,904. Generally speaking are the mines wet ?—Generally speaking our mines are dry ; there is a little water in the bottom of the level.

14,905. Is water supplied to them or would they have to take it down with them for the purpose of boring ?—They would then have to go to the nearest level which had water, which perhaps might be a few yards off.

14,906. Is there any provision for men who are off work from sickness and not from hurt ?—There are clubs in the district.

14,907. Have there been many men at any time off work ?—Yes.

14,908. Have you observed that the illness which you think arises from dust affects the younger men or the older men most ?—Sometimes it affects young men suddenly ; we need not go below ground to prove that ; I have noticed myself stone cutters who have been in the habit of working on the sandstone to be affected in their breathing sooner than those who have wrought on other work.

14,909. Do you consider that the men who are affected who are working as miners are affected in the same way as the stonemasons ?—I do to a certain extent.

14,910. Are they not liable to catch cold coming out of those mines and going home in a wet state ?—They are liable, but I presume that they do not very frequently catch cold ; of the four witnesses whom we have here to day one has worked underground I believe continuously for 58 years ; the four will average 43 years and three months.

14,911. Do you know at all what would be the average age of the number of men who are working in the mine generally ?—No.

14,912. What is the youngest age at which you allow any to go underground ?—They are generally about 17 or sometimes 18 before they go underground.

14,913. How is the work let to the men ?—By contract.

14,914. How often in the year ; monthly ?—When it is yard work so many fathoms ; probably two fathoms or three fathoms, according to the cost of the ground.

14,915. Is the bargain made quarterly, yearly, or monthly ?—Quarterly for what is termed tribute in Cornwall or bing-tale in the north, but the yard work is monthly ; we have monthly settings.

14,916. In the case of the monthly settings how much do you keep in hand when the men are paid ?—A fortnight.

14,917. What proportion of the men who are working are tribute men ?—Say a third part.

14,918. What can tut-work men earn generally at the bargains which are let ?—On the average say 15*s.* per man for 40 hours working ; that is five eight hours.

14,919. Do they work in shifts ?—They do.

14,920. Are there night shifts ?—In places where we wish the work pressed on, but not generally, because it is the most costly way of working.

14,921. What can a tributer earn generally ?—We have some that earn a good deal and some that earn scarcely anything at all.

14,922. To those who do not earn anything do you grant subsist ?—We do.

14,923. How much ?—From 40*s.* to 50*s.* per month, according to the industry of the person ; the labour that he has done and so on.

14,924. Then before granting subsist you get a report from the agent as to the amount of work which the man has done ?—Yes, and the quantity of ore that he may get in the time ; on the whole I should think that the tributers will earn a little more than the tut-work men.

14,925. Do many for a time earn nothing ?—Yes.

14,926. That would not be the case with the tut-work men ?—No, they would not earn nothing, because they generally get something, although the bargains vary.

14,927. What is the lowest that a tut-work man who gets a bad bargain earns ?—I should think that the lowest which has come under my notice for a considerable period will not be less than 30*s.* in the month.

14,928. Has that continued for any time ?—Very seldom.

14,929. The bargain has only been for a month ;—Probably for half a month or a month, as the case may be ; sometimes we let our bargains for a month, but generally speaking, we give them a certain stint, two or three fathoms, and they may have a second or probably a third bargain too in the month.

14,930. What deductions besides the money for the club do the men pay. Do they pay for powder ?—Yes, and for candles.

14,931. What do they pay per pound for candles ?—8*d.* per pound.

14,932. And for powder ?—the same.

14,933. Are they limited in the quantity of candles ?—Yes.

14,934. How much is allowed them ?—A pound and a half per man, except (and that is frequently) where the air blows the candle much, and then they are obliged to have more.

14,935. In this section of mines which we have seen, are there any close ends at which the men are working now ?—There are no ends short of air or close ends that I am aware of.

14,936. If you have any, do you apply any artificial means of ventilation ?—We have not any artificial means of ventilation at present in use. I do not believe in artificial ventilation very much ; I believe that we ought to have more natural ventilation in every mine.

14,937. Before you have connected two levels by a rise or a shaft or winze, must you not then have the air somewhat close ?—Yes, we have to contend with those things ; then we keep one or more small fan blasts, and place pipes, and blow air during that short time.

14,938. That is what I alluded to as artificial ventilation—That is artificial ventilation, but the air is taken from a place near, where it is pure, and conveyed to the men.

14,939. How is that worked ?—By hand ; by a boy.

14,940. Is the pipe through which the air is blown wood, or iron ?—Principally iron.

14,941. Do you know to what extent you have ever had occasion to send air in that way ?—I have known it sent for 300 fathoms or more.

14,942. What is the size of the iron pipe ?—Six inches.

14,943. And has that been merely by a fan turned by a boy at the end of it ?—By a fan, but not turned by a boy ; a fan turned by a water-wheel.

14,944. But at present you have nothing of that sort in the mine ?—No, and we have no place to my knowledge which is short of air anywhere.

14,945. How long is the powder smoke getting away at the extreme end of any of the levels where you are now working ?—I do not think that we have any place save one or two but where it may get away in less than half an hour.

14,946. And you have no place where the candle has to be inclined so as to burn ?—Not at all.

14,947. Is there any part of these mines very

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wet?—There is no part very wet; perhaps out of the 264 or 265 men not more than half a dozen at present are subjected to water above their heads.

14,948. When that is the case, is there any means to protect those men from the wet?—We provide them with oiled jackets, and hats.

14,949. And are they able to work with those?—They are; they are made loose.

14,950. (*Mr. St. Aubyn.*) You said that in all places, except one or two, the smoke cleared away in half an hour after the blasting; will you state what is the nature of those other places where the smoke is more than half an hour clearing away?—Those places which are furthest from ventilation.

14,951. What is the distance from a rise in those places?—The place that I allude to is about 23 fathoms.

14,952. How long does the smoke take to clear away there?—In the fore, breast, or the end, I should think within half an hour, so that the men can work comfortably.

14,953. In what level is that?—In the 40 fathoms level, east of Taylor's shaft.

14,954. You said that you had brought four miners here to day, as witnesses?—I have.

14,955. What is the average length of time that those men have worked underground?—43 years and three months.

14,956. How many men have you working in the mine?—265.

14,957. Have you any men working in the mine who suffer at all from illness, which incapacitates them from working from time to time?—There are one or two in the district, who used to work at the mine that do not work now.

14,958. Have you any men at present under medical care from causes connected with their work in the mine?—I am not aware that we have; but the doctor is below, and he can answer that question himself perhaps better than I can.

14,959. What is the average length of time for which your men have worked, taking the whole men together in the mine?—I am not prepared to say that.

14,960. It is something less than 43 years and three months, is it not—I should say so; I will not say that those men are a fair average.

14,961. Then you consider working 43 years and three months to be exceptional with you?—Yes.

14,962. Then you would hardly consider those men whom you have brought here to day as witnesses to be fair specimens of the men who are working in the mine?—We have some better looking but I do not know that we have any worse.

14,963. Do you consider the witnesses whom you have brought here to day, whose average of work underground has been 43 years and three months to be fair average specimens of the men who are working in your mine?—No; I will not say that they are average specimens because to bring an average we should bring men who would look more fresh in appearance; they are certainly a fair average specimen for an old miner. We have some men who have worked all their lifetime, and we have others who have only just started, but as to the average I am not prepared to say how long those who have gone hence worked or what is the average.

14,964. What induced you to bring as witnesses men who had worked so long with you?—Because I thought that they were better able to give evidence than younger men, they probably might state what the mines were some years ago and what they now are, whether there is any improvement or not.

14,965. (*Mr. Davey.*) You have said that the miners suffer a great deal from the dust, are there no means of remedying the boring a dry hole?—Yes.

14,966. Do not you enforce that?—I have tried to persuade them.

14,967. You are aware that a hole would bore much quicker with water than it would dry?—I am aware of that.

14,968. And are there no means of convincing the men of that fact?—I cannot convince them of it.

14,969. You say that a mine ought not to use any artificial means of ventilation; will you tell the Commission what other means you would adopt?—When I said that, for instance, instead of two shafts being the number I would have as many shafts as the magnitude of the working called for; I am speaking of extensive collieries.

14,970. We are talking now of lead mines?—We have so many shafts that there is no scarcity in our mine generally speaking; therefore the only artificial ventilation which we want is in making a communication from level to level, which is only of a short duration. Our levels are generally about nine or ten fathoms apart, consequently we have from four to five fathoms to sink and to rise; some times at the meeting point one or probably both may be a little short of air.

14,971. Then you require an artificial ventilation?—If you choose to call a fan blast fixed in pure air conveying that air to those parties artificial ventilation, that is the only ventilation which we make use of.

14,972. Is your mine in limestone?—Some part of it.

14,973. Do you ever find any fissures in that stone?—Yes.

14,974. Do you find any foul air coming out of those fissures?—I will not say in the limestone but I have noticed foul air to come out from other strata; I will not say that I have noticed it in the limestone particularly; it is a stratified district, consequently our operations are not much in the limestone. We have the sandstone and we have the shist or shale which our operations are in; at present we have very little workings in the limestone.

14,975. Do you find your mineral in the sandstone and shale?—We find more in the sandstone than we do in the shale.

14,976. Do you find mineral in the sandstone and shale?—We do.

14,977. Where do you find the fissures which you speak of, in what stratum?—More especially in the vein which is embedded in the limestone or in the sandstone.

14,978. Does anything come from those fissures, any gas?—I have never observed any, the only thing which I have observed from that is by the candle.

14,979. What has been the effect of placing a candle close to the fissure?—If you put a candle near it or into it I have seen that which would almost make the candle go out; it would probably make it go out if you were to thrust it far enough in.

14,980. Is that from the force of the air coming out of the fissure or from the nature of it?—I cannot see how force can arise; it is from the nature of it.

14,981. If you put a candle does the flame move at all?—Yes; I have observed that, as if there were a current, but whether it first goes into the fissure and plays around it I do not know; I cannot see how it can come from the far end of it.

14,982. Is there a current which comes out of the fissure?—I cannot say that I ever observed anything to come out of it, but I have observed a motion in the flame of the candle when I have placed it within the fissure; but I never observed any extra motion of the flame of the candle when outside the fissure.

14,983. A current must come out to blow out the candles?—If there is a current I should think it must proceed from without first.

14,984. Does that affect the air in your level?—It would affect the air in a level which was not very well ventilated. We do not frequently meet with those cavities or fissures.

14,985. What is the monthly produce of your mine?—1,400 to 1,500 tons of ore in a year.

14,986. (*Mr. Kendall.*) As I understand you you object to artificial ventilation solely on this ground, that you do not like long drifts. You would have

communications as quickly as possible in order to prevent artificial ventilation. Instead of driving your level some 20 or 30 fathoms you would hole a winze to some other level; you prefer that to the artificial ventilation?—I do.

14,987. That is what you mean?—Yes.

14,988. Do you know much of the agriculturists in this neighbourhood?—No; I do not.

14,989. You do not see many of the agricultural labourers?—I see them occasionally.

14,990. Are they a healthy set of men?—Much like other districts.

14,991. Are they a healthier set of men than your miners?—They have a fresher appearance.

14,992. You say that Cornishmen sometimes come up here to work?—We have several.

14,993. Were they miners before they came here?—Yes.

14,994. Taking them as a body, are the Cornish miners that you have seen more delicate than your miners here?—No; I do not see much difference.

14,995. Have you inspected Cornish mines?—I have.

14,996. Taking the body of Cornish miners and the body of miners here, which should you say, from your observation, is the healthiest body of men, or do you see any difference?—I think there is a difference.

14,997. Which are the best?—Those in the north.

14,998. They are healthier men?—Yes, especially after a certain age.

14,999. A Cornishman at 40 is an older looking man than a miner of this district?—I should say so, although I have been now in the north upwards of 20 years. I have been in Cornwall sometimes. I was there only 12 months ago.

15,000. To what do you attribute the difference which you think there is between the two?—Extra fatigue probably; having deeper mines to contend with in Cornwall than in the north.

15,001. Do you think that as a body of men they work harder than the men here?—I should think that if there is any difference the Cornishmen would work the hardest.

15,002. (*Mr. Holland.*) Do you know the Alston Moor miners?—I do.

15,003. Are yours better or worse than they, or much the same?—Much the same, although the Alston Moor miners are superficial workers. I dare say they have long drifts, but they have nothing much in depth I believe.

15,004. Is there any marked difference in health between the miners who come from Alston and your own miners?—No; I cannot see that there is a marked difference.

15,005. They are much the same?—They are.

15,006. Do your miners, as a class, remain in good health until they are 50?—Yes; our men generally enjoy good health. Their general health is good.

15,007. Is their wind good and sound till 50 as a class?—No; I cannot say that.

15,008. Is it so till 40?—Some are affected.

15,009. I am speaking of them as a class?—I should say not the whole.

15,010. If you took 100 miners of 40 would you find 50 bad in the wind?—Perhaps affected.

15,011. And at 50 very much affected?—Some.

15,012. Would they find a difficulty in getting up a hill at 50?—Probably.

15,013. Is it the case that the miners here as at Alston die of chest disease to a large extent?—Some have that complaint, but I am not aware that any die very young from it.

15,014. Do not a large number of those who get above 40 die of disease of the chest?—I am not prepared to say. The medical man will answer that question better than I can.

15,015. Do your miners suffer a good deal from powder smoke or candle smoke?—They do not suffer much from either. They suffer more from candle smoke probably than they do from powder smoke, because the candle is a constant companion, and they cannot avoid inhaling the smoke from it.

15,016. But the mines are never quite free from powder smoke, are they?—Either one part of the mine or the other has powder smoke in it probably.

15,017. Your opinion is that they suffer more from candle smoke than from powder smoke?—That is my opinion.

15,018. Do they suffer much from dust?—I fear so.

15,019. You think that they do?—Yes.

15,020. Do you think that there is any practical remedy for that dust?—I do.

15,021. What is it?—To change the mode of working as I observed at first; to adopt the wedge instead of the point of the pick.

The witness withdrew.

Mr. THOMAS MORPETH examined.

15,022. (*Chairman.*) Of which portion of the Derwent mines have you the management?—What we call the lower level, or Deborah's level as it is called; that is, the low part of it. It is at Taylor's and Jeffries' shafts.

15,023. That is your particular charge?—Yes; under Mr. Remfry.

15,024. How low is that low level below the adit?—The lowest level that we have, I think, under the adit, is what we call the 95.

15,025. How many men are there working in the 95?—Only two.

15,026. What is the length of that level from Jeffries' shaft?—I cannot give you a correct answer about that. I should think 60 or 70 fathoms; but I cannot speak with confidence.

15,027. Where does it communicate with the level above?—From Jeffries' shaft we have a cross cut which goes from there to the south about 18 fathoms I should think, and we sunk on the vein there (the vein overlying) to the south about 18 fathoms. We put a sumpt down there, and the level from that I think we have driven between 60 and 70 fathoms; and that is the last communication which we had.

15,028. How far are the men now driving from the last communication?—We have only two there.

15,029. How far are they from the last communication which you have made?—I say, that from the last it is between 60 and 70 fathoms; but I only guess at that; I cannot say with confidence.

15,030. It is about that?—Yes.

15,031. How is the ventilation there?—We have not any close air there; it is very good. You may waft the candle backwards and forwards, and it will not go out.

15,032. For 60 fathoms you are away from any communication?—Yes; we have another level over above this, but we have not a communication through.

15,033. Are you putting in a rise now to that other level?—No; there is not anybody working in the other level. The prospect was very dull and we stopped it, wishing to make a discovery in the low level; and if we did so, we should put another communication through.

15,034. How long is the powder smoke getting away, when they blast at this point?—The powder smoke there, supposing they fire one hole, will, perhaps, go away in the course of 40 minutes I should think. You will see some symptoms of smoke, but not any body of it.

15,035. How soon do the men go in to work there after blasting?—I cannot say. We are not there to see them. They may sometimes go in very speedily, within ten minutes or a quarter of an hour. They are not regular about it.

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15,036. Can they see to work?—Yes; they can see to work ten minutes afterwards.

15,037. But the powder smoke is not clear away for 40 minutes?—I should think so.

15,038. You have no artificial ventilation there?—Nothing different from what I am telling you.

15,039. You have no pipes taken in?—There are no pipes there.

15,040. How many shifts work in the 95-fathom level?—There are two men working there.

15,041. Do they change or shift?—They are on so much a yard.

15,042. How many men in the 24 hours work there?—Two together.

15,043. Is the bargain made with two men, four men, or six men?—Two men.

15,044. Then they only work eight hours?—Yes; eight hours shifts.

15,045. When they leave no other men take their place?—No.

15,046. So that it is 16 hours without being worked in?—Yes.

15,047. Is that necessary?—It is better for the place. At the same time we could work the 24 hours if it came to that, barring waiting 10 minutes or so at the holes. The place is very poor, and therefore I think that to have two men is as much as we can afford to do.

15,048. At the 40-fathoms level are there men working?—We have two 40-fathoms levels at the point where we have been speaking about; it is going west of Jeffrey's shaft. What we have over above that at the 40 there is no person working in.

14,049. Is there no person working in the 40?—Not west of Jeffrey's shaft. Then if you come to Taylor's there are men working.

15,050. East of Taylor's shaft?—Yes.

15,051. How many men are working in that level?—We have two men working in the 50-fathom level east of Taylor's. We have two men working also at the 40-fathom level.

15,052 Are there any other levels above that?—Yes; there is the 30. We have had two men driving towards a rise which we have been putting up. We have two men sinking and two rising; they are all in a party.

15,053. How long does the smoke take to get away from any of those places?—The smoke goes very quickly there; it is not more I should think than five or six minutes, the great body of it.

15,054. In how many shifts are the men working in the 30, 40, or 50-fathom level; do they change the party?—Where there are four they change at the eight hours; supposing they go in at six o'clock they come out at two in the afternoon, and the others leave off at 10 at night.

15,055. In each of those levels are there two in the party?—No; there are two in the 50-fathom level and two in the 40, that is what we have got east of Taylor's shaft, and there are four in the rise in the sumpt, and two driving towards the sumpt.

15,056. In all those places the air is good, the candles will burn?—The air is capital, the candle burns nicely.

15,057. Have you ever seen a place in the mine where the candle was obliged to be put on the side to burn?—Yes, sometimes, where I have had to slant the candle a good deal to get it to burn, but not of late years; since Mr. Taylor got hold of those mines they have been well ventilated.

15,058. In what manner have they been better ventilated?—By putting up rises and sumpts and giving ventilation close up to the fore-breast, and it is the way to win the ground, it proves the ground and shows whether there is ore in it or not; the men are able to give much better labour when they are well ventilated.

15,059. You have no occasion to put in artificial ventilation in any part of the mine with which you are connected?—We have not at present to my knowledge.

15,060. Where does the powder, smoke, and foul air go to?—We have different shafts; sometimes it goes up one day and the next down, the highest shaft takes the pull.

15,061. But still the highest shaft is not always the up-cast shaft?—Not always; I have seen it a down-cast.

15,062. That is when it is affected by the weather?—I think so.

15,063. Is this part of the mine very dry?—A great part of it is dry; towards Taylor's shaft is very wet, and we have got a great deal of water, but east of it is very dry.

15,064. Is there much dust in working the mine?—There sometimes is; but if miners would only adopt our plan, namely, when they are drilling their holes, to have water and something to keep the material from hitting them, there would be no dust.

15,065. Do they do that?—Sometimes; and the holes bore quicker.

15,066. Do you supply the men with the water there?—Yes; if they want water they will get it.

15,067. How do you supply it?—There is plenty of water close at hand, they will take a pail sometimes, or a bucket.

15,068. Do you supply it to them?—No, they fetch that themselves.

15,069. They fetch the pail?—Yes, they have most of those things by them; they get their powder in small barrels, and after the powder is out they have the barrel, and it is no expense to them.

15,070. Are any of the men under your charge affected in their breathing?—We have some affected in their breathing.

15,071. What is the cause of that?—Very probably there are some very old chaps, 68 years old; if a man has ever been in a mine it is possible that he will be affected in his breathing.

15,072. But you think that the young men are not affected by it?—Not that I know of.

15,073. At what age are they affected in their breathing?—Some young men are asthmatic and are affected before they get old.

15,074. Then do you think that there is nothing in the work of the mine which causes the men to be affected?—I do not say but what there is; it is not so pure as on the surface.

15,075. What is there in your opinion to affect them?—It may be the powder, rock, or something else; I cannot give you an actual answer.

15,076. (*Mr. Davey.*) Do your men work single-handed in boring?—Some do that; it is hard work, and most of them would rather be double, but by single-hand is a better way for getting labour done cheap.

15,077. Do you approve of the single-hand work?—Yes.

15,078. Do the men generally bore the holes dry?—No; when they are single-handed there is often water.

15,079. (*Mr. Kendall.*) What do your miners generally pay a week for their lodgings?—I believe you find different prices; 9*d.* I believe.

15,080. Do they crowd much into the rooms, or have they generally good, nice, airy lodgings?—I dare say that they will have pretty comfortable beds, and that they are not much crowded.

15,081. Are they as a body of men sober or not?—Some of them are not sober and others are very sober steady men.

15,082. Do any of them save much money?—I cannot say positively whether they do or not; I do not know their affairs.

15,083. Do they marry early or not?—Some marry early.

15,084. Taking them generally speaking do they marry earlier than the agricultural labourers?—No; I cannot say that.

15,085. With regard to the wages, do you make any difference between the wages of the married men and the wages of the single men?—It makes no dif-

ference to us, we let all the bargains as nearly as possible alike, and they may make what they can; it is no matter whether a man is a married man or a single man.

15,086. According to his worth so he has his money?—Just so.

15,087. What are the average wages?—I think the average wages this last month have been about 15*s.* 2*d.* a week at this low level, or 15*s.* 2¼*d.*

15,088. You do not know the agricultural wages here do you?—I do not.

15,089. I suppose taking the miners as a body you do not consider that they are quite as healthy as the agriculturalists?—No; I do not think that they are.

15,090. But taking them as miners do you think that the ventilation is about as good as can be made in your mine?—I think that it is so; if we go a certain distance we give another communication through; wherever we find the air getting dull we consider it better to do so we can get a great deal more labour done; if a man is working in a bad air place he is not able to give much labour.

15,091. Is the health of the men generally good?—Yes.

15,092. Have you worked in any other mining district than this?—No; I have wrought in this mine I think about 54 years, working and agent together.

15,093. You cannot compare your miners with the miners of another district?—No, I cannot.

12,094. Have you improved much in ventilation in your mines since you have been an agent?—Yes; we have made much improvement.

15,095. The ventilation now is better than it was ten years ago?—A great deal.

15,096. And ten years ago it was better than it was ten years before that?—I dare say.

15,097. Then it is possible to improve it a little more still?—I dare say it is.

15,098. (*Mr. Holland.*) What improvements have been made in the last ten years in ventilation?—By putting more shafts down and putting what we call sumpts, that, is a communication between levels; we put the communications between which causes a draught of air to work from one place to another.

15,099. Anything else?—No.

15,100. Are the levels any wider than they were?—Yes; I think that since Mr. Taylor took hold of it they are wider levels than they were formerly.

15,101. Are they any higher?—I think they are a foot higher some of then.

15,102. And how much wider?—From six inches to a foot.

15,103. And are they shorter between communications?—Yes.

15,104. Does the powder smoke hang less now than it did?—Yes; much less, that is the case when there are more sumpts and more shafts.

15,105. What difference of time is there in the hanging of the powder smoke from what there used to be ten years back?—I do not recollect; it depends a vast deal upon the place.

15,106. What was a common time for the powder smoke to hang ten years ago?—It just depends upon how the weather is; there may have been some places in that time where it would be nearly all day; supposing they went in at 6 o'clock, and fired, it might remain until 2. They may now get in in ten minutes, and sometimes less.

15,107. Is it a very unusual thing for powder smoke to hang an hour now?—Yes; at the same time you may smell it, and say that there has been powder.

15,108. It hangs about sufficient to smell, but not sufficient to prevent working?—Yes, but there is nothing to do any damage.

15,109. Are you sure that there is very much less powder smoke in the mines now than there was ten years ago?—Yes, I am confident that there is much less now.

15,110. Very much less?—Yes.

15,111. Has there been any improvement in the health of the men in the last ten years?—Yes, there must be, I think.

15,112. Have you noticed that there is?—Yes, I believe that they are a good deal better.

15,113. Is there a decided improvement?—Yes.

15,114. Are they less touched in their wind than they were ten years ago?—They are not touched so much as they were ten years ago.

The witness withdrew.

REFORM CLUB
PALL MALL

Mr. JOHN MADGIN FARBRIDGE examined.

15,115. (*Chairman.*) You are a medical man?—Yes.

15,116. Resident where?—In Blanchland.

15,117. Have you the charge of any mines?—The Derwent Company's mines.

15,118. How long have you had charge of them?—19 years next Christmas.

15,119. Have you observed during that time any particular disease by which miners are peculiarly affected?—Diseases of the chest.

15,120. Is that in your opinion occasioned by the description of their work?—Yes, to a certain extent.

15,121. Can you state shortly the symptons of that disease to which the miners are more liable?—Bronchitis, difficulty of breathing, more particularly upon any exertion.

15,122. Cough?—Cough with expectoration.

15,123. Is that expectoration coloured?—Frequently.

15,124. (*Mr. Holland.*) Is it black spit?—It is more of a lead pencil slate colour.

15,125. (*Chairman.*) Have you ever known instances where it has been vomited?—Not unless there was general vomiting from the stomach; but an excess of cough creates vomiting.

15,126. Then do they expectorate that?—Yes; and it does them good.

15,127. It relieves them?—It relieves them very much.

15,128. Have you ever seen a case where after a man has left off work in a mine for some time, that coloured expectoration has continued for some time?—Yes, generally so.

15,129. Did you ever have a post mortem examination?—Not in this country.

15,130. (*Mr. Holland.*) It is quite certain that this miners' complaint is distinct from common phthisis, is it not?—It frequently terminates in phthisis.

15,131. Is it quite distinct from common phthisis?—Yes; it is lead asthma.

15,132. You mean lead miners' asthma, do not you?—Yes.

15,133. To what causes do you attribute it chiefly?—The principal cause is the under surface working.

15,134. What immediate effect has underground working upon the health, is it the dust?—Principally.

15,135. Do you think that the smoke has much to do with it?—Yes.

15,136. The candle smoke or the powder smoke?—The gunpowder smoke.

15,137. More than the candle smoke?—Yes.

15,138. Is the disease very slow in its progress?—Very slow.

15,139. Does it come on very gradually?—Very gradually indeed.

15,140. At about what age do you see it at first?—Generally between 35 and 40.

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15,141. Not generally before 35 or after 40 ?—Not unless the miner is predisposed to consumption.

15,142. I am now speaking of miners' asthma, that seldom comes on before 35 ?—Yes.

15,143. And generally before 40 ?—Yes.

15,144. When do they generally become very ill with it; is it several years after its commencement before they become very ill ?—Few miners are able to work after 50.

15,145. Is that the case at the present time as it was some years ago ?—Yes.

15,146. We have been told that the miners are much more healthy than they were ten years ago ?—I think so; that is from the improved mode of ventilation.

15,147. Is ventilation improved generally in the mines ?—I think that in our district it is.

15,148. Does this complaint come on at a later age than it did ten years ago ?—I have not noticed that.

15,149. I thought you said that the miners were more healthy than they were ten years ago ?—Generally so.

15,150. Then one would expect that the disease would appear later in life than it did, have you not noticed that ?—There are many exceptions to it.

15,151. Do they cough a good deal before the expectoration becomes free ?—The old miners do.

15,152. When the disease first commences does it commence with cough ?—Yes.

15,153. Does the cough continue some time before the expectoration becomes free ?—Yes.

15,154. A good while ?—Yes; it is difficult to expectorate.

15,155. They do not rapidly become thin, do they ?—Not rapidly.

15,156. They do become thin, I suppose ?—Yes.

15,157. Is it accompanied with hectic fever ?—Not until the latest symptoms; when it is very much advanced.

15,158. Is it accompanied with hæmoptisis, the spitting of liquid blood ?—Frequently; but that is where there are tubercles in the lungs; where it is complicated with phthisis.

15,159. That is where the two complaints are combined ?—Yes.

15,160. Have you ever seen the spitting of liquid blood when you have had no suspicion of tubercles ?—Not often; idiopathic active hæmorrhage is very rare indeed.

15,161. Have you ever seen it ?—I have seen it in one case.

15,162. Distinct hæmoptisis ?—Yes.

15,163. Is not hæmoptisis without tubercles very rare ?—It is generally a precursor of consumption; it is generally a symptom of tubercles.

15,164. I was asking whether hæmoptisis was not a very rare symptom in pure miners' consumption as distinct from phthisis; am I right in that, or have you not noticed that ?—I cannot see much difference between ordinary consumption and miners' consumption; I suppose consumption is merely wasting away.

15,165. Did you not say that miners' consumption is much slower in its progress than common consumption ?—Very much slower.

15,166. And much less accompanied with hectic ?—Yes.

15,167. And that there is much less frequent spitting of blood ?—Yes.

15,168. And much less rapid wasting ?—Yes; it is more gradual.

15,169. As regards physical signs, is it not much less confined to the upper part of the chest ?—It is more in the bronchial tubes.

15,170. Is not the formation of cavities in miners' consumption rare ?—It is not the case until it gets to an advanced stage; there are no cavities until the latter part of the complaint.

15,171. Cavities are not common in miners' complaint are they ?—Yes; in the latter stage.

15,172. Is solidification of the upper part of the lung frequent in the early stage of miners' consumption ?—It is frequently so, but not in the early stage.

15,173. In the early stage ?—Not always in the early stage.

15,174. Is it not rare ?—It is rather rare in the early stage.

15,175. If miners change their employment and work above ground, do not they keep pretty well for a long time ?—Yes they live much longer.

15,176. Though they do not quite recover they cease to get worse ?—They cease to get worse.

15,177. Is that common in phthisis ?—Not in ordinary phthisis.

15,178. Do you not think that those are strong marks of distinction between miner's consumption and common consumption ?—You cannot say that a miner ever gets completely well.

15,179. You have had no opportunity of dissection have you ?—Not any.

15,180. There is a great prejudice against it ?—Very much indeed.

15,181. I suppose that there is a very marked excess of this disease among miners over any other portion of the population, is there not ?—Decidedly.

15,182. Twice or three times as much, or more than that ?—A great deal more than that; ten to one.

15,183. (*Chairman.*) You have spoken of lead asthma; are men affected in that way who work at the smelting works ?—No.

15,184. (*Mr. Holland.*) I think you meant lead mine asthma ?—Yes, miners' asthma.

15,185. (*Chairman.*) When the men come to you do they complain or imagine that they have got their illness from any work in which they are engaged ?—Frequently they do.

15,186. What do they complain of generally ?—Cough and shortness of breath.

15,187. Do they consider that they have got it from working underground ?—Yes.

15,188. From working in any particular level ?—Yes, frequently.

15,189. What do they complain of in that level as affecting them ?—The deficiency of pure air.

15,190. Do you recommend them to go back to their work or to abstain from their work ?—I recommend them to keep out of it as much as they can; they generally go back.

15,191. If such a man goes back to the work do you think that there is any injurious effect ?—Yes, I do.

15,192. Have you ever known any man once affected recover completely ?—If they were young and left when the first symptons made their appearance and went to another occupation they got better.

15,193. But if they have gone back to the mine, what has been the consequence ?—An increase of the disease.

15,194. How long do you think that a man could work in the mine after he was so affected before he was obliged to give up altogether ?—They generally give up before 50; it is an exception to get up to 50.

15,195. At what age have those whom you have seen generally been obliged to give up their work ?—Between 40 and 50.

15,196. Have you any cases now which you could name to us of men who are working in the mine who still are affected ?—There are some here whom you will see to day.

15,197. Are those patients of yours ?—No.

15,198. Have you any patients of yours now working in the mine ?—I have.

15,199. About how many should you say ?—About half a dozen.

15,200. Do you mean working in the Derwent mine ?—Yes; I am connected with no other mine.

15,201. Do you keep any record of the cases which come under your notice ?—No.

15,202. Are the names of the men not put down in any book ?—No, I do not keep any account, with the

exception of giving them certificates for their relief when they are off work.

15,203. How many certificates do you suppose you have given in the last month ?—I do not know exactly ; perhaps six or seven or eight ; I cannot say ; I do not keep an account.

15,204. Can you give us the names of those men ?—I should think that the bulk of those who got certificates for the last month have gone to work again ; they are not under medical treatment ; as soon as they go to work they cease to be under my treatment.

15,205. Have you any miners now who are off work altogether and are under medical treatment for miners' disease ?—Yes.

15,206. Do you know about how many ?—I know of three.

15,207. About what age are they ; are they old men ?—Somewhere about 50.

The witness withdrew.

Mr. THOMAS BELL examined.

Mr. T. Bell.

15,208. (*Chairman.*) Have you always worked in the Derwent mines ?—Yes, always. I wrought for 45 years for one company in these mines, and I never had a shilling under any other in my life.

15,209. You are affected now in your breathing, are you not ?—Yes, but I am working at my bargain. I walk nearly three miles to labour in the morning between my place and the mines.

15,210. Is it in a wet part of the mine that you are working ?—Yes ; it is so now.

15,211. Do you change your clothes when you come out of the mine ?—Yes.

15,212. Where do you do that ?—At the dry that we have convenient to the mine.

15,213. Do all the men change their clothes there ?—No ; they do not. Only the men who are wet change their clothes there. The others go to their own homes.

15,214. From what cause do you suppose you became affected in your breathing ?—I cannot say. There is many a one affected that has never been in a mine.

15,215. Have you not sometimes worked in bad air ?—There is a difference in the air, but there is a stour that will come out that will affect your breathing when you are drilling. That will arise from the stone, and that affects the wind.

15,216. Do you get much of that into your mouth while you are working ?—No. We do not find that much.

15,217. Do you not spit it out if it gets in ?—Yes. We spit it out, a part, or else we should soon be done, but not all at the time we are working.

15,218. How long does the spitting continue after you have left off working ?—Not long ; we get clear of it when we get home.

15,219. Are there some men younger than you who are affected in the same way ?—I dare say they will be.

15,220. Do you happen to know anyone now who is working in the mine whose breathing is affected, and who is under 50 years of age ?—I do not know one. I cannot name one.

15,221. Did you ever work in bad air ?—Yes. I have wrought in all kinds of air.

15,222. Did you ever work where you were obliged to put the candle on one side that it should keep alight ?—No. I never would go there ; that is not a place for a man to work in, that is where the damp strikes in.

15,223. The men sometimes do work in that, do they not ?—They do, but they had better have gone home.

15,224. But they sometimes work in it ?—They cannot when the candle is that way. They cannot work in the mines in that way ; they cannot bore their holes you see, and they cannot breathe.

15,225. How long is the smoke clearing away where you are working now ?—The wind is like to blow your cap off your head. It is going directly near where we are working now.

15,226. In some places does the powder smoke hang about a long time ?—Yes ; but there is a difference of places ; it depends upon how they are ventilated at the mine.

15,227. If you are putting in a rise will not the smoke remain there until the rise be carried up to the upper place to which it is going ?—The smoke will hang there till she be through.

15,228. How long will it hang about there ?—I cannot say. There are different places for that.

15,229. How long have you seen it hang about ?—I am sure I cannot give it a name.

15,230. Have you seen it hang about for half an hour ?—Yes, and then we smoke our pipe till it gets off.

15,231. Then you go and sit down and smoke your pipes for half an hour till it clears away ?—Yes, when we are in places like that.

15,232. Do you ever have to smoke for an hour ?—I hardly know that ; I will not say that. We work by measure ; we must have our measure.

15,233. (*Mr. Davey.*) Has there been any improvement in the ventilation within the last 10 years in the Derwent mines ?—They are well ventilated.

15,234. Has there been any improvement or is the ventilation better now than it was 10 years ago ?—I do not know. I have been in it for 10 years, and I think it will be improved. There are some levels getting forward and shafts sunk and things of that sort, but they are not like a coal pit.

15,235. You have more winzes and rises through the levels than you have in a coal pit ?—Yes ; and we have good ventilation that way.

15,236. Where you used not to have ?—Yes. We are underneath ; it used to be all up and down, but we get underneath now. We work up now. It used to be formerly down and lifting the work up, but now it falls down where the shaft is being sunk down deeper. It used to be to lift up by hand to the shafts. They have become quite improved in my time.

15,237. You say that you suffer a good deal from the dust in boring ?—Yes.

15,238. Why do you not put water into the holes ?—In every situation you cannot do that. When you are boring upwards you cannot put water in.

15,239. Do you usually put water in if you are boring down ?—Yes ; not always, but nearly so, for our own convenience. We can bore as fast again with water.

15,240. (*Mr. Holland.*) Is it common for the miners to suffer from the same disease that you have ?—I dare say it will be.

15,241. Do you not know whether it is so or not ?—I do not know for all men. I have seen some.

15,242. Is it common for a man below the age of 40 ?—I cannot say the age. I had nothing of it at 40.

The witness withdrew.

Mr. GEORGE DENT examined.

Mr. G. Dent.

15,243. (*Chairman.*) Where are you working now ?—In the Derwent mines.

15,244. How long have you been working there ?—I have wrought for 36 years in there.

15,245. How old are you ?—I was 50 last January.

15,246. Are you at all affected in your breathing ?—Yes.

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15,247. How long is it since you have been so affected ?—As near as I can say, about six years.

15,248. How did it first come on ?—Something similar to asthma.

15,249. Did it come on with a cough ?—Yes.

15,250. Have you taken any cold ?—No ; it was not by cold. It was just something like cough, as if I had some phlegm that I wanted to get rid of. After that you feel more freely to breathe.

15,251. Can you at all explain how it was brought on ?—I cannot explain that ; but I had what I thought a reason, I may be wrong. But I was working in an end where all the draught of air was coming, and all the men were working before us, and the smoke all met us in the face I had been working in a place before which our master considered the worst place in the mines. I did not feel affected in it ; but after we came to the place I have mentioned, where that smoke met us and the dust, I felt that it affected me.

15,252. Was it considered the worst place on account of the bad air in it ?—Yes ; it was what we call bad air. There was no communication to it ; it was a rise that we were putting up to cause air.

15,253. When you are putting up a rise the air is bad, is it not, until you effect a communication ?—Of course, it must be.

15,254 When that is the case, does the candle burn badly ?—Very poor ; we have to keep it in by holding it slanting.

15,255. Must that always be the case when you are putting in a rise, or sinking ?—It is not always the case ; it sometimes happens that the air cannot be got by the boxes, and sometimes we get a water-blast. Sometimes there is a little machine, something like what we call a fan-blast, and that is used to get air to us.

15,256. When there is nothing used, the air is bad ?—Yes ; it is very bad. We had a fan-blast in that place, but there was no good air. When that fan-blast was put there, the air that came was not good.

15,257. It is important, is it not, that the fan-blast should always be where the air is good ?—Of course ; but it cannot always be got.

15,258. Could they not put in a water-blast ?—Sometimes they cannot, and sometimes they can.

15,259. They have not always water ?—No ; and they have not perhaps a convenience for getting that water away when there is no pumping machine, or else the water-blast is the best, decidedly.

15,260. Have you often worked in those rises where the air has been bad ?—I have worked in three that I remember, which were considered the worst in our mines. I have wrought in what we call plate drifts, and they are the worst for affecting the wind. I worked for four years there. They are what might be termed wet.

15,261. And did not that affect you at all ?—Not in that day. I was younger then.

15,262. Did it not produce any unpleasant sensation at the time ?—Yes, it did, because the plate dust lies more heavily upon you than any other dust, and after you get out you feel that there is a general clogging in your breast, till after a little exercise, and then you get rid of it.

15,263. Did it affect your knees at all, or your head ?—The head is generally affected if the air is poor, and so are your knees.

15,264. Do you walk out by the level from the mine, or have you to climb up ?—The general way in our mines is climbing, in the part of the mine that I work in.

15,265. What is the greatest distance that you have to climb now ?—100 fathoms.

15,266. Does not that affect you very much ?—Yes ; but I go there every day, notwithstanding.

15,267. How is the ore taken out from there ?—It is taken out by machines. The water-machine draws the ore.

15,268. There is no machine for the men to go up and down by ?—No.

15,269. There are only ladders ?—No.

15,270. Are the ladder-ways separate from the air shaft ?—They are both ways in our mine. We have one at one part of the mine, and that is the engine-shaft, and we have a separate footway by the side of the drawing shaft.

15,271. Are the ladder-ways separated from the drawing shaft ?—Yes.

15,272. How are they separated, by wood ?—The drawing shaft does not come into it at all, but in the pumping shaft they are separated.

13,273. Is the footway separated by a brattice ?—They are not separated by bratticing entirely all down, but there is one part in the mine, a new one that they are making now, where they are making an entire separation ; there is a brattice all the way down for the footpath. I am what they call woodman to the mine ; I am in all parts of the mine.

15,274. You do not now work as a miner ?—No.

15,275. I suppose you could not perform the labour of a miner ?—Yes, and do the same thing as ever I did ; as to following the waggons to the tramway, that I suppose I could not do, I am too short in the breathing ; but we say generally that it suits the young men.

15,276. Is any place to be seen now, where the miners are working, and where the candle has to be put to the side ?—Not in the part of the mine that I work in, or not to my knowledge ; there might be a place.

15,277. Have you the charge of all the timbering in the mine ?—Yes ; there is another man with me in my part.

15,278. Is there a man whose business it is especially to look after the timber ?—There is a masterman, and he is in every day, and he directs us ; we have a special order from him, that if we see any failing to go direct and put it to rights.

15,279. What are the lengths of the ladders ?—They vary all the way from 12 to 18 feet.

15,280. At the bottom of the ladders, is it boarded over ?—Yes, and made all quite close, there is just a hole so that a man can go through.

15,281. (*Mr. Davey.*) Is it at Jeffery's shaft that you work ?—No, I do not work there ; it is called Ramshaw shaft.

15,282. If you come up from underground, there is no necessity to go up direct by the footpath ; cannot you go up through the winzes ?—We can ; but still we must have climbing.

15,283. But not continuous climbing ?—No, not straight up.

15,284. Do the men generally come up by the shaft, or by those winzes ?—That just depends upon how the men are working ; in the part where I am our pumping shaft goes down, and she is driven away some 100 or 150 fathoms from that, as near as I can say. I do not say that it is exactly so, because I never measured it, but it is about that ; from that we have a drawing shaft, and then she is driven away from that again. There are drifts to come back to the stepways or footways ; but we always go to the footway or out at the engine-shaft at Ramshaw.

15,285. Are you a native of this place ?—No, I came from the south when I was six months old ; I came from Yorkshire.

15,286. Do you consider that any improvement in the ventilation of the Derwent mines has taken place within the last 10 years ?—I think there has been some improvements ; I have wrought in them all my life, and I never worked for any other company.

15,287. Had you more men ill 10 or 15 years ago than you have now ?—I never knew the men very much affected in our mines ; after they come to my age they are all more or less affected.

The witness withdrew.

Mr. THOMAS WARE examined.

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15,288. (*Chairman.*) Are you the manager of mines in this district?—Yes.

15,289. What are their names? — Stone Croft and Grey Side.

15,290. Are they lead mines?—Yes.

15,291. How many men do you employ underground?—About 60.

15,292. About how many men are employed altogether upon the mines?—We have about 130 men and boys.

15,293. Do you smelt the ore?—No.

15,294. How are the other men employed on the surface?—In dressing the ore; some are smiths, engine-men, and labourers.

15,295. How do they enter the mine?—At the adit level.

15,296. How deep is the mine below the adit level?—About 30 fathoms, that is our deepest working.

15,297. What is the length of the longest level?—Our longest level is about 400 fathoms.

15,298. Are there shafts from that level to the surface?—There are two main shafts.

15,299. How far below that longest level are you working?—About 14 fathoms.

15,300. About how many levels are there?—We have four levels.

15,301. Are they all working now?—No, we only work two of them.

15,302. Are they the two lowest ones?—Yes.

15,303. How many men are working in the longest level?—About half of them, between 20 and 30.

15,304. How do the miners go down, by ladders?—Yes, and they come up by climbing.

15,305. From the adit level?—Yes.

15,306. How is the ore brought up?—By steam power and cages.

15,307. Is it brought to the surface, or only to the adit level?—It is brought to the adit level in waggons, thence to the dressing floors by horses.

15,308. Do you let your bargains by the month or by the quarter?—By the month, so many fathoms or a month.

15,309. Have you any tribute-men?—No.

15,310. In paying the men do you keep so much in hand?—We keep a week in hand until we can get our accounts made up.

15,311. Is there a doctor attached to the mines?—No; we have no doctor.

15,312. Is there any club money paid?—No; I have tried the men, and have brought that matter before them several times, but they do not seem to see the benefit that would arise from it, and we do not like to enforce it.

15,313. What allowance of candles is made to the men?—We do not allow them more than 2 lbs. a week; some of them do not get more than a pound and a half, just what they look for.

15,314. What do they pay per pound for the candles?—6*s.* 6*d.* a dozen pounds; sometimes 7*s.* We charge them just what we contract for. If they are high we charge 7*s.* a dozen pounds, if they are lower we charge them less.

15,315. What do you charge them for powder?—16*s.* for what we call a quarter barrel of 25 lbs.

15,316. Does that vary according to the contract price?—Yes.

15,317. Do the miners pay anything for the sharpening of their tools?—No; we do not charge anything for that. We provide the tools, and they pay for short weight. They are weighed in once in two months, and we deduct for short weight.

15,318. How many shifts do they work in 24 hours?—They reckon to work five in a week.

15,319. But I mean in the course of 24 hours, do they work in two shifts of eight men?—We work three eight-hour shifts in some places.

15,320. Do they work at night?—Yes.

15,321. Is a bargain let to six men?—Yes; to six, and to four men; it depends upon the place. In what we call ends we work with six. The stopes or head ends, which is the term here, we work them to the best advantage, sometimes two and sometimes four.

15,322. Are there any places where you are obliged to provide artificial ventilation?—In some places we have a fan-blast, that is, at two places, and they are worked by a water-wheel.

15,323. Is the air carried in wooden or in iron pipes?—In iron pipes. We have at one part wooden pipes for a short distance, but not long.

15,324. The fan is worked by a water-wheel?—Yes.

15,325. Do you find that that is quite effectual?—Yes.

15,326. How soon does the powder smoke clear away when that is at work?—It depends partly upon the weather at the surface. In very hot weather it does not get away so fast, when there is not much of a breeze outside.

15,327. Is one shaft always up-cast, or does it vary?—It varies; sometimes it is down cast. It depends partly upon the wind and the weather outside. It is not always an up-cast.

15,328. Is the one shaft that is up-cast any higher than the other one?—Yes.

15,329. But that does not ensure its always being an up-cast?—No; but generally speaking that is the up-cast shaft.

15,330. Are there any men working in the mine who are at all affected in their breathing?—No; ours is only a young mine. It was commenced in 1851, and we have not many old miners; they are generally young men.

15,331. Have you ever worked in a mine in Devonshire?—Yes.

15,332. Have you worked in mines in Cornwall?—No.

15,333. In what mines in Devonshire have you worked?—In Devon, Great Consols, and Old Wheal Friendship.

15,334. How long have you had the management of these mines?—Going on six years.

15,335. Have you any Cornish men working in your mines?—We have had some, but none at present.

15,336. Are the men who work in the mines mostly from this district?—Chiefly from Allen Heads, and round about the neighbourhood.

15,337. Do they live near the mines?—Some of them, and we have some of what they call wallet men, that is, men who carry wallets, from Alston and Allendale; and some of them come from Haydon Bridge, a distance of three miles.

15,338. Have you any shops for them?—Only one.

15,339. Where do the men who carry their wallets put up?—At the cottages. The people take them in at so much a week; they pay so much for four or five days; a great many of them try to get away on the fourth day. They all get away on the Friday, and sometimes they get away on the Thursday night.

15,340. Is that in violation of their bargain?—Rather. When I first came there the afternoon and night men worked but four shifts a week; but now they work five, some of them, but not at all times.

15,341. Do you not think that there is rather a want of cottages near the mines?—I do not know; I have built some cottages, or rather the company have. They built two, and we have had a great difficulty in letting them; the men prefer going elsewhere.

15,342. Have any of those men who come from a distance a piece of land and a cow?—I believe they have a piece of land and keep a cow; some of them I know have.

15,343. Probably that is the reason why they will not reside on the mine?—Yes; I think that that is partly the cause of it.

15,344. Is your mine at all wet?—No; although

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we have a great quantity of water to pump the workings are not wet but very dry indeed.

13,345. Have any accidents occurred from blasting ?--Only one, about a year and a half since ; we tapped a large quantity of water and we were drowned out for six or eight months ; the workmen's tools were left underground; we do not use any safety fuze, and the pricker that was left in got corroded ; the men did not bring it out to have it filed down and made smooth. I attribute the accident to that, in putting in the powder and rubbing it against the side of the rock which caused the powder to ignite from the roughness of the pricker.

15,346. Was it an iron one ?--Yes.

15,347. If it had been made smooth you do not think the accident would have happened ?--No.

15,348. Do the men use a straw ?—A paper match generally ; some of them use a straw.

15,349. (*Mr. Davey.*) Are the cottages very much crowded where the men obtain their lodgings ?—I have not examined them ; but I know that some of them must be crowded from the number of people they have ; our own cottages are not so much crowded.

15,350. But are the cottages where the men are taken in as lodgers crowded ?—Yes ; some of them must be crowded.

15,351. Do the men have separate beds ?—I think some of them sleep two in a bed, and upon occasions I have known them to sleep three in a bed.

15,352. In making shifts does one party get out of bed and the other turn into the same bed ?—I cannot answer that question ; I do not know ; I have heard them talk of sleeping three in a bed.

15,353. (*Mr. Kendall.*) Do you know what they pay for their lodgings ?—In some places 9*d.*, in others 1*s.* a week, which is the highest.

15,354. What is done for them for that 1*s.* ; do they get their washing done ?—Nothing at all ; they have to cook their own food.

15,355. As far as you have observed is the ventilation good in your mines ?—Yes ; I consider it good; there are some places that you cannot ventilate when you are sinking sumpts and winzes to ventilate a place; you will occasionally have a place that is bad.

15,356. Have you had a place that was had lately ?—We have one that is not very good just now.

15,357. In what part of the mine is that ?—I have a plan here upon which I will show you (*pointing out the same*).

15,358. At 35 fathoms from the adit level going west the ventilation is bad ?—Yes.

15,359. How far must you drive before you effect a communication ?—From eight to nine fathoms.

15,360. Before you can communicate you will have to drive over 40 fathoms ?—Yes.

15,361. How do you send the air in to the men who are now working at that end ?—It comes up from the adit level.

15,362. As I understand you, a great portion of the 35 fathoms is already worked away ?—Yes ; we are obliged to work it whether it is good or not to ventilate to a certain extent ; there is a little ore in it.

15,363. Is it bratticed at all ?—Yes ; it is boarded.

15,364. It is sollered over to within about 12 or 14 fathoms of the end ?—Yes.

15,365. And notwithstanding that the ventilation is bad ?—It is not bad, and it is not good.

15,366. Are the men obliged to hold the candles on the slope ?—No, not at all ; the candles burn upright.

15,367. How many men are working at a time ?—Two men at a time.

15,368. How many shifts have you ?--Three.

15,369. Are you sinking a winze at the same time from the 15 fathoms ?—Yes.

15,370. How far down is it ?—Between three and four fathoms.

15,371. How long will it be before you hole ?—Between three and four months.

15,372. Shall you use any fan ?--We have not put in any yet ; and unles it gets worse we shall not put in any.

15,373. Do the men appear to suffer when they come out, do they complain ?—Sometimes they do.

15,374. It depends upon the state of the atmosphere, does it not ?—Yes. I have heard them complain occasionally, but not often.

15,375. Do you observe anything in their looks indicative of suffering on their part ?--Nothing more than in the other men.

15,376. Are they young men, generally, or old men who are there ?--Young men generally ; some of them are about 35.

15,377. Is that the result of accident, or do you choose them ?--No. We take them as they come.

15,378. Would the older men refuse to work there ?—No. I may have two or three that I have taken on recently just to give them bread, who might object to going there. Some very old miners, who are not able to do much, might object to going in ; but in fact I would not put them into a place of that kind.

The witness withdrew.

Mr. JOSEPH DENNING examined.

Mr. J. Denning.

15,379. (*Chairman.*) Do you reside in this district ?—I reside seven miles west of this place.

15,380. Have you the charge of some smelting works ?--Yes.

15,381. Are you acquainted with the mining district about this neighbourhood ?—Yes. I think generally, very much indirectly. In some cases directly. I am principal lessee of one pretty extensive mine in Alston Moor. I am also a partner in another of rather an extensive character, but my business necessarily leads me into direct communication with the lessees of mines in Alston Moor and the district generally, in the way of buying ores.

15,382. Do you ever go underground ?--Occasionally, in my own mine. I do occasionally ; once a quarter or once in six months, as the case might be.

15,383. Are the mines to which you refer all lead mines ?--Yes. I am also a colliery owner.

15,384. In the mines which you are referring to have you observed that the men working in them suffer at all ?—I think not ; not generally. Of course I do believe that they sustain more or less injury. I do think that.

15,385. Do you think that they sustain more injury than from working in coal mines ?--Yes, I think so.

15,386. In what way do you think the miners are injured ?—I presume that it arises from impure air and from the nature of their work ; that is, from the dust that necessarily arises from drilling the holes, and from the nature of the work generally, from its dirty character. Of course they cannot stir the material, as it is like all matter, without making more or less dust, and that being necessarily inhaled into the lungs will do them injury. Generally speaking, you find the miners a little injured in their breathing, and even young men, who I fancy are not predisposed to it, but they become so from the nature of their work.

15,387. At what age do you think the miners generally become so affected ?—I fancy that if they work for a few years they will become affected. Indeed I know several young men, or at any rate men of about my own age, that are almost breathless. They cannot walk scarcely 100 yards without being affected, and of course they attribute, I fancy, that defect in their breathing most particularly to the nature of their employment. Six or nine months or 12 months are quite enough to work in one of these bad places to produce that result.

15,388. I suppose working in bad places means

driving an end or rise without much air?—Yes; without having proper ventilation.

15,389. Is it not necessary when driving in order to effect a junction with two levels to get ventilation?—Yes; that is done occasionally of course, but where there are other mechanical contrivances wanting they are obliged to do it.

15,390. Are the miners paid more for performing their work under those circumstances?—There is no mistake about that. The men must have more wages for fewer hours and less labour.

15,391. When they are driving any of these close fore-ends they are paid more and work less?—Decidedly so.

15,392. That is rather an inducement, is it not, for the young men to undertake that kind of work?—I presume that for the most part, young men are put to that kind of work; indeed, it is generally work that is done in an emergency, and they employ young men upon it in order to expedite the work, at least that is I think the general object for putting them upon it.

15,393. They do that work to the injury of their health?—Yes, sometimes people are, and in fact you find it frequently so, careless as to these consequences.

15,394. In Alston Moor are there any of these places where they have driven?—I think not, not particularly; I could not mention one instance specially, but I fancy that that sort of thing occasionally arises in many of the mines in the district; but at the same time I presume, as far as I know the disposition of the parties, that they do their utmost to remedy that state of things.

15,395. When they are sinking deeper, is there any alteration made in the dues; is there any reduction made in consequence of these deeper workings?—Yes, very recently here in this district, a reduction has been going on over the last few years, but more generally in the last two years, and that was given in consideration of their putting a larger proportion, or at least a certain proportion, of men underground by way of making new trials; for, it is generally understood I think, in the district of Alston Moor, that the veins are about exhausted, so far as the veins that have been already discovered go, that they are pretty well worked out; and now they are making efforts to get down deeper, and of course the deeper down they go, the worse ventilation there is; and until the excavations are made below, so as to produce a proper communication backwards and forwards with the air, the men will necessarily suffer more or less.

15,396. The men, I presume, are likely to suffer still more, the deeper the excavations are made?—Unquestionably; but at the same time they are not deep mines.

15,397. The levels are driven in a long way from the air, are they not?—Yes.

15,398. I suppose you have seen artificial means of ventilation resorted to?—Yes, we have occasionally used them.

15,399. What kind of artificial means should you recommend as the best?—Either water-blast, or fan-blast, either of them.

15,400. Do you mean a fan-blast worked by a water-wheel?—Worked both by hand and by a water-wheel.

15,401. Is the hand fan-blast as efficient as the other?—It entirely depends upon how far you want to convey the air.

15,402. How far can you convey it by the fan-blast?—I fancy it can be conveyed 300 or 600 yards.

15,403. Is there any difference whether you send the air in wooden or in iron pipes?—There is a sort of tin pipe that is generally used in our district; but I think that wooden boxes are a still more general practice.

15,404. Are there any iron pipes used?—Yes, but they are not of such general adoption; the others come cheaper, and answer the same purpose, or they are something like the same thing.

15,405. Are there any peculiar accidents incident to the mining as carried on here?—They are very rare I think.

15,406. Not from the falling of the earth or the roof?—I think that the mines are generally conducted on safe principles, every precaution I think is used, and when an accident has occurred it has generally arisen from some carelessness or from some uncontrollable and unforeseen circumstance.

15,407. The miners are not, from the nature of the ground they work in, peculiarly liable to accident?—Not at all; of course it is a rock, and they generally should leave sufficient strength in the galleries; but of course the nature of the labour is of a dangerous character.

15,408. In the instances where the works have been abandoned, are the shafts closed up?—That is not I dare say universally done; but there was a case that occurred in our neighbourhood about two years ago of a man who was not perhaps of the most temperate habits; the bargain days came round once a quarter or six months, and on a bargaining day this man along with his partners came to take his bargain, and upon such occasions he sometimes got upon what they call a spree; he was overtaken by drink, was away from his home for three or four days; enquiries were then made for him, and he was found at last at the bottom of a shaft dead.

15,409. Was the shaft unprotected, that even a sober man might have fallen down it?—I cannot speak to that, for I did not see it.

15,410. (*Mr. Kendall.*) Is it customary or not in this country to leave the shafts open?—They are left open for the purpose of forming a communication between, perhaps, a newer working and an older one.

15,411. Is any guard or fence put round them?—It was not so in the case I have referred to; but, generally speaking, there is.

15,412. There are instances, I suppose, of carelessness in that respect?—I presume so.

15,413. (*Mr. Holland.*) Are the shafts fenced round generally?—They are walled round generally. A masonry wall is put round the shaft top; if not, they put wood across.

The witness withdrew.

Mr. GEORGE HENDERSON examined.

15,414. (*Chairman.*) What is the name of the mine of which you have charge?—Fallowfield.

15,415. Is it an extensive mine?—Not very extensive.

15,416. How many men are there employed underground?—About 50 pickmen, besides other labourers.

15,417. How do the men enter the mine?—They have a climbing way, and they also go down the shaft.

15,418. Is the lode followed from the adit by the climbing way?—It is down from the surface.

15,419. Do the miners go down the shaft in cages?—Yes.

15,420. Are there any safety catches to the cage?—Yes.

15,421. Does it work well?—Yes.

15,422. Have any accidents ever occured?—Never in the shafts.

15,423. Has no accident occured from the use of the cage?—No; we have never had an accident in the shaft at all.

15,424. Is it a wet mine?—Middling.

15,425. Do you pump by steam?—Yes.

15,426. Do the men change their clothes when they go down below?—Sometimes; not very often until they come home.

15,427. Is there any place upon the mine where they can change their clothes?—When they do

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change their clothes they change them in the engine-house.

15,428. In the boiler-house?—Yes; they hang their clothes by the side of the boiler to dry.

15,429. What is the deepest level at which you are now working?—About 55 fathoms. The mine has been wrought deeper in my time as a lead mine only, and sometime previously, the mine was extensively wrought as a lead mine. Now it is principally wrought as a carbonate of barites mine and lead mine also.

15,430. What is the produce of your mine?—Carbonate of barites and lead ore.

15,431. Is there good demand for it?—Yes.

15,432. Are there any other mines of a similar description in the neighbourhood?—Not that yield any quantity of carbonate of barites; it is a common mineral, but it is not found in large quantities, at least not in the north of England.

15,433. What is the height of the levels?—Generally six feet under the timber, when it is necessary to put timber, and four feet wide.

15,434. In driving do you meet with any ends where the air is bad?—Yes; sometimes.

15,435. What do you do when that is the case?—We generally contrive to make a current of air play on the place, either by artificial means or by natural means, just which is most convenient; we always find that it is most advantageous to make the air good for the workmen.

15,436. What are the artificial means that you resort to in that case?—The fan blast generally, when we have to do it.

15,437. Is it worked by an engine?—It is worked both ways; sometimes it is worked by hand when only for a temporary purpose.

15,438. What pipes do you use?—We generally use wooden boxes; we have some metal pipes, but generally we use wooden boxes.

15,439. Have any accidents occurred in the mine from blasting?—No, we never had any.

15,440. Do you use the safety fuze?—Not extensively, only in sinking when there is wet work: we find it very beneficial in any place where much water comes out; but in a general way we do not use it.

15,441. Is there any reason why it should not be generally used?—I think that the other is more effectual, except in these cases, and then it is very useful.

15,442. Is a straw or paper match in use?—Paper.

15,443. Is there any club in your mine?—Not connected with the mine; there is one in the village.

15,444. Is there any deduction made for the club?—Not any.

15,445. What do the men pay for candles?—Just what they cost; we find them with the candles and they are charged the same as they cost.

15,446. Is there a fixed allowance per week to the men?—No; they take what they find necessary to use; some men who are working not on contracts are allowed a certain quantity per week, in addition to their wages; but in the case of the men who have contracts, they take what quantity they choose, and we deduct the amount from their accounts.

15,447. And is the practice the same with regard to the powder?—Just the same with the powder.

15,448. Are the tools weighed?—Yes; they are weighed.

The witness withdrew.

Adjourned to To-morrow at Allendale Town.

ALLENDALE TOWN.

Wednesday, 8th October 1862.

PRESENT:

The Right Honourable Lord KINNAIRD, K.T.
NICHOLAS RENDALL, Esq., M.P.
H. AUSTIN BRUCE, Esq., M.P.
RICHARD DAVEY, Esq., M.P.
P. H. HOLLAND, Esq.

The Right Honourable Lord KINNAIRD, K.T. in the Chair.

Mr. JOHN RIDLEY examined.

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15,449. (*Chairman*). Which of the Allenheads mines do you manage?—Coalclough.

15,450. Is that West Allenheads?—Yes.

15,451. Does that join the Nenthead mines?—Yes, it communicates with the Nenthead mines.

15,452. Are there any others in the western district of the Allenheads mines besides that?—It communicates with Swinhope on the east side and with Nenthead on the west.

15,453. There is no other mine?—No other mine.

15,454. How many men have you employed underground?—278 underground.

15,455. Have you any smelting works there?—No.

15,456. Are there any boys among that number?—Yes.

15,457. What is the youngest age at which they go underground?—We have some boys who blow the machine occasionally, and they go in when they are about 12 or 14. Then amongst these we have 14 under 16 years of age.

15,458. Do the men work double or single handed there?—Double.

15,459. How do they go underground; by the adit level?—Yes, they have what they call waggonettes, and they ride along on those and take their working tools with them.

15,460. (*Mr. Austin Bruce.*) How far do they go generally?—From a mile to two miles.

15,461. (*Chairman.*) Are there shafts communicating with that horse level?—Yes.

15,462. About how many?—That is rather a difficult question to answer. I have a short report here, which is something like a general outline (*producing the same.*) There are so many shafts that it is difficult to count them; it cannot be done; and there are communications between the different levels, what we call rises and sumpts.

15,463. You cannot say how many direct shafts there are from the surface?—No.

15,464. But there are several shafts?—Yes. There are not so many shafts from the surface as there are below it communicating with the different levels.

15,465. What is the greatest depth below the level at which the men enter?—The works are all above this level where the men generally enter.

15,466. How do the men go to the higher levels?—By means of what they call rises and sumpts; by ladders.

15,467. Are they all ladders?—They are ladders about half a yard in width, with steps nailed to the sides, and they climb by those.

15,468. They are not regular ladders?—Yes, and in

a general way they are rather upon an incline because the veins incline.

15,469. Are there two or three feet between each two bars which they climb ?—No; they are only about 10 inches.

15,470. Do they climb at all by stemples ?—Yes; sometimes when the rise is not quite finished; but when there is a regular way gate, ladders are put in.

15,471. Are the bargains let quarterly ?—Quarterly.

15,472. Is so much kept in hand on the pay day ?—Yes; the subsistence is 40*s.* per month, and the balance is paid over to them once in a half year.

15,473. But the bargains are quarterly ?—The bargains are quarterly.

15,474. (*Mr. Austin Bruce.*) Do they get any other advance except the subsistence of 40*s.* a month ?—No; some parties sometimes apply for a little more in case they stand in need, and in those cases it is never refused when a man is in needy circumstances; but very few of the men ever ask for such a thing.

15,475. (*Chairman.*) Then all men get it equally ?—Yes; 40*s* per month.

15,476. What happens if, at the end of the half year, they have not earned that amount ?—They go into arrear.

15,477. Is that deducted off the following half year ?—Mr. Beaumont arranges it in this way: supposing that 5*l.* is in arrear, 50*s.* is struck off, and 50*s.* goes on to be deducted in the next half year, in case the man has earned it.

15,478. Whatever the arrear is Mr. Beaumont strikes off one half ?—Yes; it is lost sight of altogether.

15,479. Does that occasionally happen ?—Very seldom; sometimes.

15,480. Do the men live near the mines ?—The greatest part of them. They have to go a short distance; they come down the country about two miles or so, and they get to their own homes at night.

15,481. Have you any shops or lodging houses ?—No; nothing of that sort is required; some of them get lodgings about the place.

15,482. Is it a wet mine ?—It is a very dry mine; there is a little water occasionally.

15,483. The men do not change when they go into the mine ?—They never change.

15,484. Should you say that the men are generally healthy ?—I think they are.

15,485. Have you any men at all affected in their breathing that you know of ?—Some of them after they arrive at about 50 years of age or so are affected a little. There may be some affected a little earlier, but there are not many.

15,486. What does that arise from ?—I do not know much about things of that sort. It may arise chiefly from the dust, I should think, when they are beginning to drill the holes. It creates a dust, and they have to breathe in some of that in certain places.

15,487. Do not they use water to get rid of that dust ?—No; I think that that can scarcely be applied.

15,488. Do they not use water in boring the holes ?—Yes, sometimes when they have the advantage; if they drive a hole downwards, they occasionally put water in.

15,489. But, it is not universally used ?—No.

15,490. They are not supplied with water for the purpose ?—No.

15,491. Have you any accidents from blasting ?—Very seldom. There have not been above two or three in my recollection. I think there may have been some smaller ones, but very few accidents; the men are very careful in regard to gunpowder.

15,492. How do they take the gunpowder down, in tin ?—They have bags generally; our miners have bags. They sometimes take in a quarter barrel at a time when the mine is dry, and put it in a convenient place, others sometimes take the gunpowder to some of their own places and put it where it is safe, and carry it in woollen bags.

15,493. What do they bore with; have they all iron borers ?—No, they are steel borers.

15,494. What do they use as a tamping rod ?—They are generally made of iron, but there is a little steel on the end, they are what are called the hammers.

15,495. Do they use the safety fuze ?—No. They make squibs of paper.

15,496. And they use a pricker ?—Yes.

15,497. Is it an iron or a copper pricker ?—Generally copper now; they did use iron, but most of them have copper prickers now.

15,498. Do you supply the tools ?—They are supplied at the works, but they buy them.

15,499. Then the tools are not weighed for loss of weight ?—They buy them at first, they buy them sometimes by the dozen, and wear them down until they are a certain length, and then get two of them welded together.

15,500. Do you supply candles ?—No, they buy their candles as well, and gunpowder.

15,501. What do they pay a pound for the candles ?—Mr. Beaumont buys the candles, and they are charged just what he pays. They are charged to the miners at 6*s.* or 6*s.* 2*d.* a dozen.

15,502. And gunpowder the same ?—Yes.

15,503. Is there any club ?—Yes, there is benefit society.

15,504. Is that belonging to the mine ?—Mr. Beaumont contributes to it.

15,505. Is there any deduction made from the pay of the men for it ?—No.

15,506. Is there a doctor attached to the mine ?—Yes; Mr. Beaumont pays a part of his salary, and a part he gets by practice otherwise amongst us.

15,507. Is he obliged to attend any man ?—Yes, he is obliged to attend Mr. Beaumont's men.

15,508. For sickness ?—For sickness, and everything else in fact.

15,509. Do the men pay anything towards it ?—Yes, they pay 5*s.* a year for the head of the family, and if he has any sons working in the mines, they are charged 2*s.* 6*d.*

15,510. Does the doctor attend the family for that, or only the men ?—He attends the family, unless a son or daughter leaves the family and goes elsewhere and falls sick, and then I believe he can charge; but as long as they remain altogether as a family, what I have stated is the regulation.

15,511. Do the men ever make any objection to the doctor ?—No, we have had the doctor I dare say 20 years now, and he suits the people very well; they like him very well.

15,512. Do you use timbering or stone for the arching generally ?—Both, but chiefly timber.

15,513. Is there ever any accident from the falling of the ground ?—I do not recollect any.

15,514. In which level should you say there is the worst air ?—We have very few places of that description, they are all very near to where there is a circulation. We have one or two levels which are between 20 and 30 fathoms driven, where it is a little bad, and in those places we supply them with an air machine or some other blast, we sometimes get a water blast.

15,515. At which level should we find it if we went to see it ?—There is a level which we call the Captain's level, and there is one in Whitewood vein, where they are just beginning to rise; that is as close an end as any which we have, I think.

15,516. (*Mr. Austin Bruce.*) Where is the Captain's level ?—It is a little to the east of the West Boundary.

15,517. Is is near Coalclough ?—Yes; it is in Coalclough mine.

15,518. (*Chairman.*) How far in by the horse level is it ?—It is nearly two miles, but there is a communication all the way.

15,519. How many fathoms is this level above the horse level ?—It is just at what we call the

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random, it is run in the same level as the horse level.

15,520. (*Mr. Austin Bruce.*) What is the meaning of the word "random" in this district?—It is running on at a certain level, and it has a reference to the stratum; whatever stratum it is in, it is at that random.

15,521. (*Chairman.*) Have you any ventilating machine now worked by water?—We have one, a pressure, water blast, and a few air machines, turned by hand.

15,522. Is the air carried in iron or wooden pipes?—In iron pipes generally.

15,523. Are they taken up into the rises?—Yes; wherever it is wanted.

15,524. When it is going up into the rises do you take any precaution against the stuff falling into it?—Yes, of course.

15,525. What precaution?—There is sometimes a brattice.

15,526. If you take the iron piping for the air up into a rise, what is to prevent the earth falling into it and stopping it up?—They put a wooden box at the end of the iron one, with a grate or piece of sieve to cover it, and there is a wooden box at the bottom, where there is a sluice to let the dust out.

15,527. (*Mr. Davey.*) You say that some of your men live in lodgings in the neighbourhood of the mines, are they much crowded?—No, they are not crowded; there are perhaps two or three lodgers in a certain family where they have convenience.

15,528. They have some home occupation, have they not?—Some of them work little farms as well as work at the mines.

15,529. What size do you generally carry your levels?—About six and a hal feet is the general height, and they are four feet in width.

15,530. What is the greatest distance which you have from any shaft or from any place where you can ventilate?—Between 20 and 30 fathoms.

15,531. How do you find the air in that place?—When they go beyond 20 fathoms we generally think they require an air machine, and that is when it is set to work.

15,532. And does that remedy the defect? Yes.

15,533. (*Mr. Austin Bruce.*) At what age do they usually begin to work as miners?—16 or 17. On this list there are 14 under 16 years of age out of 278.

15,534. What do you suppose is the age of the youngest among those?—15 years.

15,535. Are they doing men's work?—Not quite: some of these are along with their fathers; they sometimes take a son in before he is fit for what we call a bargain, and he works along with his father.

15,536. What employments have they up to the age of 15 or 16?—They are generally on the washing floor.

15,537. On the surface?—On the surface.

15,538. Up to what age do they generally continue to work underground?—Perhaps about 50, or from that to 60.

15,539. At what age do they generally give over working underground?—They generally work as long as they can, I think, because some of them are obliged to do so.

15,540. Have you many men in your works above 60 years of age?—There are 67 above 40.

15,541. Have you the number above 50?—No.

15,542. Are you a native of this district?—Yes, of West Allen.

15,543. You have lived in Allen all your life?—I have.

15,544. At the age of 50 is there any difference to be seen between the miner and the farm labourer?—There may be a little; there are old men amongst the miners as well as amongst the farmers.

15,545. Up to what age do they continue working in the mines?—There are some longer and some a shorter time.

15,546. What is the age of the oldest among them?—I should think that the oldest workman that we have may be about 64 or 65, as far as I can recollect. I do not know exactly his age.

15,547. You say that you have 67 men above 40?—Yes.

15,548. How many of those do you think have the asthma?—I really cannot answer that question.

15,549. It is not to be expected that you can give the exact number, but should you say one-third of them, or half of them?—I think that I would not go beyond one-third.

15,550. Do you mean to say therefore that two-thirds of the men leave off working as miners from old age, without having any particular disease affecting the breath?—I would not like to say that, they sometimes leave off and go to something else; some of them fall in for something else after they have wrought in the mines; they work as long as they are able to work at the usual work, though they are not quite as well as they were; they may be affected a little; we call them bad in the wind, that is what the miners call it.

15,551. In your opinion do two-thirds of the more elderly among the miners leave off without anything being the matter with their wind?—I scarcely understand what you want me to answer.

15,552. You say that one-third of those 67 above 40 have their wind affected?—Yes.

15,553. Then I ask you whether two-thirds of the men who leave off working from old age, leave off without anything being the matter with their wind, except such as would arise from the weakness of old age?—Perhaps many do not leave off unless they are affected a little in their wind.

15,554. Do the men ever make complaints to you of insufficient air?—Very seldom, because we soon know when they require more air.

15,555. When they do complain to you, what is your course?—We generally make the working men comfortable as soon as we possibly can.

15,556. Are their complaints always attended to?—I think they are.

15,557. Did you ever know them make unreasonable complaints?—It is very seldom that they make any complaints. If they make application that they want an air machine, or anything of that sort, then, if we consider it necessary, we set to work and get a machine in as soon as we can; that is the practice.

15,558. You have never had anything amounting to disputes with them upon those subjects?—Never.

15,559. Are they a quiet peaceable set of men on the whole?—Quite so.

15,560. They do not give much trouble?—Very little.

15,561. You say that you have had very few accidents indeed from blasting?—Very few.

15,562. Have you had any other accidents from other causes?—Twice or thrice amongst the boys driving the horses in the level, but it has generally been from carelessness, and not from the working.

15,563. Have any been injured from falling down ladders?—Never.

15,564. Are the men generally able to read and write?—Yes.

15,565. Do all the children go to school?—Yes.

15,566. By whom are the schools maintained?—By Mr. Beaumont.

15,567. Entirely at his own expense?—Yes; he built the schools and he is at the expense of supplying us with teachers, and he pays their salaries.

15,568. Do the men contribute nothing towards the schooling of their children?—All the children who attend pay 6*d.* per month.

15,569. One surgeon attends to all the workmen at Coalclough?—Yes, unless he has a bad case, or anything of that kind, and then he sometimes gets a surgeon from a neighbouring village.

15,570. What is the name of the chief surgeon?—Montgomery.

15,571. (*Mr. Kendall.*) Have you any pumps used at all?—No.

15,572. Not on your mine?—Not on our mine.

15,573. All you use is the common fan before you connect?—We have little air machines which are turned by boys, and there is a blast like a pressure of water.

15,574. The ventilation is generally very good, you say?—It is.

15,575. (*Mr. Holland.*) But there is a good deal of broken-windedness among the men nevertheless?—There is among some of them.

15,576. What do you think is the cause of it?—Something like dust, I think.

15,577. Is that the common opinion among the workmen?—I think it is.

15,578. Does the smoke injure them?—It may injure them a little, but I am under the impression that the dust does them more harm than the smoke.

15,579. Do you think that the candle smoke hurts them?—Perhaps it may a little.

15,580. Is that the opinion of the men, do you think?—I cannot recollect their ever expressing an opinion with regard to it.

15,581. Are they more liable to catch cold than other men?—I do not know; they may perhaps, to a certain extent, when they come out of the mine warm.

15,582. Are they often off work from illness?—They are very seldom off work.

15,583. (*Mr. Davey.*) How far have you driven the deepest level from the day?—About two miles.

15,584. That is principally arched by stone, is it not?—A good deal of this level is arched, but there is not any stone or wood in the greatest part of it at all.

15,585. In arching that ground do you carry an air-drift above it?—No.

The witness withdrew.

Mr. WILLIAM HEWITSON examined.

Mr. W. Hewitson.

15,586. (*Chairman.*) Are you surgeon to one of these mines?—I am surgeon to Mr. Beaumont's mines in East Allendale.

15,587. Have you been so long?—This is my 14th year.

15,588. Is the arrangement by a fixed amount paid by Mr. Beaumont, or do the men pay?—The payment is partly by the men, and Mr. Beaumont makes up the amount to the surgeon. The men only pay a very small amount; in fact it is only 5*s.* per man per year.

15,589. Have you other practice?—Private practice, but very little of that; it is nearly all mining practice.

15,590. During those 14 years have you seen much of what is called in other places miners' disease or shortness of breath?—I have seen a good deal of that.

15,591. How are the men affected?—At first it begins with a little shortness of breath—perhaps a little tickling cough; or a little huskiness in the throat.

15,592. Is it a sort of bronchitis?—It has scarcely arrived at that stage then; it does not go on to that until some little time.

15,593. When you have found that the case, have you ever seen it quite cured when it has begun in that way?—I do not think that I have ever seen it quite cured. Generally matters get worse, unless the men come out, and go to some out-door employment; then I have seen cases remain stationary for a long time, but if they continue to work they get worse as a rule.

15,594. At what age, generally speaking, should you say that they are more affected?—They begin to be affected soon after 40, in a general way; after 50, of course there are more affected.

15,595. Have you ever formed an opinion as to the cause of that?—The opinion which I formed was that it was owing to the dust in the mines settling upon the bronchial tubes, the windpipes, causing irritation and congestion there, and gradually, perhaps, leading on to inflammation and thickening of the bronchial tubes, that is thickening of the lining membrane of the tubes.

15,596. Does it ever arise from poor or bad air?—I am scarcely in a position to say that.

15,597. Do the men, when they come to complain of first feeling it, describe to you at all the place in which they have been working?—Yes, they frequently say that the air was bad.

15,598. What do you think that the men themselves attribute it to when they come to you?—I think that they attribute it to what I have just said, the collection of dust owing to the mines perhaps not being so well ventilated. Of course when the mines are well ventilated they do not feel so much of the dust. There is a current, and it is swept away.

15,599. Would the ventilation take away the dust of the stone or material in which they are working?—I think it would perhaps be more likely to be blown away.

15,600. Do you think that anything arises from candle smoke or powder smoke?—Yes, I think that that is also deleterious.

15,601. Have you ever observed the spit of the men?—Yes, but out of 100 men whom I examined on the 1st and 2nd of this month I found that scarcely one man would complain of any expectoration, although I am aware that nearly all the men do expectorate after working a few years in the mines.

15,602. (*Mr. Austin Bruce.*) How many of the 100 were affected with difficulty of breathing?—I have certain tables which I marked down at the time. Under 30 years of age I found only five per cent. affected with incipient asthma.

15,603. How many did you examine?—I examined 100. At that ratio I found only five per cent. affected with incipient asthma under 30 years of age. Of course those 100 were men of all ages. Between 30 and 40, 20 per cent. will be found to labour under pulmonary disease of some sort. Between 40 and 50 years of age, 30 per cent. have decided asthma; 50 per cent. have asthma in the incipient stage, and 20 per cent. are free from disease. That is a greater proportion of persons free from disease than I expected to find at that age. Between 50 and 60 years of age all are affected more or less; about 60 per cent. are affected, but not to a great degree; about 40 per cent. are cases of greater severity. Between 60 and 70 all are affected more or less in their breathing.

15,604. (*Chairman.*) How does this asthma affect their general health?—For a long time it does not seem to affect them at all. In fact there are many cases of incipient asthma which are not brought under my notice perhaps for years; they may not come under my care until some attack of bronchitis or severe catarrh, or something of that sort, brings them to me.

15,605. (*Mr. Austin Bruce.*) Is the attack of catarrh much aggravated by asthmatic disease?—I should think that the catarrh aggravates the disease then existing; it is more likely to lead on to inflammation.

15,606. (*Chairman.*) Have you ever examined the men's spit especially?—I have frequently.

15,607. Is it black dust or carbon in your opinion?—I have sometimes seen greyish material in it, but in a general way it looks simply like mucus; and I put that question to nearly all these men, whether they had any expectoration, and very few would admit that they had any expectoration at all, and as regards the few that did admit it, all their explanation was that it was only like phlegm, by which they mean mucus, I suppose.

15,608. When the men are off work from sickness,

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is there any club or provision for them ?—There is a most excellent club at Allenheads.

15,609. Is that independent of the mine ?—It is connected with the works, and Mr. Beaumont himself contributes largely to it.

15,610. It is an independent club ?—Yes ; I think it is principally confined to miners ; a few others have been admitted, but they are only to be admitted on leave from Mr. Sopwith, if they are not miners at the time. It is not exactly confined to miners, because some of Mr. Beaumont's men are out-door labourers —quarrymen.

15,611. Is it optional whether the men enter the club or not ?—Quite so.

15,612. (*Mr. Austin Bruce.*) Have you observed any improvement in the men's health since you have been placed here ?—I cannot say that I have.

15,613. Any change for the better or the worse ?—I do not see very much change in that respect, I have only the men's statement when they say that the mines are much better ventilated than they used to be.

15,614. Have you observed any difference in their health in consequence of that improvement in ventilation ?—I have not.

15,615. Have you ever attended men who professed to have suffered from working in any particular close end ?—No doubt I have done so, although I cannot call it to mind. No doubt some cases of that kind have come under my observation.

15,616. You do not recollect their complaining to you ?—No, I do not.

15,617. Should you say that the life of a man was shortened in consequence of his employment ?—I think so, decidedly.

15,618. To what extent as compared with the surrounding agricultural population ?—I have not been able to ascertain that, but I have looked over the certificates of the cause of death for the last 10 years, of miners who have died in this district that I have attended, and I find that there were 72 deaths in the last ten years, and the united ages of these men amounted to 3,204 years, giving 44½ years as the average age of each miner in my district.

15,619. Have you compared that with any number of agricultural labourers ?—No ; I have not had an opportunity of doing so.

15,620. Do you believe that to be below the average of a similar number of agricultural labourers ?—I think that it is below the average of agricultural labourers, but I believe that it is above the average age of miners generally ; I think that the average age of miners generally is rather below that.

15,621. Have you ever known any other mining population than in your district ?—No. I lived at Allendale Town as assistant to Mr. Arnison, three years before going up into that district.

15,622. That is a similar population ?—Yes, and it was of course at the very commencement of my practice.

15,623. Are they exposed to any other disease except this asthmatic one which you have mentioned ?—They are liable to many diseases.

15,624. I mean any special disease ?—Not in connexion with the mines.

15,625. (*Mr. Kendall.*) When you visit those miners, of course you are able to see how their bed rooms are, and to know as to whether they are crowded or not ; how is that ?—In some cases they are crowded.

15,626. How many have you ever known sleeping in one room ?—I cannot say.

15,627. But at times they are much too crowded ?—Sometimes they are much too crowded but that is the people's own fault ; it is perhaps in order to make up a little money that induces them to take lodgers. There are some ironstone works in an adjoining district, and some of the workmen, single young men, come over to Allenheads to get lodgings, to sleep for the night.

15,628. Do you think that much evil arises from that ?—It cannot be good at all ; overcrowded apartments must be objectionable.

15,629. You have never met with any case of illness which followed immediately upon it ?—Not which I could trace immediately to that cause.

15,630. (*Chairman.*) Those are mostly young men, are they not ?—Yes.

15,631. (*Mr. Austin Bruce.*) Have you any statistical reports besides those with which you have furnished the Commissioners ?—No.

15,632. (*Mr. Holland.*) Do a large proportion of the men live in overcrowded sleeping rooms ?—Not many, I think ; not a large proportion by any means. In fact the dwellings in our district are very comfortable ; indeed some of them are almost luxurious for miners.

15,633. Then the overcrowding of which you speak is an exception ?—It is.

15,634. And a rather rare exception ?—A comparatively rare exception.

15,635. Then of course it would not affect the condition of the men to anything like the amount shown by this table ?—Nothing like it.

15,636. You say that 72 men lived, on the average, 44½ years each ?—Yes.

15,637. What is the youngest age of those ?—It would require to go over the table again in order to answer that question.

15,638. Were there any working in the mines under 20 years of age ?—There were some 17 or 18; there are perhaps two or three cases in 100 where they may begin at 17 or 18, but they were mostly as old as 20. Out of 100 miners that I examined the other day at Allenheads there were only three under 20.

15,639. (*Mr. Austin Bruce.*) Were the 100 miners a fair sample of the mining population of the district ?—Yes ; they were just taken as they first came out of the mines ; the first 100 that came out.

15,640. (*Mr. Holland.*) You say that 20 per cent. of those between 30 and 40 were labouring under pulmonary disease of some sort ?—Yes.

15,641. That includes every variety of lung disease?—It is principally asthma, but it is more in degree.

15,642. Was there any true phthisis among those cases ?—Not that I examined ; I believe there was one threatening it.

15,643. Rather more than a third of the cases were decidedly asthma ?—Yes.

15,644. Were those chiefly young miners ?—At all ages.

15,645. Is phthisis pretty well distributed among all ages ?—Pretty well ; but of course it is a disease which affects the young chiefly.

15,646. Do you consider the miners' asthma, at its commencement, a perfectly distinct disease from phthisis ?—Quite distinct from phthisis.

15,647. You have no doubt about that at all ?—Not the slightest.

15,648. Have you heard the men attribute injury to their lungs to breathing close air, or only to dusty air ?—To close air and dusty air also.

15,649. Have you heard them attribute it to close air alone ?—I have heard them complain of both very much ; they were so mixed together that it was very difficult to distinguish.

15,650. Do you consider miners particularly liable to catch cold ?—I asked these 100 miners that I examined, "Are you liable to take catarrh, that is to "say, cold ?" Only about 10 of that 100 would say "Yes."

15,651. Then it would appear that they were less liable than men usually are ?—Yes. I asked whether they were any more liable than the generality of men, and they said, "No."

15,652. Does that correspond with your own observation ?—Yes, I think it does.

15,653. Does the asthma come on very gradually ?—Very gradually ; in fact, a man will labour under difficulty of breathing for 20 or 30 years, and the surgeon in the district, perhaps, will not know that he has such a disease.

15,654. How does it show itself at first ; simply

from difficulty of breathing?—Simply a little shortness of breath, and a little cough and huskiness.

15,655. I am told it is some time before large expectoration begins?—Yes, it is many years, perhaps, before that will take place; if a person is predisposed to chest affection, of course it makes a difference.

15,656. Is it generally a good many years before they become decidedly ill?—Yes.

15,657. Have you known men become rapidly ill from working several months in very bad close air?—That has not come under my notice.

16,658. I suppose I am right in assuming that you say that in almost all cases the disease is of very slow progress at its commencement?—Very slow progress at its commencement; unless a person has any lung disease, perhaps, or a weak constitution.

15,659. Such as tubercular deposit?—Yes, it is then apt to hasten on.

15,660. When the men are much affected in their lungs and get out-door employment, does the disease become suspended?—I have known cases where it has been suspended for a time.

15,661. For a long time?—For a long time. Their health improves very much as far as appearance goes. Instead of being pale and pasty-looking, as the miner generally is, they are ruddy.

15,662. If they get out-door employment they may live for many years asthmatic?—Yes.

15,663. Are they frequently able to get surface work?—Some who can afford it when they have grown-up sons will leave their employment and do little or nothing; they will, perhaps, just work about their ground at home, and they live on for many years.

15,664. Without getting rapidly worse?—Yes; I know one man of 77.

15,665. (*Mr. Austin Bruce.*) Is the population of this district a migratory one?—It has been rather migratory lately.

15,666. Have you any men here from Alston Moor?—No.

15,667. Do any of your men go there?—Not that I am aware of.

15,668. Have you no men working here who have been working in other mines out of this immediate district?—Yes, there are some working in the mine in Derwent.

15,669. Some have been working in Derwent?—Yes; in fact some who are living in my district work in Derwent now.

15,670. But you have no men working here who were working in other districts before they came here?—I cannot say that.

The witness withdrew.

WILLIAM CAMPBELL ARNISON, Esq., Surgeon, examined.

15,671. (*Chairman.*) Are you a medical man?—Yes, residing in the village here.

15,672. Have you charge of any portion of the mining district?—No particular district, in fact, I have not been much amongst the miners for upwards of 20 years.

15,673. Have you at all observed cases of miners' disease?—Not particularly of late years, my practice has been more of a general nature.

15,674. Is there any disease to which the agriculturists or others about here are subject?—No, I do not think that there is anything more than common.

15,675. Are they subject to any asthma or difficulty of breathing?—No, we have not had many cases of asthma.

15,676. Consumption?—We have a good many cases of consumption, but still I do not think that we have more than there are in country places generally.

15,677. Have those cases of consumption which have come under your notice been of agriculturalists or of miners?—Both.

15,678. (*Mr. Holland.*) In your opinion is miners' asthma a distinct disease from phthisis at the beginning?—I think it is; but I have not had many cases of it of late years, and in fact we never have an opportunity of making a post mortem examination, but I do not think that asthma is a prevalent complaint here at all.

15,679. Are you speaking of miners or amongst the general population?—Amongst the general population.

15,680. And among miners you have not had much practice lately?—I have not had much practice for the last 20 years amongst miners.

15,681. Do you consider this a healthy part of the country?—I consider it a very healthy district.

15,682. Amongst the general population?—Amongst the general population.

15,683. And that there is no excessive prevalence of lung disease among the general population?—I do not think that there is.

15,684. (*Mr. Kendall.*) Though you have not practised among the mining population, yet you are in the habit of seeing them; do you think that as a body they are improved in health from what they were 20 years ago?—Yes, very materially, I consider.

15,685. To what do you attribute that?—I attribute it in the first place to the mines being in a much better state than they were 20 or 30 years ago.

15,686. A much better state of ventilation?—Yes, and there is another thing, namely, that the miners' dwellings are much more comfortable.

15,687. There is much more interest taken in the miners' health and welfare than there used to be some 20 years ago?—That is decidedly the case; in fact I think that everything is done for the miners that can be done in this district, from what I have seen of them.

15,688. So far as they go, are they more careful themselves than they were 20 years ago?—I think so, decidedly.

15,689. They are better educated?—They are better educated, and I think that there is more temperance amongst them.

15,690. Then as a class of people they are very much improved?—As a class of people they are improved.

15,691. Both in health and in manners?—Yes.

15,692. You speak of this immediate district?—I am speaking of this immediate district.

15,693. You have not the means of speaking of any other district at all?—No.

15,694. You generally stay in this district?—Yes; I generally attend in this parish, and in Whitfield, the adjoining parish.

15,695. Do you think that in the improved state of the mining population there is a very great difference between the health of the mining population and of the agricultural population?—Yes; I should say that the agricultural part of the population are decidedly healthier.

15,696. There is still a difference?—Yes; there is no question of it.

15,697. But there is not so great a difference as there was 20 years ago?—I think there is not.

15,698. Perhaps the agricultural population have increased in their comforts?—Yes; there is no question of it.

15,699. But the miners have made a more rapid stride than the agriculturists in the last 20 years?—Yes; I should say so.

15,700. (*Chairman.*) How long have there been schools here?—We have had a free school here ever since I can remember, and long before.

15,701. So that there are men working in the mines now who have been educated in those schools?—Yes; in fact, I should say that the most of Mr. Beaumont's agents have been educated in the district.

The witness withdrew.

Mr. William Montgomery examined.

Allendale Town

Mr. W. Montgomery.

8 Oct. 1862.

15,702. (*Chairman.*) Are you the medical practitioner at West Allendale ?—Yes.

15,703. How many years have you been in the district ?—I have been among the miners for 25 years.

15,704. Have you charge of the West Allendale mines, under Mr. Beaumont ?—Yes, I have ; but I am on the other side of the water, nearer to Nenthead.

15,705. During the time you have been here, have several cases of miners come under your notice who were suffering in their breathing ?—Yes.

15,706. At what age have you observed that that complaint generally commences ?—It takes a decided form between the age of 38 and 45 or 50, and sometimes sooner ; it depends upon when they go into the mines. If they go into the mines before they come to the age of puberty, the complaint attacks those miners sooner. There is a number of young boys, at the age of 14 or 15, taken in with their parents into the mines before they are able to work full work.

15,707. And in your opinion, those young persons are sooner affected afterwards than others who begin to work in the mines at a later period ?—Decidedly.

15,708. Do the men discover any early symptoms of this disease before they come to you for advice ?—They do not apply to me when the cough and the asthmatic symptoms begin, they do not apply for some time—three, or four, or five years.

15,709. So that the early stages of the disease are not always, or seldom brought to your notice ?—No ; the men do not come under medical treatment.

15,710. Do you think that the disease could be checked if it were treated at an earlier stage ?—I think so.

15,711. Have you ever known a case of the disease being checked when it was brought under treatment at an early stage ?—Yes, several cases.

15,712. Have the men gone back to their work ?—Yes.

15,713. And have they had no return of the disease afterwards ?—It always does return upon them sooner or later.

15,714. How are the men affected ; what are the symptoms ?—It begins with cough and difficulty of breathing, and derangement of the digestive organs, mucous expectoration and liquid phlegm, that is the commencement of it.

15,715. When the men come to you for advice what do they attribute their complaint to ?—They attribute it to the mines.

15,716. Do they ascribe it to anything particular in the mines ?—To the impure gases which they inhale in the mines, and the powder reek, and the dust and small particles of the rocks and of the different strata they are blasting, which they must inhale more or less.

15,717. Is it your opinion that they are right in attributing it to those three causes ?—I believe they are right.

15,718. Have you ever known cases of miners who have left the mines, and who have got quite rid of the disease ?—I have known of some leaving between the ages of 30 and 40, before they became decidedly affected, and never being troubled with it at all, and living to a good old age. Many are living over on the west side of the water now who left the mines, and who are now doing very well.

15,719. Have you ever had an opportunity of attending any of the miners on the west side besides those under Mr. Beaumont ?—There are no other mines there on the west side. I am sometimes over in Nenthead.

15,720. Do you perceive any difference in the miners in Nenthead or the Alston district as compared with the men who are working here ?—I think that the men are not so healthy as the men employed in the West Allen mines ; their appearance is not so good ; those that I have seen in the way of my medical experience, I think that they are decidedly worse than the West Allendale miners.

15,721. What opportunity have you had of comparing the health of the miners in the two districts ?—Very little, but I have been called in in consultation with my medical brethren, and all the knowledge that I have has come in that way, not very often either ; but their general appearance is more unhealthy than in the West or East Allen side.

15,722. To what do you attribute that difference ?—I cannot tell. It may be the imperfect state of the ventilation in the Alston Moor mines. I do not know that they are any worse ventilated than ours, but it looks like it.

15,723. Have you ever made any calculation as to what proportion of the men are affected out of every 100 ?—I have made no calculation.

15,724. (*Mr. Austin Bruce.*) How many men do you think would leave work at 50 years of age unaffected by the miners' disease ?—I should say none at all, or very few at the age of 50.

15,725. At the age of 40 how many men leaving off work do you think would be likely to be entirely free from asthma ?—It generally begins between 38 and 45 or 50.

15,726. Then a certain proportion at the age of 40 would be unaffected ?—Yes, there is a certain proportion, but I cannot reduce it to figures.

15,727. What would your impression be ; would half of the men at 40 be unaffected by the disease ?—I think that half would not be unaffected.

15,728. (*Chairman.*) Have you ever had an opportunity of making post mortem examinations ?—Never ; they are never allowed in our country.

15,729. Have you ever examined the expectoration of the miners ?—Yes.

15,730. Have you ever observed anything peculiar in it ?—Yes, where the disease has become decidedly fixed the expectoration is similar to the expectoration of tubercular consumption, muco purulent, purulent, and sometimes approaching to the expectoration of coal miners' consumption, inclining to a dark blue, nearly black sometimes.

15,731. Have you ever observed that to continue after a man has left off working at the mines ?—Yes,

15,732. For a long time ?—Yes, they often die with it ; those who spit up this dark coloured expectoration very often die with it. Some young men I have observed with this black spit that have got completely rid of it, and they are now working in the mines again. In the case of some young men who have gone in too soon to work——

15,733. (*Mr. Austin Bruce.*) To what do you attribute the dark colour of the expectoration ?—I should say it was produced in this manner : from the carbon that they breathe from the candle smoke, and the powder smoke, and the strata in which they work.

15,734. I understand you to say that even after they had ceased to work in the mines the expectoration would continue, and the colour would still be dark ?—Yes.

15,735. In that case it could not be caused by the substances which they inhale ?—Not then, but in past life.

15,736. Do you think that their lungs would be so loaded that the expectoration would be of the same dark colour afterwards ?—Yes, I have seen calcareous expectoration for a long while after.

15,737. For how long have you observed that ?—I have seen it for a very long time when they have been lying on their death bed ; many times I have seen it in the expectoration ; but referring to a case that I have in my memory just now, the man did not cease to work for a long time, or rather, he did no long live after he did cease to work.

15,738. In your opinion does this disease affect, to any considerable extent, the length of the miner's life ?—Yes, I should say that it does, decidedly.

15,739. Have you formed any opinion as to the extent to which life is affected by it ?—I can tell you

what I think is about the average duration of miners' lives in my district. I should say that it was about 45 or 46.

15,740. What do you think would be the average duration of the lives of agricultural labourers?—Very near 60, I should say, but I am not prepared to say positively.

15,741. You have stated that, in your opinion, this disease is caused partly by the powder reek that they inhale, and partly by the dust which follows the explosions, and partly also by gases which they inhale?—Yes.

15,742. What are the gases that are thrown out in the lead mines?—I cannot tell, but there is carbonic acid gas very often. I have heard of men being pulled out of the levels almost dead, labouring under the apparent influence of the poison of carbonic acid gas.

15,743. Have you ever known an explosion to take place in the mines?—Yes; in the course of the last 25 years, I have known of carburetted hydrogen being set fire to, but not causing any serious mischief, and there was one young man about 12 or 14 or 15 years ago who exploded in the same kind of rocks some carburetted hydrogen which burned his whiskers and his hair; it singed him a great deal.

15,744. Have you known frequent cases of men who have suffered from inhaling carbonic acid gas?—Not so much lately, the mines are better ventilated.

15,745. Is that, in your opinion, in consequence of a larger supply of fresh air being introduced into the mines?—Yes.

15,746. I suppose that a large supply of fresh air, while it would carry away the powder smoke, would rather increase the danger from the dust?—The miners generally, after they blast a hole, sit down and rest a bit out of the influence of the explosion until it all settles; but there is not a current or draft throughout the mines to cause the dust to fly about, not to raise it.

15,747. Have you ever known any cases of cholera?—No.

15,748. Have you ever practised in any other mining district than this?—Never.

15,749. With the exception of the asthmatical tendency, are the miners as a class in all other respects free from disease?—The other diseases to which they are liable from their mining are pulmonary diseases, affecting the substance of the lungs or their investing membrane, the pleura.

15,750. And rheumatism?—Not so much.

15,751. Do you think that the men suffer from being long in the works, and then being exposed to a different temperature when they go home?—I think that that may induce some slight coughs or catarrhs.

15,752. You do not distinctly trace rheumatism to that cause?—No; there is some rheumatism, but very little, comparatively speaking.

15,753. (*Mr. Holland.*) You have stated that the miners are very liable to pulmonary disease?—Yes.

15,754. Are the women very liable to it?—Not so much.

15,755. Any more so than other women?—No.

15,756. Are the inhabitants of the district generally not peculiarly subject to pulmonary disease?—No.

15,757. Not more so than among persons having nothing to do with mines?—No.

15,758. You have also stated that you thought the Alston Moor miners looked worse than the Allendale miners?—Yes.

15,759. Do you mean generally?—Yes, I do; I speak of what I have seen of the Alston and Nenthead miners, judging from their common appearance.

15,760. Do the Alston Moor miners come here to work frequently?—Yes.

15,761. You have stated that, in your opinion, cases of asthma might be cured if treated early; did you mean that the miners might be cured if they left their employment earlier?—Yes.

15,762. And they would not be cured by any remedial means if their employment continued?—No.

15,763. As long as the cause continued the effect would continue?—Of course.

15,764. You said also that the disease might go on for years, not only slight cough, but difficulty of breathing, and attract very little notice?—Yes.

15,765. Is it quite distinct at that time from common phthisis?—Yes.

15,766. And it is only confounded with phthisis when it is very far advanced?—Yes.

15,767. Do not the miners leave their work when they become so affected?—Not always; very seldom indeed.

15,768. They may leave for other reasons?—Yes.

15,769. For whatever reason they may leave their work, they are generally affected by the disease if they are above the age of 40?—Yes; they are slightly affected then.

15,770. If you were told that a lead miner on the average lived six or eight years less than other men, should you think that remarkable?—I should expect that they would live less than some other trades, but I should hardly think it would be so much as that.

15,771. Have you no means of ascertaining how much less?—Not now.

15,772. Does a miner at the age of 40 look as old as an agricultural labourer at 50?—He looks older.

15,773. At 50 does he look older than an agricultural labourer at 60?—Yes; decidedly older than the average run of agricultural labourers.

15,774. If that be true you will not be surprised to be told that they die upon the average eight years younger?—There is a difference there, I think.

15,775. To what do you attribute the difference in their appearance besides their ill health?—I attribute it to the progress of the disease that is going on within them.

15,776. Do you attribute the chief part of the older look in the miners to internal disease?—Not more to the progress of disease than to their exclusion from open air and sunlight.

15,777. You would not expect them to die so much earlier as their looks would indicate?—No.

15,778. Still you are satisfied that a miner would die earlier?—Yes; but they are very much improved of late years.

15,779. You cannot say how much earlier you think a miner would die?—Four or five years on the average.

15,780. (*Mr. Austin Bruce.*) Are the miners a tolerably sober set of men?—Very much so for the most part.

15,781. (*Mr. Holland.*) Do they lodge pretty well? The greater part of the miners have good houses, others are not so well lodged.

15,782. Is there not some overcrowding amongst them?—Yes.

15,783. Does that affect a large proportion of them, or only a small proportion?—A small proportion.

15,784. That cannot then have a very strong effect upon the health of the class generally?—No.

15,785. Do they live pretty well?—Yes.

15,786. Do they suffer at all from dyspepsia?—Yes, they do.

15,787. Do they suffer much from it?—A good deal.

15,788. To what do you attribute that?—I think it is owing to their working in the mines.

15,789. Do you mean working in air that is not quite fresh?—Yes; it takes away their appetite considerably.

15,790. Is not that a proof that the air is not sufficient for their health?—The air is not sufficient for their health.

15,791. Speaking of the air alone, and quite independently of the dust?—Yes, that is, the gases; it is not sufficient for their health, but they have been very much improved in the last 10 or 15 years.

ALLENDALE TOWN.

Mr. W. Montgomery.

8 Oct. 1862.

15,792. Has their health, with reference to the prevalence of dyspepsia, become much improved in the last 10 or 15 years ?—Yes, decidedly. I calculate that a miner 15 years ago at the age of 30 was only equal to a miner at the present time of the age of 40.

15,793. In appearance and in health ?—Yes.

15,794. Is the chance of his life at 40 equal to what it used to be at 30 ?—Yes.

15,795. Has this improvement taken place lately, or has it been going on gradually ?—It has been going on gradually.

15,796. To what do you attribute that ?—I attribute it to the better state of ventilation in the mines, and to their stopping shorter hours in the mines. They used to work for 12 and 14 hours at a time, and now they work for only eight hours.

15,797. Is the quantity of dust that they breathe diminished ?—Their number of hours formerly were 48, now they work 40 hours per week they must be exposed to the influence of the dust ; 8 hours, therefore, the quantity of dust that they breathe is diminished.

15,798. Is their health with reference to lung disease as much improved as it is from being less liable to dyspepsia ?—Yes, there are very few cases now; almost all the miners go down with this miners' asthma, which terminates in a complaint resembling tubercular phthisis ; but the occurrence of pneumonia, pleurisy, and pleuropneumonia is now almost nil to what it was 15 or 16 years ago.

15,799. Do you mean that acute diseases of the lungs are less frequent than they were 15 or 16 years ago ?—Yes.

15,800. Do the cases which require bleeding occur much less frequently than they did 15 or 16 years ago ?—Yes.

15,801. But it is very rare to bleed a man now, is it not ?—Yes, very rare indeed, not once in a year.

15,802. Are you sure that that is attributable to a change in the disease, or to a change in medical opinions, or to which most ?—It is a change in the disease I should say partly, and it may be an improvement in the treatment otherwise.

15,803. (*Mr. Austin Bruce.*) Do the men drink any beer with their daily food ?—No, very few of them.

15,804. What beer is drank by them I suppose is drank at the end of the week ?—Yes.

15,805. Do none of the working people drink beer with their meals ?—Very few, they are almost all in teetotal societies in my district.

The witness withdrew.

Mr. WILLIAM CURRY examined.

Mr. W. Curry.

15,806. (*Chairman.*) I believe you have charge of the East Allendale mines ?—Yes.

15,807. How long have you been so employed ?—I have been in that position for 27 years.

15,808. What is the number of men employed in the East Allendale mines at present working underground ?—There are 301 men so employed.

15,809. How do the men enter the mines ?—Part of them go in by an incline, and the other part down the shafts. They are drawn up in cages.

15,810. How are they enabled to ascend and descend the shafts ?—By machinery, the principal part of them.

15,811. How do they go down ?—The shafts are partitioned, and they go down in tubs or cages.

15,812. Is it the patent safety cage that is used ?—It is not.

15,813. Do you ever have any accidents in these mines ?—Not with the exception of one or two, when coming up the shaft. At the top the framing is closer than below, and by carelessness had their heels outside the cage and were bruised.

15,814. Is the machinery worked by hydraulic power ?—Yes.

15,815. What is the lowest level to which the men descend ?—The deepest shaft that we have is 93 fathoms ; but when I say that a level goes into the side of a hill, and the depth taken from it. There may be, perhaps, 50 fathoms above that to the surface.

15,816. Have any accidents occurred from blasting ?—We have had accidents occasionally, but very seldom.

15,817. Do the men use the patent fuze ?—Never, except in wet places in sinking.

15,818. Is there any reason why it should not be generally used ?—No ; I do not see any particular reason why it should not be generally used beyond the extra cost incurred.

15,819. Do the men prefer the other mode ?—Yes, they do.

15,820. Do they use copper or iron prickers ?—Some are copper, and some are iron ; the principal part are iron. In the hard mines, where they are more subject to explosion, they are copper, and in the softer mines they are iron.

15,821. Do you mean by softer that they are not liable to explosion from the pricker coming in contact with the rock ?—I mean they are not so liable as the others.

15,822. In the case of the accidents that have happened, have you been able to trace the cause of them ?—In some of them we have ; nearly all, in fact. I have known an accident occur where a hole has been charged, a squib has been put in, and has burned down half way, and then exploded, just when the men were going back to take it out ; in other cases, from cracks in the rock, where the gunpowder has got in, and in beating to fill the hole up, it has exploded in those cracks.

15,823. I suppose the tamping rod has come in contact with the rock, a spark has been struck, and the powder exploded in the crack ?—Yes.

15,824. If the tamping rod had been made of a material that would not have struck fire against the rock, the accident would not have happened ?—No ; it would not have happened.

15,825. Is the mine at all wet ?—It is dry, comparatively speaking ; very dry.

15,826. Do you think that the men suffer at all from the dust ?—I think they do occasionally in some places.

15,827. Are they supplied with water when they are boring, or how do they get it ?—It is very little used.

15,828. Do they bore dry ?—Yes, they do generally; in some few cases they do not, but by far the greatest bulk of it is bored dry.

15,829. Does not water facilitate the boring ?—In tough stone I consider that it does, but not much in a very hard one.

15,830. What is the stone in which the mineral is found ; what kind of rock is it ?—We have stratified rock in our mines composed of shales, hazels, and lime, all of which produce less or more ore in places, but the great or mountain limestone is the principal bearing sill.

15,831. Is the gunpowder smoke long in clearing away in any of the ends in which the miners are working ?—No, it is not, with the exception of one single place in the whole of the mines.

15,832. Where is that ?—That place is in the southern part of Victoria vein.

15,833. What are you doing there ; is it a rise that you are putting in ?—No, they are merely working the drifts; there is a regular communication through, but the draft is not strong enough to take away the smoke quickly.

15,834. Have you employed any artificial means ?—Yes, all the artificial means that we could use, such as placing trapdoors, and confining the current to one course; in other cases we have succeeded, in this

case it is not so good; but there are only four men working in that place.

15,835. Do you use a fire blast down below?—None below, but there is one at the surface.

15,836. Have you any shaft by which to draw out the foul air?—Yes, there is one below the furnace I spoke of for that purpose.

15,837. Where is that?—That is a little south of Allenheads, and communicates with the principal workings in Henry's vein, by the Plantation cross cut, which is 600 fathoms in length.

15,838. Have you no means on the mine for drawing out the air by exhaustion?—We have one on the Blackett level works.

15,839. Does that answer?—I can scarcely give a decided answer upon that.

15,840. Has it been long used?—It has been in practice here for about 16 months.

15,841. What do you think is the best mode of ventilating a place where the air is bad?—In sucking the air out there is this advantage, that it keeps the level all clear alike from one end to the other, I consider when the pure air is blown in to a fore end the men have better air to work in; but the great danger then is of the foul air accumulating behind, and clogging up, so that they could not get out; I have known instances of that kind where the men have had to come through some portion of the drift where they could not carry a lighted candle; and drawing the air out avoids that.

15,842. Have you known it to happen that after the men have been working and have been supplied with pure air they had to pass through bad air where the candle would not burn?—Yes, I have seen that.

15,843. I suppose that there is nothing of that sort now that one could see?—No. I do not know that it has occurred more than twice or thrice, and always in the same place, the plantation cross cut.

15,844. That, I believe, is where you have now a furnace?—Yes.

15,845. Has the furnace remedied that state of things?—Yes; it has effected a decided improvement.

15,846. Do you at all know what quantity of coals are consumed in that furnace?—I cannot answer that question off hand.

15,847. (*Mr. Davey.*) Can you assign any reason why the air should be stopped all at once after blowing fresh air in so as to prevent the men from going back again?—I cannot, except from the quantity forced in not being in proportion to the requirements of the men, and at the same time to force the smoke out of a drift 600 fathoms in length, as in this case.

15,848. Was there sufficient air for the men to work in at the end?—They could work, but not comfortably; there was certainly not sufficient.

15,849. Had there been sufficient air forced in would not that have been enough to extract all the impure air?—Yes, certainly.

15,850. Are there any cracks in the limestone?—Yes.

15,851. Do you think that there is any escape of carbonic acid gas from those cracks?—Yes; large quantities at times.

15,852. So much so as to extinguish a candle?—Yes.

15,853. Have you ever known an instance in which the men have been affected by it?—No; I am not aware of that, I have tried it repeatedly with a candle.

15,854. That would of course affect the whole of a working?—Yes; in that part of the district, so far as those men were concerned; not the whole district, but in that partnership.

15,855. (*Mr. Kendall.*) Were you a working miner yourself originally?—I was.

15,856. How early did you begin to work as a miner?—I cannot answer that question exactly.

15,857. About what age were you when you began?—I think about 11 or 12, perhaps 12.

15,858. Did you work on the surface or underground?—I worked underground.

15,859. In this neghbourhood?—Yes; in Mr. Beamont's mines.

15,860. What was your occupation at the age of 12?—To blow an air machine.

15,861. How long were you occupied in that employment?—I think for not more than 12 months.

15,862. What did you do afterwards, did you still work underground?—Yes; I was a hireling after that with some men at bargain work.

15,863. What was the nature of your work?—Drilling holes; I was a regular miner so far as I was capable, and after this I was employed in bargain work.

15,864. And you worked your way up to become an agent?—Yes.

15,865. How long did you work as a miner before you became an agent?—About 10 years.

15,866. How long have you been an agent?—27 years, come the 24th of next December.

15,867. While you were working underground were you ever in the doctor's hands?—I think I was.

15,868. Do you recollect what it was for?—It was some liver complaint I think.

15,869. Since you have been a miner, and since you have been an agent, has there been any great improvement in the ventilation of the mines?—Yes; a decided improvement.

15,870. Has the health of the men become very much improved since that?—I think the health of the men has improved.

15,871. Are the working hours now as many as they were when you first commenced?—Yes.

15,872. Eight-hour cores?—Yes; but they are more punctually worked now than they were formerly.

15,873. You are of opinion that the ventilation has been very much improved, and that the men work more comfortably; but that the hours of working are the same now as they were before?—Yes.

15,874. What should you imagine, in consequence of the improved ventilation and other improvements which have been made, is the increased value of the labour performed in the eight hours; or, in other words, can a man do as much work under the improved system in six hours as he could in the olden time in eight hours?—He ought to do it in some of the fore-ends, if he was willing.

15,875. He has the ability to do it, if he likes, with the same wear and tear of constitution?—Not, generally speaking; only where the places were so very bad for air.

15,876. What do you think that a man, with the same wear and tear of constitution, can do now during eight hours, compared with 25 years ago; do you think he can do 20 per cent. more work, or one-fifth more?—He could not do that, generally speaking.

15,877. Do you think he could do 10 per cent. more?—That is a subject I have never fairly thought about; but I think 10 per cent. could be accomplished if confined to the fore ends, for these are places where the greatest improvement in the ventilation has been made, but not throughout the whole mine.

15,878. Where there is good air, have you any doubt that a very large per-centage more of work can be done?—Yes; I have known places where, previous to communications being made, the men were allowed to go in and work as long as they could and come out when they liked; sometimes they worked three hours, four hours, or six hours; but the air varies in the same place; it will vary considerably on different days and in different weeks.

15,879. It would vary with the state of the atmosphere?—Yes.

15,880. At present there are no cases of that kind, I suppose; the ventilation is generally good?—Yes; it is generally good.

15,881. Either by the use of a fire machine or a pumping machine, your ventilation is good?—Yes: I consider it very good.

ALLENDALE TOWN.

Mr. W. Curry.

8 Oct. 1862.

15,882. Have you heard any complaints made within the last six months, or 12 months, of bad air? —None.

15,883. (*Mr. Austin Bruce.*) You have stated that you began to work as a miner at the age of 11 or 12? —Yes.

15,884. Are there any who begin to work as early as that now?—Not underground.

15,885. At what age do they begin to work now? —Thirteen; none below that.

15,886. Are there many who begin to work as young as 13?—We have not one employed in the mine, nor have had for years, at 13.

15,887. How many of your 300 workmen should you say were under 16?—Three; there is one in a bargain, a regular miner, and two employed as labourers under 16.

15,888. Then they rarely begin to work under the age of 16?—Not in the mines.

15,889. Are the labourers who work underground less subject to asthma than the miners?—Decidedly so, if they were confined to the same work always, but it very often happens when they are partly done with mining that they are put to easier work, such as wooding or underground labouring. I have here a paper showing the number of workmen employed at Allenheads, Swinhope, and Blackett level:—

The following Paper was handed in:—

Workmen employed at Allenheads, Swinhope, and Blackett Level, October 1862.

How employed.	Under 16.	Under 21.	21 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	Total Pickmen.	Total Underground.
Pickmen - -	1	21	101	59	52	7	2	243	
Labourers underground	2	11	8	7	9	13	8	58	301
Master washers	–	–	–	–	–	–	–	17	
Boys - - -	–	–	–	–	–	–	–	75	92

Total in mines and washing floors - - - 393

Pickmen on Bingtale (or tributers) - - - 145
Ditto Fathomtale - - - - - - - 98
Underground labourers - - - - - - - 58

301

Surface shafts, exclusive of Blackett level - - - - 22
Underground do. do. do. - - - - - - 6

28

Length of horse levels open at Allenheads - - 9 miles.
Length of horse levels open at Swinhope - - 1⅝ miles.

10⅝ miles.

Length of waggon levels by men at Swinhope - ¾ miles.
Length of waggon levels by men at Allenheads 1¾ miles.

2½ miles.

15,890. Did you ever suffer yourself from breathing bad air underground?—Yes, I have.

15,891. Was that long ago?—Yes.

15,892. Have you ever known any of your miners suffer from breathing carbonic acid gas in the present mines?—I think not.

15,893. Are your men easily managed? — Very much so.

15,894. Are they sober?—Very steady indeed.

15,895. (*Mr. Holland.*) Do the men begin work here at an older age than they used to do?—They are older before they get work; there are none admitted to the washing floors before they are 10, and none into the mines before they are 13 years of age. One cause why there are so few under the age of 16 arises from insufficient employment to give them, or else more would have been employed.

15,896. How are those employed between the ages of 13 and 16?—In various ways; they are, generally speaking, employed on the washing floors. If we had more in the mines from the age of 13 to 16 the probability is they would have been blowing air machines, assisting woodmen, or if strong and healthy those near 16 years old in bargains.

15,897. Was it the practice formerly, or 20 years ago, to permit them to enter the mines earlier?—Yes.

15,898. Has there been an improvement in the health of the miners in consequence of their not going to work underground until older?—I cannot answer that question satisfactorily, but I think their health is improved.

15,899. You stated that you thought it was an advantage to draw the air out of a mine rather than to drive it in, as then the men escaped the return air? —Yes.

15,900. How does that happen unless you have a separate channel from each set of men outwards?—From the fact of there being only one drift, generally speaking, between the machine and the fore-end where the men are at work, and the air sucked out being confined in metal pipes or boxes along the said drift back to the machine, thereby forming a separate or artificial channel. In cases where other men are employed between the fore end and the machine, branch pipes are taken from the principal ones to each fore head, but these are very rare instances. These remarks are confined to fore ends only. But taking the whole mine this could not be accomplished.

15,901. The men going to and from their work would be exposed, you think, to breathing the return air if the air was driven in?—Yes.

15,902. And that is avoided by drawing the air out rather than driving air in?—Yes, in the ends where the most air is, but not generally throughout the mine.

15,903. How are the nine miles of horse levels open at Allenheads kept ventilated?—They are the best ventilated of any; they run into each other, and are in connexion with the surface shafts all along from which the whole mine is principally ventilated.

The witness withdrew.

Mr. THOMAS JOHN BEWICK examined.

Mr. T. J. Bewick.

15,904. (*Chairman.*) You are engineer of Mr. Beaumont's works?—Yes.

15,905. Have you different modes of ventilation in use in those mines?—Yes.

15,906. Will you be good enough to describe to the Commissioners the different means that you resort to?—They are both by exhaustion and propulsion by means of water-wheels or other motive power, driving fans and similar machinery; we have also recently introduced furnace ventilation. The plan adopted on the Blackett level here is so far entirely by exhaustion by Byrom's patent another fan, one of which is at work within three-quarters of a mile of this place, and also by a machine somewhat similar to Struve's system, this method is in operation close to this place. At Allenheads and other mines for propelling the air into the workings, we have the ordinary blowing fan, and a sort of bellows which is worked in a box with valves and likewise a piston working horizontally in a cylinder or box with valves. Under certain favourable circumstances we also occasionally ventilate by the water blast.

15,907. (*Mr. Austin Bruce.*) Is the air, in these cases, forced generally through the workings, or only into certain special close ends where the ventilation is imperfect?—Only into the special fore ends where there is no natural ventilation.

15,908. In the case of Struve's exhausting machine, is that applied only to special places?—Only in special airless fore-heads.

15,909. And how is it with regard to the furnace? —That applies to a district; it affects the general

ventilation of one large mine. Our machine ventilation is merely for special places. I may say that generally it only applies to close fore ends where there is no through communication. The furnaces that we have erected are for ventilating a series of levels and workings which extend over a considerable area, they are for exhausting at one point, and of course the fresh air enters the mine at the various inlets by its own gravity, and replaces the impure air that is exhausted by the furnace.

15,910. What quantity of coal does a furnace consume ?—About three tons a week.

15,911. What coal do you use ?—County of Durham coal, from the neighbourhood of Bishop Auckland.

15,912. What is the cost of that coal here per ton ?—At Allenheads it costs 14*s.* 3*d.* per ton, a thet Weardale furnace the cost is 17*s.* per ton ; the price of the coal at the pit is only about 5*s.* 6*d.* or 6*s.* per ton, but the carriage adds greatly to the cost.

15,913. What sort of furnace is it ?—The furnace is placed at or near the top of the shaft, which is closed, a communication is made in any convenient place down the shaft, and a covered air tight passage made from it to the furnace, which is simply a series of bars on which the fuel is placed, and at the other end of the bars is a chimney a few feet high ; at Allenheads it is 40 feet ; it was first tried 10 or 12 feet in height, and answered very well ; any moderate height is sufficient ; at the side of the furnace there is a door above the bars for feeding, and another below the bars to take out the ashes.

15,914. Have you calculated what addition was made by the furnace to the amount of air passing through the mine ?—No, but I may say that in one particular part of the mine prior to the furnace at Allenheads being lighted in July of last year the men in dull damp weather were frequently prevented from working by a want of ventilation, and since that they have not lost any work, and speak very favourably of the effects of the furnace.

15,915. The men, I suppose, would not leave work until the condition of the mine were such as to be injurious to their health ?—They would not.

15,916. How far off is the furnace ?—Upwards of a mile from a part of the working, and the levels are at different elevations and in various directions.

15,917. Before you had the furnace in operation a mile distant from them, there were places in which the men could not at times work ?—The places where the ventilation was so deficient prior to the erection of the furnace are three-quarters of a mile distant, but even at a mile the ventilation is improved.

15,918. Now the men are never hindered from working, and you attribute this entirely to the furnace ?—Yes, the improved ventilation is no doubt entirely due to the furnace.

15,919. Do you employ no other means besides this furnace for the ventilation ?—Except in airless foreheads no other artificial ventilation whatever,

16,920. It is all effected by this furnace ?—Yes. Two months after the furnace was first lighted we put it out, just to try whether or not it was beneficial in what we considered was favourable weather, that is to say, the temperature was low, and the wind was from the north ; the miners left their work as usual at 2 o'clock in the afternoon, the furnace was extinguished at five o'clock in the evening, and next morning at six o'clock when the men returned there were very few of them who could get to their place of work.

15,921. Is the shaft at which the furnace is, an upcast shaft for all the mines ?—Not exclusively so ; there are other upcast shafts ; since the furnace was erected it is exclusively an upcast, but it is not the only one at Allenheads.

15,922. Did you not state, that within the period during which this furnace has been in operation no mechanical means were ever used for driving air into the close ends ?—We almost invariably apply either manual or other power for the purpose of propelling air into the close ends, whether there is a furnace or not.

15,923. (*Mr. Davey.*) Which method do you most approve of, that of exhausting the air, or forcing it in ?—Exhausting it.

15,924. (*Mr. Holland.*) The exhaustive power is in proportion the height of a column 40 feet high ?—Yes, and the effect of the fire in the furnace.

15,925. The chimney is 40 feet high above the fire ?—Yes, we have one in Weardale only seven or eight feet high.

15,926. Is it not a weak draft ?—No, it creates a good brisk draft.

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Mr. T. J. Bewick.
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The witness withdrew.

Adjourned to To-morrow at Allenheads.

ALLENHEADS.

Tuesday, 9th October 1862.

PRESENT :

NICHOLAS KENDALL, Esq., M.P.
JOHN ST. AUBYN, Esq., M.P.
H. AUSTIN BRUCE, Esq., M.P.
RICHARD DAVEY, Esq., M.P.
P. H. HOLLAND, Esq.

RICHARD DAVEY, Esq., M.P., in the Chair.

[The Commissioners inspected the Allenheads mines, after which they inspected and entered the Burtree Pasture mine, in the Weardale District, and at the latter mine they took the following evidence.]

Mr. JOSEPH COWPER CAIN examined.

15,927. (*Chairman.*) What is the name of the mine which you superintend ?—I do not superintend any particular mine ; I go through the whole of Mr. Beaumont's mines.

15,928. You are the general overlooker ?—I am called surveyor.

15,929. How many men do they employ in this mine ?—365 men and 100 boys ; that is the total.

15,930. What proportion of those would be pick men ?—362 men and boys are employed underground.

15,931. I need not ask you the manner in which you let the work or the wages, because we have had that before from the other mines in which Mr. Beaumont takes an interest ; it is the same, I presume ?—It is the same.

15,932. What is the longest level which you have ?—Burtree Pasture is the longest ; it is two miles within 11 fathoms.

15,933. The work is brought out by horses ?—Yes.

15,934. What is the depth under that level which you have been working. If I understand you rightly the present end is about 105 fathoms from the surface ?—Yes.

ALLENHEADS.
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ALLENHEADS.
Mr. J. C. Cain.
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15,935. Have you made a shaft under it?—Yes, of 131 fathoms.

15,936. How many levels have you under the one which we have gone into?—Five below the horse level.

15,937. How are those ventilated?—By the air going in at the two level mouths. The shaft above the engine shaft supplies the water to the engines, the water-wheels, and it is divided and goes along those different levels, and then out of the shaft at Middlehope Head, at the top of which the furnace is lighted.

15,938. Have you any of those lower levels which are deficient of air?—No; there are none more deficient than the one which you have been into to-day, at the end.

15,939. Do you use artificial means to carry the air into those levels?—We use none, excepting what is blown from the last rise or sinking to the ends, and that is done by hand by boys.

15,940. By hand-blast?—Yes.

15,941. You have recently erected a furnace for better ventilation?—Yes.

15,942. What has been the result of that?—It has only been lighted four or five days, and so far the result is very beneficial, apparently; but it has not been lighted a sufficient length of time yet to enable us to judge of the change which may take place.

15,943. But are there times when you cannot enter the horse level for want of air?—Yes; several times lately, we could not do so for want of air.

15,944. Consequently the men could not follow their daily work?—They could not.

15,945. From what you have seen of other mines do you think there is every chance that this furnace will remedy the defect?—I have every confidence that it will answer there and ventilate the mine effectually.

15,946. Have you seen it at work in other mines?—Yes; at Allenheads mines for upwards of a year.

15,947. And that has been very satisfactory?—Very satisfactory indeed.

15,948. Do your men suffer much from working in these close ends?—Not a great deal; not so much as might be calculated upon.

15,949. Have you many at this moment who are off their work from illness?—Very few; there are not more than two or three altogether out of the whole number.

15,950. Is that caused by what you term the miners' disease, or from any other cause?—I think other complaints; it is not caused by the miners' complaint; I do not think that we have a single one at present who has the miners' complaint. We may have old men who are really not fit to go in any more; but then old age and the length of time that they have worked are the causes of that.

15,951. What is the age of the oldest man that you have working?—73.

15,952. Have you any working above 50?—A great number; we have 85 above 40. In the Weardale district there are 102 shafts, from 3 to 105 fathoms in depth. The total length of levels is 20,609 fathoms, being $23\frac{1}{2}$ miles; the price is from 2*l.* 10*s.* to 20*l.* per fathom; $14{,}813\frac{3}{4}$ bings of lead ore is the average produce for 5 years ending the 30th June 1861. There is a total of 1,133 men and boys, of whom 877 men and boys are underground; of the latter number there are 49 under 16, 106 under 21, 281 under 30, 182 under 40, and 259 above 40. Of the 877 there are 469 on bingtale, and 408 on dead-work, labourers, rail-layers, trappers, &c.

15,953. There is a large proportion of your men above 40?—Yes.

15,954. Have you any continuous ladders going from the horse level?—They are continuous, but there is a little distance sometimes between the different stages for the different levels; but they may be considered continuous.

15,955. What is the length of a ladder?—Generally 12 feet.

15,956. Have you a stage at the bottom of each ladder?—Yes.

15,957. What is the inclination of the ladder for climbing?—I could not state it in figures, but it generally goes half-way through the shaft across the way gate.

15,958. How wide is the shaft?—Perhaps 5 or 6 feet.

15,959. Then it would be about $2\frac{1}{2}$ feet in 12 feet?—Yes.

15,960. Do the men complain at all of climbing the ladders?—Not at all. I have not heard of any complaints.

15,961. Do they suffer much from climbing?—I do not know that they suffer a great deal; they must suffer from it of course.

15,962. You have no means of putting a man engine, or a skip, or anything of that kind below, to let the men down?—We have not adopted anything here. At Slittshaft, a mine further down the district, we are preparing means. There has not been anything employed here yet; but at the fore end, where they are about to put in the engine, it will be adopted with the skips or cages.

15,963. In fact you have no means of doing it at present, because you have no top to your shaft?—Not at present, but that will be put in operation within 12 months in the fore end.

15,964. In the limestone do you find that you get air cracks?—There are a variety of cracks, and no doubt air cracks, because the air is sometimes felt; small quantities come out of those cracks, and it has some little effect upon the light.

15,965. Did you ever find it have any effect upon the men?—No, I never did; and I cannot say that I ever saw it have much effect upon the light here. I have seen it in other mines have a great effect; but I think that this mine is very free from the carbonaceous gas.

15,966. You have never seen anything so bad that a miner has been obliged to be pulled out?—Never; we have not had any instance of that sort, indeed it is very free from it. One has known instances of men having been pulled out, and having been killed from it; that is to say, in other districts, not in Weardale. In Alston Moor there were two or three cases.

15,967. Your men work eight hours' shift?—Yes.

15,968. They have, of course, a great deal of spare time?—They have.

15,969. Have they any recreation?—Yes; they generally try to find something to engage their attention at times when they are not working.

15,970. Will you state what the recreations are?—Farming is one of the principal what they consider recreations. They work about little farms and gardens; some indulge a little in cricketing.

15,971. Is there a cricket club?—Yes; agriculture and gardening are the chief recreations.

15,972. Are there agricultural societies?—We have one here in Weardale.

15,973. Which is supported by the miners?—Yes.

15,974. Have you also a horticultural society?—Yes.

15,975. Which is also supported by the miners?—Yes.

15,976. (*Mr. St. Aubyn.*) Is that subscribed to by the working miners?—Yes; they pay their shilling or their 2*s.* 6*d.*

15,977. (*Chairman.*) You think that the recreation which they have above the surface considerably improves their health?—I think that it has a very beneficial effect upon their health; it improves their health generally.

15,978. (*Mr. St. Aubyn.*) The end in which the Commissioners were to-day is 40 fathoms from a rise?—It is.

15,979. How far do you expect to drive before you get fresh communication?—Perhaps another 10 or 15 fathoms; much depends upon circumstances.

15,980. That would be from 50 to 55 fathoms?—Yes.

15,981. You have it in contemplation to put in a trap door in the horse level where we were to-day?—We have it in contemplation to put in several, but particularly one in that part of the mine which you visited, which I think will have a very beneficial effect.

15,982. Is it usual to drive so far as 50 fathoms from a rise without additional air communication?—Yes, it is usual; but when the ground is productive it is put up at 20 fathoms, but that is done for the convenience of working more than for ventilation; 50 fathoms is not a great distance for ventilation.

15,983. Was the state of the air in the end where the Commissioners were to-day a fair specimen?—I think it is a better specimen than we have had for the last three months, but I think that to-day the end is very near what might be called an average specimen.

15,984. Do your men complain at all of the bad air in those ends?—Only when they cannot work; they complain that they cannot get in to work.

15,985. In your opinion do they continue working for the sake of their bargains after the air has become too bad for them?—I should think that lately they have done so in this particular mine.

15,986. Do you exercise any control over them in that respect?—We have not done so.. We generally leave it to their own discretion; we do not force them to stop longer than they really should when the air is really bad; we do not exercise any influence over them when they find that the air is not fit to work in; we leave it entirely to their own discretion.

15,987. Are the miners generally under your superintendence subject to accidents?—No, not at all; or at least very seldom. If it is the case it is chiefly from their own carelessness.

15,988. You have scarcely any accidents from falling away from the footways?—No, it is of very rare occurrence.

15,989. Nor from the falling away of ground?—That is equally rare.

15,990. Nor from blasting?—We sometimes have an accident from blasting, but it is very rare. I believe that there have been only two since I came to the district, which is 4½ years, and there are a great number of men.

15,991. In those two instances was the cause to be ascribed to the men's carelessness?—I think not, I think it was purely accidental, simply from the fact that the holes which they were boring were in broken ground, lime-stone, with a little iron in it; the powder got lodged and did not get to the bottom of the hole, and the powder got fired in tamping.

15,992. You do not use the safety fuse?—Very little indeed, chiefly from the fact that it creates such a disagreeable smell, and more smoke than an ordinary squib.

15,993. I understand that in this district the men object to the safety fuse on account of the smell which it creates?—Yes, it would be necessary to enforce it if it were used, on that account. In addition, there is an extra quantity of smoke.

15,994. In case men are temporarily or permamanently disabled from causes connected with their work, how are they provided for?—In this district they have two clubs, but they are not at all connected with the works.

15,995. They are open to agriculturists as well as to miners?—Yes, to every class. One is the Odd Fellows and the other has been of long standing.

15,996. Is any contribution made by the proprietors of the mines in this district towards a sick fund for the men?—No.

15,997. Nor towards an accident fund?—No.

15,998. All the assistance which the men derive in case of accident arises from their club funds?—And from the parish.

15,999. How is that there is no club in connexion with the mines?—I believe the principal reason is that the rules were not exactly what Mr. Beaumont considered a sufficient guarantee, or at least what he would like; that if he supported a club at all he would wish to have the rules to his liking.

16,000. Then there was a proposition to establish a club?—There was at one time and those clubs were got up without paying attention to any proposition which was made from Mr. Beaumont or Mr. Sopwith.

16,001. From whom did the proposition to establish these clubs come?—I am not in possession of sufficient information to give all the particulars, but I should think that it would come from Mr. Sopwith. They had an old club, and Mr. Sopwith proposed to make it similar to the Allenheads Benefit Society, provided they would have it under certain rules and regulations.

16,002. And that was declined by the men?—Yes.

16,003. In fact the proprietor and the men did not agree about the rules?—I fancy that that was the case.

16,004. We saw to-day at Allenheads Mine the men ascending and descending by means of a cage with a wire rope, where there was a top to the shaft, do you intend to carry that out in this mine also?—The same system is proposed to be adopted and is being carried out at some of the shafts here which is already in existence at Allenheads.

16,005. Namely cages and wire ropes?—Yes, the same sort of machinery.

16,006. Is it in contemplation to erect that generally in the mines in this district?—I cannot say that; there is one shaft which has been fitted up very similar to Allenheads, upon the principle that is adopted at Allenheads, with hydraulic engines and lowering and raising the men by skips or cages.

16,007. Have you any reason for adopting the cage in one shaft and not in another?—There is no particular reason excepting that that improvement has not taken place in the whole district which is carried out in Allenheads, which it is very likely intended by degrees to carry out.

16,008. In your opinion, then, the cage and the wire rope is an undoubted improvement upon the footways?—Yes, I think that it is an improvement to the pathway

16,009. (*Chairman.*) I suppose one reason is that you have not a shaft here which will suit that?—It is not sufficiently large, and it is not adapted to the purpose, but we are fitting one up in this mine exactly similar to what is carried out at Allenheads, that is near the fore end.

16,010. (*Mr. St. Aubyn.*) Where the shafts suit it is the intention to fit up cages?—I cannot say what the intention is, but from what has really been done it appears to me that that is very likely the intention.

16,011. And in your opinion where it can be done it is preferable to the footways?—Decidedly.

16,012. (*Chairman.*) I think you have had said that you are the general surveyor?—Yes, of what are called the W. B. mines. I go through the whole of those mines.

16,013. What is the condition of Greenlaws mine so far as regards ventilation?—It is considered to be in a good state of ventilation.

16,014. You think better than this?—I think so; there is not the same extent of workings opened out.

16,015. Have they a horse level there?—Yes.

16,016. Have they any sinking below that?—No, the workings are all above the horse level.

16,017. Have they any cross drifts in search of veins or deposits?—There are several cross drifts.

16,018. And those are well ventilated?—Yes, all of them are very well ventilated, at least upon the whole you may consider it to be in a good state of ventilation. There may be little ends here and there which are a little smoky now and then, but not the usual course; it is only the powder smoke which stays a little before they get a hole through to the other places to cause a ventilation.

16,019. Then you do not use a blast there?—Not where it is not very bad, but where it is very bad we put in the blast at once.

16,020. At what angle would you hold your candle

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when you consider the air very bad?—The best position of the candle for working in bad air is to put it rather more than horizontal, but I consider that whenever there is the slightest inclination of the candle the air is not good.

16,021. Do you not think that it would be very prejudicial for the men to work in air where you are obliged to put the candle in that position?—I should think that it would be very injurious.

16,022. And it would cost you a very trifling expense, I presume to put a blast in those ends?—We generally adopted the blast when it is necessary to put the candle in that position or nearly in that position.

16,023. But not before?—Even before that perhaps; much depends upon the state of the smoke and the air as regards putting the blast in; the smoke is the worst thing to deal with in those cases in the ends.

The witness withdrew.

Mr. JOHN WALTON examined.

Mr. J. Walton.

16,024. (*Chairman.*) What position do you hold in this mine?—Mine inspector under Mr. Cain.

16,025. Have you been here long?—Nineteen years.

16,026. I have asked Mr. Cain the principal part of the questions which we think it desirable to put, which you have heard. What is the condition of the men now compared with what it was 19 years ago?—I think the condition of the men is better now than it was 19 years ago.

16,027. You have lately put up a blast furnace for the purpose of ventilation, have you had it long enough to give any idea what the effects of it are?—There is no doubt that there is an improvement since it was put up.

16,028. There has been already an improvement?—Yes.

16,029. Before that furnace was erected it was frequently the case that men were obliged to retire from the work?—Yes, often during the July, August, and September months.

16,030. In going through this level since the furnace has been erected, do you not find it much cooler?—Yes, it is much cooler.

16,031. You went in with us?—Yes.

16,032. Did you hear the expression from a miner who was waiting there that he was nearly frozen from waiting so long?—Yes; I heard him make use of that observation.

16,033. Did you ever hear that observation before?—No.

16,034. From the horse level you go down 131 fathoms?—Yes.

16,035. Did you ever hear any complaint from the men of climbing that ladder?—No, I never heard them complain of the climbing.

16,036. They do not climb continuously?—No, they have stages of so many fathoms, and then they take a rest.

16,037. I do not mean continuously in the shaft, but do they go to a rise and then to a level and then rise again?—Yes.

16,038. Therefore it is not continuous from the shaft?—It is not.

16,039. What is the general condition of the men now in this mine, in your opinion?—All of them seem to be very healthy. I do not suppose that we have had one off work from sickness for a considerable length of time in this mine.

16,040. Not arising from working in the mine?—No.

16,041. But from other causes?—From other causes.

16,042. How do the miners live, have you ever seen anything of the mode of their living in their cottages?—Yes; they live well.

16,043. Just as well as an agriculturalist would live?—Better.

16,044. In what respect do they live better?—I think they use more animal food than is used by agricultural labourers.

16,045. Probably they have better wages?—They have better wages.

16,046. What kind of food do they eat?—Beef and mutton principally.

16,047. What is the price of the beef and mutton?—7½*d.* and 8*d.* a lb. at the present time.

16,048. Most of the miners have some little land of their own?—Yes; small farms, either as owner or tenant.

16,049. What extent of cattle do some of them keep?—Two or three cows, some of them have as many as four cows.

16,050. And they take great delight in their farms?—Yes, they do.

16,051. And they support the agricultural meetings?—Yes.

16,052. And they show their cattle?—Yes.

16,053. They have also horticultural meetings?—Yes.

16,054. And they exhibit the produce of their gardens?—Yes.

16,055. And in fact the society is supported almost entirely by the miners themselves?—Yes; in a great measure.

16,056. Do they get any support from the neighbouring gentry or proprietors?—Yes.

16,057. What are their amusements in the 16 hours they are off work?—The young men chiefly play at cricket, wrestle. During hunting season they sometimes go off with the hounds.

16,058. They run after the hounds?—Yes.

16,059. For hares, I suppose?—Yes, harriers.

16,060. Have they any reading room here?—Yes; a reading room at Newhaven, and several good libraries.

16,061. I suppose that almost all of them can read?—Yes, most of them.

16,062. Are the schools here the same as at Mr. Beaumont's other mines?—Yes.

16,063. Who pays for them?—Mr. Beaumont, in a great measure.

16,064. Do the children pay anything themselves?—Yes.

16,065. What?—6*d.* a month for tuition, and pay for books and other school material.

16,066. But the men do not subscribe?—They do not subscribe.

16,067. Can you state about what proportion the children pay and what proportion Mr. Beaumont pays for the schools?—Mr. Beaumont pays 100*l.* a year and the scholars pay something like 70*l.* towards one school in the district.

16,068. Who built the school?—The school building was erected by subscription. Mr. Beaumont paid the largest proportion of it, and other individuals and the miners also contributed; nearly the whole of them subscribed about 10*s.* each.

16,069. Is Mr. Beaumont the proprietor of the surface about here?—No.

16,070. Then the other owners of the land subscribed for the schools here for the benefit of the miners?—Yes, they subscribed a small portion. Mr. Beaumont was considerably the largest subscriber, and he gave the land too.

16,071. (*Mr. St. Aubyn.*) So far as your judgment goes, is anything omitted which ought to be done towards insuring the safety of the miner under ground?—No.

16072. Or towards making him comfortable above ground?—No.

16,073. (*Mr. Kendall.*) Did you ever know a suggestion for the miners' benefit which was not attended to?—No.

16,074. (*Chairman.*) You have heard the evidence which was given by Mr. Cain, and you have given your own; is there anything which strikes you which you would like to mention to the Commissioners?—No.

16,075. (*Mr. Austin Bruce.*) I suppose that the men here suffer from a difficulty of breathing much in the same degree as they do at the other mines?—Yes, they do.

16,076. Do you think that there are many men who have worked up to the age of 40 under ground who are free from more or less difficulty of breathing?—Great numbers of them in this district are quite free from it.

16,077. What proportion of them should you think are quite free?—I should think more than half of them.

16,078. (*Mr. Holland.*) You mean half of those above 40?—Yes.

16,079. (*Mr. Austin Bruce.*) What number of men are working under ground in this mine?—Three hundred and sixty-two men and boys.

16,080. Have you taken the numbers above 50?—No.

16,081. Can you form any estimate of those above 50?—No.

16,082. In the mine of which you have charge, are there many men working above 50?—Yes; there are a good many

16,083. Are there any working above 60?—Odd ones.

16,084. How many, should you think?—There is 25 above 60, and one 73.

16,085. Is he still a hale man?—Yes.

16,086. Does this man work in the deep levels or in the shallow levels?—He is working at Greenlaw's mine.

16,087. At what depth below the surface?—Where he is at the present time would be, perhaps, 25 fathoms below the surface.

16,088. Do the elder men ever ask to be placed to work in the shallower levels?—Yes.

16,089. So as to be relieved from the fatigue of climbing?—Yes.

16,090. Do you always attend to that request when it is made to you?—Always.

16,091. How are the men in this district with respect to sobriety?—They are very steady men.

16,092. There are not many public-houses here, are there?—There are considerably more public-houses in this district than there are in Allendale.

16,093. Do you believe that in consequence of the great number of public-houses the men are less sober than they are at Allenheads?—No; I do not think but what they are as steady here as they are at Allenheads.

16,094. Who support the public-houses in this neighbourhood?—The market is held at St. John's Chapel, it being the centre of the district, once a month, and tradesmen from a distance meet their customers at the public-houses for payments and orders.

16,095. Have you any drunken workmen?—A few.

16,096. Are there any portions of this mine where the air is decidedly less good than in the others?—The only place where it is worse than in the other mines is where we have been to day; but it is improved by this furnace, and is much better.

16,097. In those places are the men able to work for the whole of their ordinary time?—In nearly the whole of the mines they are, with the exception of this place.

16,098. I ask whether, in those places where the air is less good than it is usually, the men are able to work their usual day's work of eight hours?—No; they are not able.

16,099. How long do they work there?—They are not restricted; they use their own discretion in a great measure where it is bad for air we do not force them to stay.

16,100. They work a shorter or a longer time, according as they feel that they are able to bear it?—Just so.

16,101. Have you ever known men the worse in health from continuing to work in that bad air longer than they ought to have done?—No.

16,102. Is there any escape of gas into the levels from the rock?—Very little; I have scarcely ever seen that.

16,103. (*Mr. Kendall.*) The miners pay, I understand, 6*d.* a month for their children?—Yes; for those who attend school; they also pay for their books, &c., required.

16,104. Whatever age the children are?—Yes.

16,105. Until how old do they generally stay at the school?—11 or 12.

16,106. How early do you employ them here?—Above 11 years of age.

16,107. Not under?—Not under 11.

16,108. Do you find that the miners are anxious for their children to go to the school, or not?—Most of them are anxious, up to that time.

16,109. The moment they can earn anything, then they become anxious to employ them?—If they have large families they like to have them employed.

16,110. To help towards their maintenance?—Yes.

16,111. The children are examined, and you have prizes, and so on, I suppose?—Yes.

16,112. Do the miners or their families attend the examinations?—Not many of them.

16,113. Are they invited to do so?—They are invited.

16,114. Is it open to them to attend if they like?—Yes.

16,115. Some of them do attend the examination? Not often.

16,116. Who attend, generally, when the prizes are distributed?—Mr. Sopwith attends.

16,117. Who conducts the examination?—The schools are examined by the Government inspector annually and by Mr. Sopwith, and a committee appointed for that purpose.

16,118. The prizes are awarded more by ticket than by examination?—By both.

16,119. Do the miners enforce their children going to school pretty regularly?—Yes; they go very regularly.

16,120. (*Mr. Austin Bruce.*) Are there Sunday schools here?—There are several Sunday schools, but not in connexion with Beaumont's schools.

16,121. They are maintained by the different denominations?—Yes; Wesleyans and Primitive Methodists.

16,122. Do all the children go there?—A very great number of them.

16,123. (*Mr. Holland.*) You have said that the men here are generally healthy?—Yes.

16,124. I see by this table which you have given that 436 are under 30, and 441 above 30 years of age, how do you account for the small proportion of men above 30, namely, only half; do they leave the work?—Not many have left the work, excepting those who have emigrated to Australia.

16,125. Have a very large number left?—Not latterly.

16,126. Do they leave work, generally, from any other cause than from falling out of health and emigration; do they often go to other employments?—A few who have left have gone to the iron-stone workings.

16,127. Do a very large proportion who are above 30 go to other employments?—Not a great number.

16,128. Those who cease to be miners generally do so, I suppose, because they are out of health?—Several have left and begun in business.

16,129. What sort of ill-health is it which makes them give over mining; is it being touched in the wind?—I do not know.

16,130. (*Mr. Kendall.*) If fresh men come to offer to work do you give the preference to young men over old men; to men under 30 rather than men above 30?—Preference is given to the young men, certainly.

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16,131. Of those whom you take in during any month in the year, are there more under 30 than there are under 40; out of the last quantity of fresh men whom you have taken in, are there more under 30 than there are under 40?—More under 30.

16,132. (*Mr. Holland.*) Is not that the case in all employments?—Yes.

16,133. (*Mr. Austin Bruce.*) Are the men much given to change their work; do they come and go here?—No; they are principally inhabitants of the district.

16,134. Do you take in many strangers in the course of the year?—No; we principally employ just those who belong to the district.

16,135. The workmen employed in the mine are a very fair sample of the workmen in the district with respect to ages?—Yes.

16,136. (*Mr. Holland.*) I understand that most of your miners begin as boys and work up?—Yes.

16,137. But those who come in as men are young men?—Yes; but there are very few of those.

16,138. Do young men who begin mining at 20 and upwards preserve their health better than those who begin very young?—Those who begin to go underground above 20 preserve their health better.

16,139. (*Mr. St. Aubyn.*) Do you agree in the opinion expressed by Mr. Cain that it is very desirable to establish the use of cages and wire ropes where it is practicable, instead of the footways?—Yes.

16,140. And it is being done as fast as is convenient, is it not?—Yes, it is.

16,141. (*Mr. Kendall.*) Have you ever known of any accident in cages?—No.

16,142. (*Mr A. Bruce.*) What number of men have you at this moment working in places where the ventilation is in your opinion imperfect?—Not more than 20 in this particular mine.

16,143. (*Mr. Holland.*) Are your mines free from dust?—Most of the places are free from dust.

16,144. Are the men annoyed at all by breathing dust?—Not a great deal.

16,145. Are the men much subject to rheumatism in this neighbourhood?—No.

16,146. In speaking of your men as being healthy, you mean that they are healthy for miners?—They are very healthy men.

16,147. Do you mean as healthy as those who work upon the surface, or that they are very healthy for miners?—They are very healthy as miners.

16,148. But not so healthy as agricultural labourers?—Scarcely that, I think.

The witness withdrew.

Adjourned to To-morrow at Middleton.

MIDDLETON.

Friday, 10th October 1862.

PRESENT:

The Right Hon. Lord KINNAIRD, K.T.	H. AUSTIN BRUCE, Esq., M.P.
NICHOLAS KENDALL, Esq., M.P.	RICHARD DAVEY, Esq., M.P.
JOHN ST. AUBYN, Esq., M.P.	P. H. HOLLAND, Esq.

The Right Hon. Lord KINNAIRD, K.T., in the Chair.

ROBERT WALTON BAINBRIDGE, Esq., examined.

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16,149. (*Chairman.*) I believe you have the charge of the London Lead Company's mines in this district?—Yes, and in the North generally.

16,150. Will you be good enough to name the different districts?—Teesdale, Alston Moor, Westmoreland, and Weardale.

16,151. What are the names of the mines here?—The Teesdale district, I think I would call it.

16,152. Are they lead mines?—They are; and the major part in the hands of the Lead Company; but there are other small companies in the district.

16,153. Can you tell us what number of men are working underground is this district?—In Teesdale we have 470 pickmen working underground.

16,154. Do the royalties belong to one Lord?—The chief of them belong to the Duke of Cleveland, another part belongs to Mr. Hutchinson, and a very large district, although we are not working it extensively, to Mr. Bowes, the late member for South Durham.

16,155. Do you confine your workings to the Duke of Cleveland's?—No; we work in all of them.

16,156. Are the mines entered by a shaft, or by a horse level?—By horse levels generally; indeed, I think I may say almost exclusively.

16,157. What is the longest horse level in which you are working?—Some 400 or 500 fathoms; longer when you take the line of the level in the course of the vein. In driving the adit from the valley, we reach a number of objects on the road; and in each of those objects we drive a branch level when reached.

16,158. Are there many adits driven for the purpose of ventilation alone?—Yes; in order to effect an opening to a pre-existing level or shaft, I may say, generally, that when we set on a level it is seldom for the purpose of covering only one object; we, generally speaking, know of the existence of a number of veins before us, and on our reaching the first vein, if it be of sufficient magnitude and of a fair mineral character, then we rise to the surface, not only for ventilation, but for proving the character of the vein in all the strata between the level and the surface; we follow up the vein according to the course of the lode.

16,159. Do you then work it as a rise, or do you put in another level?—We rise, in the first instance, to the surface for ventilation, and after we have done that, then we drive in the course of the vein at the same random as the original level, and into that level we put a horse and waggons always. Suppose we find, in the course of our rise, in the different strata through which we have passed, ore yielding indications, then we put on, from the rise, drifts in the course of the vein; and between such drift and the horse level, and also the surface, frequent communications are made for ventilation and other purposes. As each vein is reached a like procedure takes place. Generally speaking in mining we find some of the strata ore-yielding and some not; as a general rule, it may be said that the plate beds are not ore-yielding; there are exceptions.

16,160. Is it limestone generally?—We have alternating beds, both of limestone and sandstone.

16,161. Which contains the most?—We have more ore out of the sandstones in Teesdale, and in Alston Moor, more out of the limestones; that is a general fact; we find both productive, but we have raised and are now raising, a much larger proportion of ore out of the sandstones than out of the limestones.

16,162. Are you obliged to use much timber?—Yes; we use a large quantity of timber.

16,163. Is it the limestone or the sandstone that requires most support?—The sandstone in general.

16,164. Do you make arches?—We always arch our levels with stone arches, as a matter of course, that is our horse levels. I may say that universally we arch our horse levels, and we arch such opening drifts above as we conceive are likely to be of permanent use.

16,165. How do the miners enter the mines, and how do they come out?—By the horse level, although that depends upon the convenience of their own residences. Some of the men may have, from their own residences, to come out over the summit of the hill, and in that case they go down the shafts.

16,166. When they go down the shafts, do they go by ladders?—Yes; not by buckets.

16,167. Do you mean by stempling?—Not by any machine, we have ladders; it is not by stempling.

16,168. What is the greatest depth that the men may have to go down in any shaft?—You may take 20 fathoms as the utmost extent, it is very often much less.

16,169. You would not think it desirable to have stempling?—No, I should think not; those stemplings are very apt to rot at the ends that go into the rock, and they might break almost without the knowledge of the parties that they were so near the point of breaking.

16,170. (*Mr. Holland.*) They are dangerous and also uncertain?—Yes, after a certain length of time; they are safe in the first instance.

16,171. (*Chairman.*) You would consider it a dangerous mode to adopt?—Yes, I consider it an objectionable mode of ascending and descending a mine, and such as we do not at all adopt in our present mines.

16,172. Have you got iron steps to the ladders?—No; flat wooden staves.

16,173. Are they tenoned into the uprights?—Yes, into the sides.

16,174. When you use ladders, what divisions are there, or sollers?—We have divisions where one side of a shaft has to be used for the men ascending and descending, and the other side has to be used for the purpose of putting down the work.

16,175. They are divided, are they?—Yes, they are; but in general we endeavour to get what we call our hoppers; between the place where the men are working and the horse level, we have these at every 10 fathoms, and these are not used for the men to ascend or desend by; but exclusively for putting down the work.

16,176. (*Mr. Austin Bruce.*) If a man were to fall in your 20-fathom shaft, how many fathoms might he possibly fall without being stopped?—To the end of the ladder; I believe the length is about ten feet.

16,177. At the end of each ladder is there a stage to prevent a man falling?—Yes.

16,178. What is that called?—We call it the landing.

16,179. (*Chairman.*) Is your mine a wet mine in any part of it?—Some of them are wet and some dry; they vary very much in that respect.

16,180. In a wet mine what means do you resort to to get rid of the water?—It descends into the horse level; we have pumping occasionally; in our Little Eggleshope or California mine we have pumping.

16,181. How is the pumping carried on?—By hydraulic pressure; we have no steam power, but an upright column of water.

16,182. That works the pumps?—Yes.

16,183. Is that sufficient?—Quite sufficient to relieve the mine of the water.

16,184. Are the bargains of the mine let quarterly?—Yes.

16,185. Do the men receive any monthly allowance?—Yes; merely subsistence, and the balance is paid at the end of the year.

16,186. What is the monthly allowance made to the miners?—44*s.* per month, or 11*s.* per week.

16,187. If a man gets into arrear, is that carried on into the next year?—Yes, we carry the balance on against him to the next year.

16,188. (*Mr. Austin Bruce.*) The whole of it?—Yes, we always carry the whole of the balance on against him.

16,189. (*Chairman.*) Does it often happen that there is a balance against a man?—No, by no means; decidedly the minor portion of our men have no balance; by far the larger proportion have a balance to receive at the end of the year.

16,190. (*Mr. Austin Bruce.*) On what theory of wages are the bargains made; what is it expected that a man may fairly earn?—Our basis is 15*s.* a week clear, for five eight-hour shifts; but the basis fluctuates according to the state of the times, and according in the price of provisions.

16,191. (*Mr. Kendall.*) If there is a balance against a man, is that carried on into the next year?—Yes, invariably.

16,192. (*Chairman.*) Will you describe to the Commissioners the way in which the ground is valued when you make the bargains?—As between the masters and the men our system is this:—we send not fewer than five agents to each working, throughout the whole of the mines; and, generally speaking, I have two sets of five agents going on with their view at the same time, and that is done with the object of saving the time of the men. Formerly one set of agents used to view all the mines, and it took them a fortnight to complete their work in this district; but for some years past, instead of having one set of agents going, I have had two sets to view, and we are able to accomplish all our bargain arrangements within a week. As a general rule, the men do not work at the time that the view is going on, so that we have a loss of time, a loss of time to the masters, and a loss of time to the men also; and, with the view of occasioning to both the Lead Company and the workmen the least possible loss of time, I now accomplish all the views and the bargain-letting within a week in each of the districts. I have two sets of men who travel, and to each of these sets I give its own peculiar department; that is to say, I would send five to one mine on one day, and five to another mine on the same day; and these agents are not exclusively the local agents, but they are drawn from the different districts. I should have all our Teesdale agents travelling, and I should have agents from Alston Moor, from Westmoreland, and from Weardale; mingling the home agents and the stranger agents together; and in that way all possibility of partiality, and all possibility of any improper dealing between the local men and the miners, is prevented. To each of these parties I give the basis of the wages, upon which they are to give their opinion, so as to bring out the net earning of 15*s.* a week to each man, for five eight-hour shifts, of free and skilful exertion. Then, having that basis, each of those parties goes to a mine and views the place, and considers what the rate ought to be for the bargain, and he enters that in his own book or sheet, which he delivers to me independently of his fellows.

16,193. Do they not consult together?—I presume they may in some cases of difficulty, or where it is desirable that they should be possessed of local information, they may in some cases talk with each other; but, as a general rule, they do not. Supposing that the local agent may be presumed to have better knowledge than any stranger, I conceive it to be his duty to bring under the notice of all his fellows everything that he conceives they would not be acquainted with without his communication to them.

16,194. The object, I presume, is to obtain independent opinions; and, upon the whole, you think you obtain them?—Yes; as a general rule I believe they do not consult. I do not conceive that it is improper that they should consult on some particular occasions.

16,195. Has this system been in operation for some time?—Yes, before I came into the concern. I

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apprehend that it has been in operation for the last half century.

16,196. Supposing there should happen to be a great difference of opinion, what is done then?—Then I have to arrange it myself. After I have obtained all their opinions, I then form my own figures founded upon their opinions; and my own practice generally is this: I take the figures and add them together, and divide by five; or I take the highest and the lowest, and take the mean between the two; then I look to the parties in whom I have the greatest confidence, to see how their figures bear upon that, and I fix my own accordingly. I exercise my own judgment, guided by the judgment of those different parties. I am not bound by those figures, but I use their judgment in forming my own.

16,197. Has this system worked beneficially with reference to the owners of the mine?—I conceive that it has.

16,198. Has it given satisfaction also to the men?—Yes, it has; no system could possibly be devised that would keep the agents more independent of the men, or the men more independent of the agents; supposing that a local agent had a pique against a partnership, his pique would be corrected by the opinions of the others; or supposing that he had any favouritism towards them, then his favouritism would be corrected by the independent opinions of the others.

16,199. And upon the whole it has given satisfaction?—Yes, decidedly so; I believe that both the masters and the men are thoroughly satisfied, and that the judgment thus formed is sound; I may state that the results generally come out very closely approximating to the basis that I have given.

16,200. (*Mr. Kendall.*) Have you made an average of the wages in the last year?—Yes.

16,201. What was the average?—It was 2*d.* below the basis, it was 14*s.* 10*d.*; occasionally it will come out some 2*d.* or 3*d.* or 6*d.* above the basis.

16,202. (*Chairman.*) Is that for working by the fathom?—By both weight and fathom; we have two systems, one is to pay them by the amount of ground cut, and the other to pay them by the amount of ore raised.

16,203. What proportion should you say that the men in this district are paid by the amount of ore raised, and what proportion by the fathom?—I should say that three-fourths of the miners are paid by the amount of ground cut in this district; we are guided in that respect very much by the state of the vein, whether it is a wide or a narrow vein, or otherwise.

16,204. When the payment is made by weight, is the value of the ore taken into consideration?—No, not the market value of the ore, the simple weight.

16,205. Do the men work double or single handed in your mines?—Two of them work together, one will hold the jumper and the other will strike; we have always two men working together, very few of the men work single-handed.

16,206. What is the youngest age at which you allow a boy to go to work underground?—Eighteen is the youngest age.

16,207. May not a father take his son down into the mine with him before that?—No, we do not allow that; and at present in Teesdale here particularly, many of the boys are kept out until they are 20 or 21, but that is contrary to our wish; we should conceive it desirable that a boy should go underground at 18 in order to obtain skill when his mind and body are in a proper state for learning.

16,208. Are the men who work underground sooner or more affected by the work than those who work at the surface?—I conceive, as a general rule, that they are, because it is more unhealthy.

16,209. Are you of opinion that going into the mines young is likely to increase the evil?—Yes, decidedly.

16,210. Will you be kind enough to state what education is provided for the children of the miners?—Our rule is that every child belonging to our workmen shall go to school between six and 12 years of age.

16,211. Do all the men contribute to the maintenance of the school by weekly or monthly payments, or those only whose children attend the school?—Each parent pays for his own children and for no others. The rule is that the girls shall go to school until they are 14, provided they remain under the parental roof; if the parent sends his child out to service, we do not stand in the way of that. At 12 years of age the boys are eligible to come to our ore-dressing floors; but in order to do that they must have a good school character. Then, from the age of 12 to 18, as a rule, they must attend the ore-dressing floors, and at 18 years of age they are allowed to be placed underground. At 14 years of age we allow them to go underground during the three winter months when the ore dressing is not in operation. Owing to the severity of our climate here, we cannot dress the ore throughout the whole of the winter, and we must take it that on the average, for two or three months in the winter, each boy, after becoming 14 years of age, is underground; he is placed with one of the mining partnerships as a labourer, and in that way he is serving a sort of apprenticeship, or obtaining knowledge that is likely to be useful to him in after-life. At 18 years of age we consider these young men eligible to be placed as partners in the mines, and to become members of a partnership. We do not allow them full wages, but we put them in at so much in the shilling, varying from 9*d.* to 11*d.*, and in that way the experienced men, with whom they are working, are getting some compensation for their tuition; but in practice I may say that the bulk of our boys have been kept out until they become 20. In recent years, owing to the fact that we have had a greater amount of ore to dress than we had boys under 18 to dress it, they were kept out longer, so that the bulk of our boys now may be said to be kept out of permanent underground working until they are 20 years of age, and even beyond that.

16,212. How are the schools supported?—They are supported exclusively by the Company, that is, their own two schools; but every workman pays 1*s.* a quarter for each of his children that he may have taught there—4*s.* a year.

16,213. But, as I understand you, single men and those who have no children do not pay anything?—No, except they have brothers and sisters, and there is not a father.

16,214. You say that the children are compelled to attend school; what kind of pressure is brought to bear upon a parent?—I should remonstrate with a parent against the impropriety of not sending his children to school, and giving them education; and if I found any children absent, and he did not pay attention to my remonstrance, I should inflict a pecuniary fine upon him. If he still remained obstinate I should not hesitate to dismiss him from the service as an unworthy operative.

16,215. Have you ever had occasion to take such a step as that?—No, I have had occasion to fine occasionally, but not to any large amount; say 2*s.* 6*d.*

16,216. Was any objection made to the infliction of that fine?—No; I may add also, that the boys are not placed underground unless they have a good school character.

16,217. On what is that good school character based?—Every boy must pass a scriptural examination, and, upon his passing a satisfactory Bible examination, he is presented with a Bible by the Company, and he is then considered eligible for the works.

16,218. On what principles is the school conducted, in conformity with those of the Church of England, or of dissenters?—On neither, it is conducted on a general and liberal principle. Our rule is this, we have the Bible, and we have such catechisms in the school as contain all the fundamental doctrines of Christianity, without any denominational or sectarian bias; we use the catechism of Gall, of Edinburgh, and Lloyd's Bible catechism, and Watts' catechism,

and the yearly issue of Bible lessons by the Sunday School Union's ; those are the chief.

16,219. Has there never been any objection made by the miners to send their children to school on account of religious bias ?—None whatever.

16,220. Do you find that the men working in the mines are to a certain degree well educated ?—Yes, I consider that they are.

16,221. Do you conceive that that has had a good effect upon the general conduct of the men ?—I am of opinion that it has decidedly had that effect.

16,222. Have there been any strikes among them ?—No, we know nothing of that ; there has not been one since I have been in the concern, and I have been here above 20 years ; there were none in the time of my predecessor, except during the two or three first years of his superintendence.

16,223. Do you think that the men, on account of the education they have received when young, take care not to injure their health by overwork, or working in bad places ?—Yes, I conceive that they are generally intelligent on the subject, and that they are alive to the maintenance of their health.

16,224. In the course of the workings I presume you come upon places where the air is not good, and where the candle will not burn properly ?—We may have come upon such a place ; but we hold it to be our duty to ventilate such a place.

16,225. Do the men ever complain of it, or is it brought under your notice by the men or by the agents?—It would be brought under my notice by the agents. My general instruction to the agents is this, to have all the mines thoroughly well ventilated, and in right working condition. I give them authority to take all the measures they consider necessary or desirable for effecting that object, so that the overman has in his own power at once the remedy for any evil that may arise.

16,226. What are the remedies to which they generally resort to supply, for example, any deficiency of fresh air ?—They force in fresh air, pure atmospheric air, into the fore ends, where the men are working.

16,227. What means are adopted for forcing in the air ?—I mean forcing in the air where we are driving a level, by a water blast or a fan blast.

16,228. Is the fan blast worked by water or by hand ?—Sometimes it is worked by men, and sometimes by water power. If we are driving a long level, our object is to get a water blast down a shaft, or from the inclination of the hill, which we are generally able to do from the springs, bringing them down in close pipes, and so get 15 or 20 fathoms of pressure, as we find it convenient, and then the escape of that water through an opening in the bottom, into a pipe at the end, forces the air forward a great distance.

16,229. Are the pipes by which the air is carried on, made of wood or of iron ?—They are made of iron generally, that is, cast iron ; we may use wooden pipes for a small local purpose, or a temporary one.

16,230. Do you ever use zinc pipes ?—No, we have not ; the pipe is five inches internally.

16,231. Is that the general size of the pipes ?—Yes, the universal size.

16,232. When you are putting in a rise, are the pipes then carried up ?—Yes, they are carried up the rise.

16,233. What means are taken to prevent it from filling up, when the pipe is taken up a rise ?—They will so place it as that the stuff will not come into it, or a perforated hose is used.

16,234. That is always carefully looked to by the agents, is it ?—Yes, otherwise it would neutralize all our other efforts.

16,235. To your knowledge are there any men working in your mines who have suffered, or are suffering in their breathing ?—Yes.

16,236. At how young an age should you say that that first shows itself ?—It will depend partly on the constitution of the individual and partly upon the particular places in which he may have been working for some time.

16,237. By places in which he may have working, do you mean that he may have been working in a place before a communication has been effected ?—Yes, or where there has been a large amount of dust.

16,238. Do you think that the dust is injurious to the miners ?—My own impression is that it is the dust and the gunpowder smoke, and the absence of day light, that affect the miner's health.

16,239. More than any want of air ?—Yes.

16,240. Do you adopt any means when a mine is very dry and dusty to get rid of the dust ?—No, I do not know that we can, it arises you see from a moving operation that we really cannot control.

16,241. You mean, I presume, from boring ?—Yes.

16,242. Is there a doctor attached to the mines ?—Yes, the Company find a doctor in each of the districts.

16,243. How is he paid ?—He is paid by the Company exclusively, without any charge being made upon the men.

16,244. Do the men belong to any sick club ?—We have a sick club connected with the concern.

16,245. What do the miners contribute to it ?—Every man pays 30*s.* a year.

16 246. Is a separate account kept of that fund ?—Yes.

16,247. Are the contributions made by the miners sufficient to meet the demands upon the fund ?—They have not been so in times past, but they are at present.

16,248. Is relief afforded only in case of visible accidents, and not for sickness ?—Yes ; in both cases.

16,249. What is the amount of the allowance made to each man ?—7*s.* a week for sickness, and now 6*s.* a week pension after attaining 65 years of age.

16,250. Does that come out of the same fund ?—Yes.

16,251. Is that pension often claimed ?—Yes, we have several parties on the list.

16,252. Have you any notion how many of such pensioners there are now ?—Yes, the paper which I hold in my hand will show you, from the year 1851 to 1861, the number of members, the number of pensioners, and the deaths, in those respective years.

The following paper was handed in :

Governor and Company's Workmen's Fund.

In the year.	No. of Members.	No of Pensioners.	Deaths of Members.
1851	943	16	21
1852	934	15	11
1853	871	13	16
1854	940	14	19
1855	921	16	12
1856	946	16	9
1857	943	16	9
1858	965	16	14
1859	979	17	14
1860	1,020	18	17
1861	1,038	16	21

16,253. (*Mr. Kendall.*) The moment a miner becomes 65 years of age has he a right to claim a pension ?—Yes, whether he be in health or in sickness.

16,254. (*Mr. Austin Bruce.*) And whether he continues to work or not ?—Yes, it is totally irrespective of all considerations.

16,255. (*Chairman.*) Is there any consideration as to the number of years he has already worked in the mines ?—None whatever. On attaining the age of 65 his personal contribution to the fund ceases, and he is entitled to that pension without any further contribution.

16,256. You say that at present the receipts from the miners are sufficient to meet all demands upon the fund ?—When it was first established it was established on a too liberal basis ; that is to say, the payments out were too large for the fund. In the course of a few years it became insolvent, and it was then submitted to an actuary, who reported the fund to

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be insolvent, and at that time the Lead Company agreed to contribute 200*l.* a year. I think that the men were called upon each to pay an additional 6*s.* per year towards the redemption of the fund, and the Company agreed to pay an amount equivalent to the whole amount of the men's contribution of 6*s.* also, over and above the 200*l.*, and that went on until the fund got into a state when it was reported to be solvent. Upon its becoming solvent, then the men's additional contribution of 6*s.* per year ceased, and the Company's contribution equivalent to that 6*s.* a year also ceased; their payment of 200*l.* a year was reduced to 100*l.* a year, and that 100*l.* a year was given because the actuary, to whom the fund was then submitted, stated that the then proposed increase of the pension from 4*s.* to 5*s.* a week, and the proposed increased allowance from 6*s.* to 7*s.* per week when the men were sick, would not be met by the fund—that there would be a deficiency of 100*l.* a year. The Company at once said, in order to enable these increased allowances to be made to the members, "We will give 100*l.* a year for the next seven years, "until the fund is again reported upon." The fund has since that time undergone another septennial revision down to October 1860, and it was then submitted to Mr. Ansell, the eminent actuary of London, and he reported that the fund was not only solvent, but that there was a surplus of above 3,000*l.*, which was available either for a diminution of the contributions to the fund or for increased benefits. It was then a question whether the contributions to the fund were to be diminished, or whether an increased allowance was to be given to the sick members and pensioners, and it was decided that it was not desirable to diminish the amount of the yearly contributions into the fund, but it was more desirable to increase the benefits to the members.

16,257. By whom was that question decided?—It was decided by a general committee, in whose management it is, two-thirds of whom are selected by the men themselves, the other third is represented by the Company's several district agents in their official capacity. Then it was agreed that the sick allowance should stand as it was, 7*s.* a week, but that the pensions at the age of 65 should be increased from 5*s.* to 6*s.*, and the actuary conceived that the fund would just about meet that for the next seven years. It was also thought desirable by the committee that a payment of 2*l.* should be made towards the funeral expenses of a wife of a member. The actuary did not conceive that the state of the fund would admit of that, and the Company said, "We will continue our contri- "bution of 100*l.* a year, expressly with the view of "meeting that charge." So that now the Company are still continuing their contribution of 100*l.* a year to the fund for the current seven years, with the view of covering that payment of the funeral expenses of a wife.

16,258. Supposing the husband dies, what is done in that case?—In that case 2*l.* are allowed for his funeral expenses, and 3*l.* are paid to the widow.

16,259. Are the contributions which you have just mentioned confined to the men who work underground?—No; they apply to all the workmen in the Company's service.

16,260. Do all of them pay alike?—Yes.

16,261. They pay alike, whatever the amount of their wages may be?—Yes, and receive alike. I may mention that the number of members belonging to the Company's workmen's fund in 1850 was 921, while in 1861 it was 1,038. The number of pensioners in the year ending 1st November 1850, was 22, while in 1861 it was only 16.

16,262. Are the pensioners confined to men of 65 years of age and upwards?—Yes; there are none under 65. It has been agitated amongst us whether the age should be reduced; but the actuary stated that he did not conceive the state of the fund would allow of it.

16,263. (*Mr. Austin Bruce.*) If a man becomes disabled before he attains the age of 65 by any accident, he is relieved, I suppose, as a sick man, and not as a pensioner?—Yes.

16,264. (*Chairman.*) If he is permanently injured, would he become a pensioner?—No; the Company are the treasurers of the fund.

16,265. (*Mr. Austin Bruce.*) Do the men contribute to any other club besides that which is connected with the works?—Yes, they do; they are at liberty to do so. We object to their becoming members of the Odd Fellows, or of those clubs that travel all over the kingdom.

16,266. Why so?—We do not like it, our men, generally speaking, are local men, and we do not like them to be connected with those clubs that extend all over the kingdom; they generally contribute to clubs in their own neighbourhood.

16,267. Are the poor rates light in this district?—They are comparatively light; there is no doubt that this sick fund is a most material relief to the poor rates.

16,268. (*Chairman.*) What deductions are made from the miners?—For candles, gunpowder, and tools.

16,269. Are the tools weighed?—Yes, they are weighed to the men; we charge them so much per pound for the tools, and we charge them for the drawing of the work out of the levels, that is paid by the men as part of the bargain, and deducted out of their earnings.

16,270. Then the responsibility of removing all the material rests with the Company?—Yes.

16,271. And not with the men?—No, it rests with the local inspectors, in whose charge the drawing may be said to be.

16,272. What do the miners pay per pound for candles?—That varies according to the price; we charged them last year about 7½*d.*

16,273. Are they charged anything beyond the contract price?—Yes, something to cover the agent's trouble, and everything of that kind.

16,274. Is it the same with regard to the gunpowder?—Yes, and I may say that they pay that with this view: the men, if they had these things too cheap, would be wasteful, and it is not desirable that we should be below the country price.

16,275. They do not pay anything beyond the country price?—No, I do not conceive that they do in general; I believe that we are below the retail price of the country.

16,276. Are the miners limited to a certain quantity?—No; I hold it to be the duty of the overlooker to see that there is no waste; and I always cause to be hung up in the office a list of the quantity of powder and candles that each partnership has been supplied with during the preceding quarter. That is ostensibly in order that the men may have information of how our accounts stand; but really as well that the men may be mutual checks upon each other, as to the use and the waste of candles, and it does operate in that way.

16,277. As they pay for them, it is for their own advantage that they should not consume more than is necessary?—Of course; we intend that our men should earn a net sum after the deductions for these things are made, and if they are wasteful, then the charge comes upon the Company as it were.

16,278. (*Mr. Austin Bruce.*) Will you be good enough to state how many men were in your employment in 1851, and what the number of men receiving pensions was, and the same with respect to 1861?—There were 16 men receiving pensions in 1851 out of 943 workmen, and in 1861 there were 16 men receiving pensions out of 1,038.

16,279. In you opinion, does the difference of proportion arise from any but accidental causes?—I cannot give you any reason.

16,280. Have you ever taken the pains of comparing the length of life of your workmen with that of those who are not engaged in mining operations?—No, I cannot say that we have.

16,281. At what age do they usually begin to show

that they are affected by their lives as miners?—Perhaps about 40.

16,282. Is their health then usually so affected in your opinion, as to diminish the produce of their labour?—No, I do not think that it is. By that time, generally speaking, the younger members of the same family connexion will work with the older, and there is the skill of the one and the physical energy of the other, the one compensates for the other, and there is a good deal of that among the miners. Supposing the members of the family of an old man see that he is rather failing, they will work along with him and take the laborious part of the work off him.

16,283. Have you spent all your life in these districts?—I am a native of Alston Moor.

16,284. How early did you become connected with these districts, by occupation?—At about two or three and twenty years of age.

16,285. Since that time have you observed any change in the physical condition of the workmen?—My impression is, that upon the whole, it has been improving; mainly from this fact, that during the preceding 20 years, the mines underwent a general improved ventilation, then by the time that I came here, those who had suffered previously to the previous 20 years from a comparative defect of ventilation were dying out.

16,286. In the last 20 years have there been also improvements introduced in ventilation?—No; I really cannot say so. My impression is that my predecessor paid equal attention to that as I have done myself.

16,287. Have there been any improved modes of introducing fresh air or extracting the foul air within your recollection?—No; we still have recourse to the water blast and the fan blast, which were in operation above 20 years ago.

16,288. Do you ever use the furnace as a means of improving the ventilation?—Never.

16,289. You conceive that it is not necessary?—It is not necessary in our case.

16,290. Have you many shafts over your workings in Teesdale?—Yes, a great many.

16,291. Does the upcast air generally ascend through them, or pass out at the levels, or both?—It depends upon the state of the atmosphere; sometimes the current will be one way and sometimes the other.

16,292. Have you any fixed upcast and downcast shafts?—No.

16,293. You do not attempt to conduct the air in regular courses?—No; we have not the need of that. The only thing in that respect is this: supposing that we have a level going, and that we have an opening drift above, then the air will pass along the level up the furthest working and back with the drift; that may be said to be comparatively the same as in the coal fields.

16,294. It is conducted in that case?—Yes; and any intermediate opening would in that case be closed.

16,295. You would have doors put up?—Yes.

16,296. Do you observe any difference between the relative health of the miners in the different districts under your charge?—I should say, that upon the whole Westmoreland is our healthiest district.

16,297. Where in Westmoreland are your mines?—At Dufton and Hilton and Merton.

16,298. Do you attribute the slightly superior health of the workmen there to any particular cause?—One cause may be this: the men are living in a farming country, and can get an abundant supply of milk and oatmeal, and everything of that kind. Another cause may be this: that when they are not working underground they may be able to obtain agricultural employment, which is beneficial to them.

16,299. Do they do so occasionally?—Yes, most of our miners, when they have completed the 40 hours which we require of them, will obtain any above-ground employment that they have the opportunity of getting.

16,300. You stated that in your opinion dust was the chief cause of the miners' disease?—And the gunpowder smoke. I should say also, that if there was bad ventilation there would be a great injury, but then we endeavour that there shall be no bad ventilation.

16,301. The ventilation in all your mines, I presume, is pretty good?—I consider it good as a whole.

16,302. And equally good?—When there is a larger number of men in a given locality, of course the air will not be so good as with a smaller number.

16,303. But as between the different districts, is there any difference?—Westmoreland may be said to be the best ventilated, naturally, owing to the rocks there being of a more broken character, and the fissures themselves yielding air independent of artificial ventilation.

16,304. (*Chairman.*) What is the rock?—There is a great deal of limestone there.

16,305. (*Mr. Austin Bruce.*) Does one sort of rock throw off more dust than another?—There would be more dust in the sandstone and shale than in the limestone.

16,306. Do the men therefore suffer appreciably from working in one sort of rock?—I cannot say that I can speak to the fact of any difference, I do not go so closely underground myself as to enable me to speak particularly upon the point; you will get that better from the more practical agents; I may refer you to them in that respect.

16,307. Have you a night school for boys between 12 and 18?—No; several of them do attend a night school, but that we do not recognize, excepting that whenever they do attend a night school we are ready to pay. With regard to education, I may state this: the Company have a school of their own at Middleton, applicable to the Teesdale district, and a school at Nenthead, also applicable to that locality, but the men are scattered, many of them are at too great a distance to be able to send their children to those schools, and in those cases we contribute 3*s.* per quarter for each child at any school to which the parent may choose to send his child; and in some instances contribute also a yearly sum in aid of the stipend.

16,308. Any school not connected with you?—Not directly connected with us; in that case we still charge the man 1*s.* per quarter, so that the Company virtually contribute 2*s.* and the man 1*s.* I had better give you our school regulations (*delivering in the same*).

16,309. (*Mr. Davey.*) Have you any accommodation at the surface for the men to change?—Yes.

16,310. Have you lodging houses also?—Yes.

16,311. How many do you get in those houses generally?—That depends upon the number of men employed at the mine, and how many of these men are able to go to and from their work to their own homes.

16,312. What accommodation have you for the men who come there, have they separate beds?—There are beds which will contain two men each, two men are allowed to sleep together.

16,313. In shifting the pairs do they come into the same bed afterwards, or are there two in each bed for the whole of the time?—In general I apprehend that two men appropriate a bed and stick to that bed, they do not like sleeping indiscriminately in each others beds.

16,314. Does it happen that two men are in the bed at the same time?—Yes.

16,315. How many beds have you in one room?—That varies very materially; the beds are six feet four inches in length, and four feet four inches in breadth, if I mistake not; we generally fill a room with beds, and we have two tiers in general, but I may say that practically the upper tier is seldom used; the lower beds are generally those which are used, the upper tier is only put into requisition when there is a greater number of men than are sufficient to occupy the lower.

16,316. What is the ventilation of the room?—We have an opening under the eaves for the admission of fresh air; we also have an opening at the ridge.

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This is a specimen of our ventilating apparatus (*producing the same*).

16,317. (*Mr. Holland.*) Is that the size of it?—No.

16,318. (*Mr. Davey.*) Who settles the ventilation, is it done by the men themselves?—The agents do that.

16,319. (*Mr. Holland.*) What size do you use for your ventilating apparatus?—Those that we use ourselves are perhaps a foot in diameter, one tube within another, so that there is an inlet and an outlet draft, that is the principle of it.

16,320. (*Mr. Davey.*) What distance have the men generally to come to these lodging houses?—Many of them have to travel six or eight miles to the mine where they are at work; the lodging houses are always at the level mouth. With regard to the ventilation, I may state further that we carry up a tube parallel with the chimney flue. The object of that is to carry off the impure and heated air. When the fire is on, the heat in the chimney flue extends to this tube and rarefies the air in it, so that it will either carry the vitiated air off or bring fresh air in, and whichever it does it is beneficial; that is one means of ventilation which we have; we make use of that also in our cottages here; the Company have built a number of cottages for the use of the miners upon the spot, and we make an opening under the ceiling, and carry up a tube, say of three or four inches in diameter, parallel with the chimney but quite distinct from the chimney, still the air in that parallel tube is affected by the heat in the chimney, and it will create either an internal or an external draft; it will either admit pure atmospheric air down the tube, or it will carry off the vitiated air of the room into the open air at the ridge.

16,321. (*Mr. Holland.*) What gives the motion down the tube?—The natural pressure of the atmosphere; the air in a room is rarefied, and is of less weight than the cold atmosphere.

16,322. (*Mr. Davey.*) Have your men who live in the lodging houses any holdings of fields?—Yes, a great many of them have little farms.

16,323. Do you find any difference in the men who hold these small farms and those who live in the Company's houses?—Not in point of general health; because the fact is this, those men who live in our houses are found by us with gardens.

16,324. Does it improve their condition as miners?—I conceive that it does. The holding of a small farm will improve the family condition of a miner; it is calculated to improve both his health and his circumstances. But in order to compensate such of our men as have not farms we endeavour to provide them with gardens.

16,325. What proportion of your men live in lodging houses?—In Teesdale, I should say fully two-thirds, or more than that; we have a much larger proportion in Teesdale than in any of the other districts, owing to the fact that the mines are, generally speaking, at a distance from the town.

16,326. (*Mr. St. Aubyn.*) You have said that during the three months of hard weather in winter the boys of 14 work underground?—Yes.

16,327. Do all the boys who are employed by you go underground, or do a part of them go underground and the remainder remain above?—At 14 years of age we place the whole of them, of good character, underground, till we have occasion for their services at the ore dressing in the early spring.

16,328. Does it ever happen that part of those boys remain working underground at the expiration of the hard weather?—No.

16,329. They all come to the surface?—They all come to the surface again. Here is a list of the rules in the library, to which all our men have free access without any payment whatever (*producing the same*).

16,330. (*Mr. Kendall.*) Have you periodicals?—The Company built a reading room in the town here, for which they charge no rent, and the Company find fuel and light and cleaning, leaving the men themselves to provide the periodicals and works; and such of the men as are members (it is optional with them) pay 6*d.* on entry, and 3*d.* per month contribution. With regard to the mine shops, these are the printed rules, which we hang up in each mine shop for the regulation of the mine shop (*producing the same*).

16,331. You have a system as to your children and as to your miners; we have heard nothing at all as to the inspectors. Have you a system as regards inspectors of mines?—Yes.

16,332. What is the rule as regards inspectors; are the agents taken from the miners?—Yes; in the first place being raised to the rank of an overseer or inspector.

16,333. What is the test for an inspector?—Generally speaking I apply to all the local agents to give me a list from time to time (say once in three or four years) of all the young men in the concern whom they conceive likely to make good inspectors. When I have obtained that list from them I keep my eye upon each of these parties individually, and form my own opinion of their character; and our test, of course, is intelligence, integrity, and independence of character. I should say that those are the three grounds upon which we make our selection.

16,334. When your pensioners arrive at 65 they are entitled to 6*s.* a week; may they quit the district then?—Yes, and do what they like; they are thoroughly their own masters in every respect.

16,335. Then they may go elsewhere and work and do what they like?—Yes.

16,336. And still draw from you their pension?—Yes.

16,337. (*Mr. Austin Bruce.*) Many of your men live in houses belonging to the Company?—Yes.

16,338. Have you any objection to state what is the rent which they pay for those houses?—£3 10*s.* and 4*l.* a year.

16,339. How many rooms are there in the houses?—Four rooms; we charge 4*l.* 10*s.* a year for four rooms and a garden.

16,340. Of those rooms how many are sleeping rooms?—Two of them; and then they generally make use of the kitchen also as a sleeping room.

16,341. So as to make a division of the sexes of the children?—Yes; the father and mother generally sleep in the lower room, and the girls upstairs in one room, and the boys in another.

16,342. Do many of the cottages belong to the workmen themselves?—Yes, many of them.

16,343. Is that a common way of investing their savings?—Yes.

16,344. (*Mr. Holland.*) Do they take lodgers?—Our rule with regard to the Company's houses is, that they shall not take lodgers; but I suppose that we find it needful to be blind occasionally.

16,345. Then that rule is relaxed?—Yes.

16,346. What relaxation do you allow?—I cannot say that we have any general rule. Supposing that there was a surplus of population over the house accommodation, then instead of going to the party and saying, "You ought not to have lodgers," I should think it advisable to look over it.

16,347. Is there often a surplus of population over the house accommodation?—Occasionally there is, but only occasionally.

16,348. Then the overcrowding as regards lodgers is an exception, is it?—It is an exception to the general rule.

16,349. (*Mr. Kendall.*) The balance beyond the 11*s.* a week is paid up at the end of every year?—Yes.

16,350. Do you think that the sums of money which the men receive then lead them to invest in small farms, and buying stock for farms?—Yes.

16,351. Then you think that their receiving a balance at the end of the year is more beneficial than their receiving so much more money a week?—Yes, I do. It comes to meet those annually accruing charges which they cannot escape, and our retaining

the money in our own hands I believe is better than if they had it in their pockets, in many cases.

16,352. You find that very frequently those balances are invested in cows and so on?—Yes, and in the building of cottages. I think you ought to know that at our mine shops we always provide a cool pantry for the keeping of the men's provisions, and we always provide a flow of water where they can insert their cans or bottles of milk so as to keep them fresh for several days, and in each of those mine shops there is a flow of water so that they can wash themselves.

16,353. How long has the Lead Company been working?—Nearly 200 years.

16,354. (*Mr. Holland.*) Are the cottages let at a fair paying rent, or is an advantage given to the miners?—I consider that the miners have an advantage in the cottages; that they do not pay the Lead Company pecuniarily, but the cottages are provided for the accommodation of their best class of workmen.

16,355. The difference between the real rent and the rent paid is in fact an addition to the men's wages?—It is an indirect addition, there is no doubt.

The witness withdrew.

Mr. WILLIAM EWART examined.

16,356. (*Chairman.*) Are you the surgeon employed by the Lead Company?—I am.

16,357. Have you any other general practice, or are you almost solely employed by the Company?—I am almost solely employed by the Company; there is a little practice besides, but so trifling that I am almost solely employed by the Company.

16,358. How long have you been surgeon of this district?—15 years.

16,359. Have you had the superintendence of the mines in this district for 15 years?—I have.

16,360. Do you observe as regards the health of the miners that there is any peculiar disease to which they are subject?—Decidedly; there is one variety of disease; that is, disease of the lungs, commonly called bronchitis; the disease called bronchitis is not peculiar to miners, but there is a variety of bronchitis, both acute and chronic, peculiarly belonging to lead miners.

16,361. (*Mr. Holland.*) You mean to say that miners are liable to a peculiar form of bronchitis?—Precisely so. I am not acquainted with other mines. This disease is not produced by the lead.

16,362. (*Chairman.*) By what is it produced, in your opinion?—In my opinion this bronchitis is caused by a variety of influences; these, as far as I am able to judge, are, the air being rendered impure by physical particles from the stratifications, these being limestone, sandstone, and so on, the irritating gases produced by the explosion of the gunpowder, which is so extensively used in blasting these stratifications, by the men's own respiration polluting the air with carbonic acid, and by the combustion of candles.

16,363. And by the dust?—Yes, the dust being of a mechanically irritating character. I think so on this account, immense quantities of this matter is spat by these miners at all times while they are working; not only so, but there is evidently a deposit of powder in the air passages and cells of the lungs remaining for years after the men have ceased to work in the mines. I have cases every now and then occurring of men who have left the mines I should say nine years, who have not been working in mines but working in the open air; they have kept in tolerable health; they may perhaps have had a slight attack of acute bronchitis now and then; by the appropriate remedies we subdue that, and they get into working order again, they are perhaps not in very good health, however; they are perhaps at last seized with a very severe attack of acute bronchitis; they then begin to spit enormous quantities of blue and dark matter, and they perhaps continue to spit this for months before they are cut off, that evidently having been in the lung for years. Of course I have not had this matter analysed, but to the eye it is plainly like powder floating in thick mucus and pus, what surgeons call muco-purulent matter.

16,364. But you have never looked at it with a microscope?—I have not. I sent some to London some two years ago, and I never heard the result. I submitted some as far as I recollect to Dr. Greenhow and I never heard what was made of it.

16,365. Have you in that case ever seen a person recover when he has got rid of that matter?—Very seldom. I always consider that when they begin to spit this blue matter in any quantity, particularly when that is combined with general irritation of the system, it is the beginning of the end.

16,366. At what age have you ever observed that miners are attacked with the first symptons of this disease?—They are attacked at all ages. The first thing generally by which a miner is attacked is acute bronchitis, which is simply inflammation of the lining membrane of the air passages, more or less.

16,367. At what age have you observed it?—From the age of his entering into the mine at 20 or 21, during the whole time, they are almost all liable to these attacks; almost the whole of them have an attack either slight or severe, I should say, before 35. I give a good margin there. I had a case the other day of a man about 25 or 26. These attacks are generally easily subdued, they are acute, and the men go to work again. They commence under the same circumstances.

16,368. (*Mr. Holland.*) Do you mean that the attacks are acute and short?—It is according to the severity; they are sometimes not long, perhaps I may say, that generally the men have come under treatment for a fortnight or three weeks.

16,369. (*Chairman.*) When that happens to men so young, they can go back to work?—Yes, they get quite well again.

16,370. They are not affected at all in their breathing?—They are generally slightly asthmatic. I use the word asthma simply as having the meaning of shortness of breathing. Almost all our miners, be they young or be they old, from the first attack of bronchitis, from their having wrought in the mines a year or two, are slightly broken-winded,—slightly affected in their breathing. A man supposing himself to be thoroughly healthy, when I am walking with him beginning to ascend a bank, begins to show difficulty of breathing, he breathes fast and quick.

16,371. When they have come under your care, have you ever thought it right to recommend that they should not go below again?—Yes, I sometimes do that, but it is a difficult thing to enable them to remain outside; there is no work for such a number of men; but in some cases I decidedly recommend that they should not go underground again if possible.

16,372. Do you think that the effect of their going underground is likely to confirm the disease?—Assuredly, where the disease is in a chronic condition. What I mean by "chronic," is certain effects which we suppose to be perhaps a little thickening of the lining of the air tubes, partially closing the passage; there is a little of that left, which produces the asthmatic breathing. A man continues to work in that condition for years perhaps, but then again he is seized with an acute attack, which injures his health, and renders this chronic condition of disease still more decided, and still more extensive, and still more severe.

16,373. Could you name men who are affected in their breathing, and are still working in the mines?—Decidedly so; I could find out several; I have no doubt of it.

16,374. Did you ever have a post mortem examina-

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tion ?—Never. Post mortem examinations in these countries are difficult to be had.

16,375. Do you ever go down into the mine yourself ?—No. I have been in a mine ; I have gone into a mine just to see the mine.

16,376. Have the men ever stated to you that they have been affected by working in any particular level ?—I am sure that they have ; I am sure that men have stated to me that they have been injured by working in such a fore-head, but I cannot call to mind the particular place.

16,377. What is the man's opinion of the cause of his disease generally ?—I should think that generally speaking the men's opinion is very much what I have stated, that it is owing to impure air, not, perhaps, that they are capable of stating the scientific causes of that impurity ; but, as far as I know, I believe that their opinion is generally that their complaints are caused by impurity of air.

16,378. (*Mr. Kendall.*) Having given a great deal of attention to this matter, has it ever struck you that there is any mode of working which might remedy the defect there ?—As far as I have been able to judge, the modes of prevention resolve themselves into the proper ventilation of the mines, and of course into a proper attention on the part of the miner to his general health ; and there is one thing that the miners do which I have sometimes thought they ought not to do, they work in flannel shirts, which have sleeves, and of course one half of the miners are always employed in striking a borer; these sleeves are continually full of dust, and they must breathe an air much fuller of dust than if they were robed without this flannel shirt altogether. Then another thing is this : the atmosphere of a mine is generally much warmer than the external air, they perspire, this flannel shirt gets saturated with moisture, they come into the cold air and frequently there is a chill, at all events a chill is likely to be produced in that way. Now I would suggest that the miner should, if possible, work bare to the waist, and that he should have his flannel shirt kept thoroughly dry and comfortable, which he could put on when he came towards the external air.

16,379. You have no reason to suppose that there is any lack of ventilation ?—No ; as far as I know, I believe that every attention is paid to the ventilation of the mines.

16,380. (*Mr. Holland.*) Did you not just now recommend improved ventilation ?—Yes, improved in this way, if possible : supposing that a level is being driven into a hill where there is no shaft, and no possibility of a current of air passing into the level and out at another outlet. I dare say it must be, to engineers, very difficult indeed to produce a proper change of air at what is called the fore-head ; I suppose that they have various contrivances to carry up pure air by means of machinery. My department being so thoroughly outside, I am not called to go down the mines.

16,381. You spoke of miners being very liable to acute bronchitis at all ages ; is that in young miners produced by catching cold or by dust ?—I look upon the dust in the young miner as the predisposing cause, and generally speaking the exciting cause of the attack is exposure to cold.

16,382. By catching cold ?—Yes.

16,383. They generally recover from those early attacks of acute bronchitis pretty well ?—Yes, time after time, generally speaking.

16,384. After a time the attack becomes less acute? —Yes, it seems that there is a progress.

16,385. Is there thickening of the mucous membrane ?—Yes ; that is an inference, because without a post mortem examination I would not speak positively; but from the expectoration and from the physical signs, from the sounds listened to by the stethoscope there is a pretty fair and sure inference that there is a thickening of the lining membrane of the air tubes.

16,386. What sounds do you hear by the stethoscope ?—Sibilant,—mucous, sonorous, and hissing.

16,387. A whistling sound ?—Yes.

16,388. Is that whistling sound frequent ?—Not very frequent ; the most common sound that I have listened to is a sound something like a snoring sound.

16,389. I think you have said that almost all miners are slightly broken-winded after their first attack of acute bronchitis ? — Yes, more or less, but it is sometimes so very slight as scarcely to be noticed.

16,390. But still it is noticed ?—Yes, they all confess that they are affected more or less with shortness of breathing.

16,391. You have stated that they spit up discoloured sputa a long time after leaving the mine ? —Yes.

16,392. Do you believe that that discoloured sputum has been in their lungs all that time ?—I can account for it in no other way but by believing that it has been, because it is of the same colour, and the same sort of matter as they spit generally on leaving a mine. A miner almost always on coming out of a mine, from a little irritation of the throat, heaves up a few mouthfuls of this coloured expectoration.

16,393. What colour is it generally ?—A sort of greyish blue.

16,394. Where do you suppose that that matter has been lodging all that time ?—I think that it must have been lodging in the lining of the air passages, and probably in the air cells.

16,395. What quantity would there be to last for 20 years ?—I cannot say.

16,396. A pound or two ?—No, I should think not so much as that, it is exceedingly light.

16,397. I understood you to say that they continued to spit this discoloured matter ?—While working in the mine they are always spitting a little of this discoloured matter ; but I am speaking of a man who has not been in a mine for ten years, he is then seized with an acute attack of bronchitis, which gradually verges into a chronic condition, and he goes on spitting this coloured matter until death.

16,398. With pus ?—Yes; it is sometimes decidedly purulent, of the nature of pus and coloured again, and he continues to spit this coloured stuff during this last attack until death.

16,399. Does he go on spitting it day by day for years ?—He may do so for several years, more or less. I have had a case of this sort ; a man, judging from my recollection, perhaps about 50 years of age, who had not worked in a mine for eight or ten years, he is seized with acute bronchitis, he begins to spit and he spits a considerable quantity of this bluish matter. By treatment, he is relieved of this attack, and he again ceases to spit this for a time, longer or shorter, according to circumstances ; he is seized again, perhaps, a year after this. These attacks very often come on in spring. In the commencement of the winter, he is again seized with an acute attack, and he spits the same matter for a short time again ; he is relieved again, but he is not a healthy man ; he is laid off again, he goes wandering about, and perhaps doing a little light work about a little farm which he may have, and at last he is seized again with acute bronchitis, and this proves intractable and severe, and it just gradually verges into a chronic state with irritative constitutional fever.

16,400. (*Mr. Austin Bruce.*) In the case which you have mentioned, where you have supposed that a man has left work for eight or nine years when the attack has come on, what has he been doing during those eight or nine years ; has he been, in your view of the case, expectorating all the time ?—Yes, more or less.

16,401. And expectorating matter discoloured by the substances which he has inhaled during the time that he has been working ?—Yes, more or less.

16,402. Do you think that he could during that time have laid in a stock of discoloured matter sufficient to supply the expectorations of many years ?—When I speak of his expectorating during the intervals of these acute attacks, I mean to say, that perhaps a single sputum in the day may be slightly coloured ; he does not spit that coloured stuff when

he is walking about in the intervals between the acute attacks, so that my belief is decidedly that this blue expectoration is the result of the inhalations in the mines.

16,403. (*Mr. Holland.*) But I understood you to say that that supposed mechanical irritant was only after long intervals, and for a few days at a time, in any quantity ?—Yes.

16,404. And that at other times it was exceedingly small ?—Yes, during the intervals of the acute attacks.

16,405. (*Mr. Austin Bruce.*) At what age do men usually discontinue working from inability to bear the fatigue of work ?—It is not in my power to state an average, but some are obliged to give up work before 40 ; some work till 45, and some till 50.

16,406. Do many attain the age at which they become entitled to pensions, namely 65 ?—I am afraid not, but I cannot speak with certainty ; it must be a small proportion, I should say.

16,407. What is the general moral character of the lead miners ?—I should say pretty good; for instance, with regard to intemperance, in intoxicating drinks, they are pretty free from that, as far as I am able to judge.

16,408. What are the prevailing vices ?—The prevailing vice of this country, I am sorry to say, is want of chastity.

16,409. With respect to honesty, how are they ?—Generally speaking, they are strictly honest.

16,410. Have you had sufficient experience of the working population in any other parts of the country to enable you to compare the general conduct of the lead miners with that of other workmen ?—I practised in an agricultural district for five years before coming to Middleton, namely, in Wigton in Cumberland, amongst an almost purely agricultural population (certainly there was a sprinkling of coal mines) ; and as far as I am able to judge, and as far as I recollect, perhaps not devoting strict attention to the affair (I should not like to speak dogmatically on the subject), the moral character of the miners will stand very favourably compared with the agricultural population of Cumberland.

16,411. (*Mr. Holland.*) In the respect which you have just stated ?—Yes ; I believe that it is about equal.

16,412. (*Mr. Austin Bruce.*) Does the miners' disease in any way affect the constitutions of their children ?—Not that I am aware of.

16,413. Are the children generally healthy and robust ?—Yes, until they begin mining operations.

16,414. (*Mr. Holland.*) Is there any excess of scrofulous disease among them ?—There is a good deal of scrofula.

16,415. Is there any excess ?—No. We must take into account our climate, and we must take into account our locality.

16,416. But compare it with a similar climate ?—Compared with a similar climate there is no excess of scrofula here, but we have a great deal of consumption of the lungs in those who are not working in mines.

16,417. Do you attend the women as well as the miners ?—Yes.

16,418. Do they suffer from phthisis ?—Yes, a good deal.

16,419. Have you noticed true phthisis most amongst the men or the women of the miners ?—It is quite as common amongst the women as amongst the men.

16,420. Is it not more common ?—It is, perhaps, a little more common. I have not noticed it particularly, but from general recollection I can call to mind case upon case which I have had, and I can state that it is my opinion that phthisis prevails (I mean real phthisis from tubercles) more amongst the women than amongst the men.

16,421. Do you consider that the miners are healthily lodged in their dwellings ?—Yes, generally speaking.

16,422. As well as agricultural labourers ?—Better.

16,423. And better fed, or the same, or how is it ?—With regard to the food it very much depends upon themselves.

16,424. What is the fact ?—I should say that they are fed quite equally ; what I was alluding to was a circumstance more applicable to the woman of the house than to the man; they are too much inclined to live upon unleavened bread ; that is to say, cakes made on what they call the girdle, — heavy indigestible bread.

16,425. Is that the practice of the miners or the practice of the country ?—It is the practice of the country, but very much the practice of the miners.

16,426. Is it more particularly the practice of the miners than of the agricultural labourers ?—No. We have very few agricultural labourers here. The country is almost entirely mining ; but I should say that it is the general practice of the country to use that bread.

16,427. Is dyspepsia prevalent among the miners ?—Yes.

16,428. Unusually so ?—No, not unusually. This chronic bronchitis, of which I am speaking, will unhinge the system.

16,429. Does dyspepsia precede bronchitis or bronchitis precede dyspepsia ?—The bronchitis precedes the dyspepsia, beginning when a man is young; and he very often has dyspepsia when his health has been a little shattered by repeated attacks.

16,430. Do you attribute that dyspepsia to the shattered state of the men's health from bronchitis, or to some other cause ?—I do not mean to say that dyspepsia is a common accompaniment, but I meet with it now and then as an accompaniment of this chronic irritating disease of the lungs.

16,431. As an accompaniment, or as a consequence ?—I would not say a consequence ; I am scarcely in a position to say that.

16,432. Have you ever heard them complain of loss of appetite, or bad appetite, from mine air ?—No.

16,433. Do you think that they eat with as good an appetite as other workmen, or are their appetites delicate and capricious ?—I should think that the appetite is rather delicate.

16,434. Are they fond of rich and stimulating and more tasty food than other workmen ?—No, they generally live on very simple food.

16,435. Insipid food ?—Yes.

16,436. They have not any craving for tasty, high-seasoned food ?—No, decidedly not.

16,437. Do they ever complain of great heat in the mines, or closeness of the air. Do they attribute any of their disease to closeness or heat of air in the mines ?—I have not heard any one attribute disease to that.

16,438. Or do they complain of discomfort in the mines ?—No, certainly not.

16,439. You would be sure to hear of that if it were the case ?—Yes, decidedly so. I have now and then heard a man say that in his life he has worked in a bad place, in a close fore-head. That may be one case out of 400 men.

16,440. That is a very rare thing ?—Yes, I feel certain of that. I can speak with confidence on the point, that I do not hear it made a subject of complaint.

16,441. Do they complain of the candle smoke as a source of annoyance ?—No, I have not heard the smoke of candles complained of.

16,442. Have you never heard them attribute any of their disease to that ?—No, decidedly not.

16,443. Do they complain much of the powder smoke, the reek ?—They do not complain of it much ; they do not complain of it to me, at all events.

16,444. You think that it is mostly the dust of the rock ?—Yes, decidedly.

16,445. Would that give a clay-coloured yellow spit ?—No, it depends upon the stratification ; because the blasting of the rock with the lead ore is of a bluish colour ; but my impression is that the dark colour is produced by the smoke of the exploded powder.

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16,446. It is black ?—Yes, blackish ; carbonaceous, as if it contained a little carbon.

16,447. Is it a rare thing for men to get above 40 without being touched in their lungs permanently ?—Very rare indeed ; I cannot call to mind having met with a miner who is not more or less affected with shortness of breathing before he is 40 years of age.

16,448. Permanent shortness of breathing ?—Yes.

16,449. At what age do you consider a miner an old man ?—I should consider a miner really an old man at between 55 and 60.

16,450. A decidedly older man than an ordinary workman ?—Yes, than an agricultural labourer, for instance, decidedly.

16,451. Or a joiner ?—Or a joiner, or a mechanic of any sort.

16,452. Very distinctly so ?—Distinctly so.

16,453. (*Mr. St. Aubyn.*) Is the Commission distinctly to understand that you have known several cases of men who have lived eight years after leaving their work, and who at intervals during that time have been subject to a discoloured expectoration ?—Clearly so. I understand the question thoroughly, and I answer distinctly.

16,454. (*Mr. Holland.*) Do you not think that it is probable that this discoloured sputum may be a secretion of the lungs, and not an excretion of that which has been received into the lungs ?—I should say that it is possible, simply stating an opinion of my own. I say that it is decidedly possible that this dark matter, whatever it may be, may be secreted by the lungs.

16,455. Do not you think that it is probable that the slight discolouration which you speak of as continuous is a secretion, whereas the large quantities which come very occasionally may be an accumulation in the air cell or otherwise ?—I will state the hypothesis which I have. I reason in this way : a miner, during his work in the mines, is continually breathing an air loaded with matter of this colour ; daily as he goes from the mines he spits up a little of this coloured mucus, and after leaving the mines he has an acute attack ; this acute attack spreads more or less over the lining membrane of the air tubes, and perhaps sometimes even extends into the cells ; that after a short duration brings on an excited action and an increased secretion ; and my hypothesis is, that during that state of activity of secretion it loosens, as it were, and carries off this accumulated impalpable powder. We never find the whole lung affected with this acute attack of bronchitis, it is only portions of it, portions of the tube and portions of the air cell ; but subsequent attacks affect other portions of the lung and bring away other portions of this coloured matter, and attack after attack, as far as I am able to judge, affects a large portion of the lung, ultimately, perhaps, affecting nearly the whole substance and producing increased secretion from a large extent of mucous membrane ; it dislodges a quantity of this coloured stuff, and at last is so severe as to kill the man, and though I have had no post mortem examination, still my impression is that if there was a post mortem examination there would still be a portion of this coloured matter found in the cells or small tubes of the lung ; that is the hypothesis which I hold.

16,456. (*Mr. Austin Bruce.*) My difficulty in following your statement is this: I can understand that a man who had been for many years inhaling this dust might be giving out a certain portion of it for the rest of his life, but I cannot understand how the portion which he gives out from time to time should be sufficiently large to discolour the copious expectoration which you have described ?—When we say "copious," it depends upon the quantity ; and there is another consideration, this colouring matter is not deep, the spittings are generally simply streaked; there is with them a thin streak of blue through the middle of the sputum, and the colour shades off. There is evidently in this expectoration not a great quantity of colouring matter in weight.

16,457. (*Mr. Holland.*) Are the men apt to breathe any smoke elsewhere ?—No.

16,458. Are you aware that the inhabitants of smoky towns constantly spit up black sputum when quite well ; mucus tinged with soot ?—Yes, I believe so, and I know that the colliers are accustomed to spit up immense quantities of black expectoration.

16,459. The black matter of the sputum is very small in quantity ?—The colouring matter is evidently small in quantity. A very small quantity of this colouring matter will tinge the expectoration. In these men of asthmatic breathing, in the progress of its passage from the lung it is positively churned and mixed up with the bubbling of the air.

The witness withdrew.

Adjourned to To-morrow, at Redcar.

REDCAR.

Saturday, 11th October 1862.

PRESENT :

The Right Hon. Lord KINNAIRD, K.T	H. AUSTIN BRUCE, Esq., M.P.
NICHOLAS KENDALL, Esq., M.P.	RICHARD DAVEY, Esq., M.P.
JOHN ST. AUBYN, Esq., M.P.	P. H. HOLLAND, Esq.

The Right Hon. Lord KINNAIRD, K.T., in the Chair.

Mr. JOSEPH WHITWELL PEASE, examined.

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16,460. (*Chairman.*) Will you be good enough to mention the name of the mine in which you have the chief interest ?—We have two ; Upleatham, which we hold under Lord Zetland, and the Hutton mines, which we hold under the Crown, and one or two smaller freeholders.

16,461. What other mines are there in this district ?—There are the Eston mines, worked by Messrs. Bolkow and Vaughan, and there are the Normanby mines and the Skelton mines, which are worked by Messrs. Bell, Brothers, of Newcastle.

16,462. Are there any other mines of importance ?—There are also the Swainby mines, which are worked, I believe, by Messrs. Holdsworth and Benington, not far from Stokesley, but they are worked to a comparatively limited extent under a lease from Lord Ailesbury ; they are, I suppose, 22 miles from here (Redcar).

16,463. Are there any other mines ?—Yes ; there are Captain Challoner's mines, which are worked by Mr. Attwood, near Guisborough ; they are worked to a considerable extent.

16,464. Are these mines all worked on the same principle as yours ?—Yes, as far as I know ; I have not been in all of them.

16,465. Is the description of the ironstone the same ?—Yes, precisely, for all practical purposes of your inquiry.

16,466. How many men have you working underground in your mines?—At the Hutton mines we have had on the average 121 men per day, extending over a period of six years; we have fewer in the mines at the present moment.

16,467. Have all these men been working fairly underground?—Yes; I have not included the outside men.

16,468. Will you have the goodness to state to the Commissioners the way in which the men enter the mines?—They enter the mines entirely by what we technically term "from the day," by levels; they do not go either up or down shafts.

16,469. Can you state shortly the manner of working with reference to the lie of the ironstone?—Owing to the railways being nearer to the outcrop of the stone, almost all the Cleveland mines have been worked "to the dip," and at the Hutton mines most of our workings have been rather to the dip; but they have been, since we got further into the hill, turned away on the principle of a water level, just making so much fall to the outcrop as brings the water away.

16,470. What is the greatest length of any level?—The greatest length of any level that we have is 1,820 or 1,830 yards.

16,471. Is that in a straight line from the day?—Almost straight; there is a slight curve in it.

16,472. Do you work by cross-cuts from that?—Yes.

16,473. Do you find any difficulty in ventilating the mines to the extreme ends?—We have had none at all; we have adopted the ordinary mode of ventilation that is generally used in coal mines by a furnace, and in these mines we have five ventilating shafts. The furnaces are now working in four of them, each of these shafts is six feet in diameter, the depth varying from 10 to 30 yards; there are only two furnaces to the dip; they each produce about 27,000 cubic feet of air per minute per furnace.

16,474. Does the air enter by the level?—Yes; and after passing through the workings of the mine returns to the furnace, which is not very far from the entrance of the level in the back course; every level is driven double.

16,475. Have you two upcasts in the whole?—Yes; at the present moment every level is driven double, and cross cuts for ventilation as far as it will go in.

16,476. What is the size generally of the levels that are driven?—They are five yards wide; and the height of the stratification varies from six to seven feet.

16,477. Do you find that the furnace not only ventilates but also has the effect of drawing the smoke away?—It draws the "powder reek," as it is called, away, and also the foul air that is generated by the horses and men; but we have never tried, and I believe there has not been tried, any other mode of ventilation in the Cleveland mines, coals being cheap and the furnace always being considered the most effectual method.

16,478. Is the ore all moved by blasting?—Yes, in the first instance.

16,479. Are you obliged in order to make this furnace work to have any trap-doors or any similar contrivances?—Yes; the whole of the return air is regulated by trap-doors, with boys to attend to them, to see that they are shut.

16,480. And occasionally is it carried across the levels?—Yes; it is carried across.

16,481. In brick tunnels?—Yes, or else in closely-planked wooden ones; but we prefer the brick ones.

16,482. Do you know the quantity of coals that one of these furnaces consumes?—About a ton and a half a day, I think, is the average quantity in each of them.

16,483. What is the price of coals at the present moment?—About 5*s*. a ton.

16,484. Is the furnace any larger than is absolutely necessary for the ventilation?—No, I think not; but the air in all our mines is exceedingly good.

16,485. You think it requires as large a furnace as you have described?—Yes; the difference between the quantity of coals is so small, and the better the air the better your mine is liked by the men.

16,486. If the miners are driving any foul ends have you any means of supplying them with air?—None, but having the air very regular in the rear of the men; if we only drive one end we have no return course, except the cross-cut immediately behind them.

16,487. Do you find that in driving a headway there is ever any deficiency of air?—No; as soon as it gets close or uncomfortable for the men we cross-cut immediately, closing the cross-cut behind.

16,488. What distance would you leave?—Our cross-cuts are only about 10 yards apart; the men are close to the air the whole time. If we did drive a headway further we should divide it by a timber or cloth brattice; you can carry that close up, and to so great an excess will you have good air that you will make the men so cold as to make them uncomfortable.

16,489. Have you ever used a cloth brattice in the iron mines?—No.

16,490. You use powder, I presume?—Yes.

16,491. A cloth brattice is used in coal mines?—Yes.

16,492. Does it answer perfectly well for the purpose?—I think that they generally prefer timber as being more durable.

16,493. But supposing it was only required for a short time, should you use it?—Yes; we saw regularly for the collieries brattice deals, very thin; they are easily nailed up and taken down again.

16,494. Would not the cloth answer?—Yes, very effectually; we have employed it in sinking shafts.

16,495. You have divided them with cloth brattices?—Yes, and they have answered perfectly well.

16,496. For creating a circulation, or for making a return current?—Yes.

16,497. Have any accidents occurred in your mine from blasting?—Not directly; I think not one. Most of our accidents have been indirectly from blasting, either by the men going in too soon, or else from the roof falling after they have been in. In these mines we have only had, in the course of six years, ending 31st December 1861, (and I have not gone further back) four fatal accidents. One man was killed in 1856 by the fall of stone from the roof; one boy was killed in 1857 from a horse running away; one man was killed in 1858 from the stone falling upon him that he was working under, and one man was killed in 1859 from the roof falling. Since that we have had no fatal accident.

16,498. I suppose that the greatest risk to which the men are liable is the falling of the stone from the face?—Yes; and in my opinion it is generally from their own carelessness and anxiety to get quantity.

16,499. Do you use timber in the mines?—Yes.

16,500. Is that timber supplied to the men, and do they put it up?—No; we have men whom we term deputies, whose care it is to see that the men are properly supplied with timber, and that the mines are properly protected with it.

16,501. That is their special business is it?—Yes, that and the laying down the ways to the men who are working.

16,502. Is it their business to see where the timber is required?—Yes, and if any man calls their attention to his place it is their duty at once to go to it. At the time of the last accident from the roof falling the deputy had just put up a prop behind a man, and the roof fell within, I believe, two feet of the end of his place of working.

16,503. How are the bargains made with the men, by the ton?—Yes, and we pay them for the actual work that they get out. We weigh every tub that comes out, and pay the men a price per ton according to the weight of the tub that he sends out.

16,504. How often are these bargains made?—All our men are under fortnightly hiring, and these are the conditions of the hiring (*handing in the same*).

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16,505. How often are the men paid ?—They are paid fortnightly up to the end of the previous week.

16,506. Then there will be one week in arrear ?—Yes ; we pay on Friday up to the previous Saturday.

16,507. Do you find that that mode of paying on Fridays is attended with advantage ?—At the Hutton mines we adopted the practice of paying on Friday in order to give the men an opportunity of attending Guisborough market on the Saturday.

16,508. With how many men is a bargain made ?—It is made with every man individually, but they generally work in pairs.

16,509. How many men are there in a pair ?—Two men ; these accidents have been in the proportion of one to 179,301 tons.

16,510. Amongst how many men ?—On the average 121 men.

16,511. You bring out nothing but iron ore, I suppose ?—Yes, we bring out a small quantity of iron pyrites, which goes down to the sulphuric acid works.

15,512. Is it enough to affect your estimate ?—No, the whole of the stone that we work out goes into the market ; we have no division in the strata.

16,513. In case of accidents have you made some provision for the men ?—Not on these mines ; we are here within a short distance comparatively of the houses occupied by the men ; we have no hospital on these mines, nor do we make any further provision than this ; we pay a doctor 25*l.* a year, and the married men pay 6*d.* a week, the single men 3*d.* a fortnight, which includes medical attendance on their families. To that subscription we add 25*l.* a year, and we also pay 5*s.* a week smart money, as it is called, for men who are out of work from small accidents or from ill health.

16,514. What deductions are made from the earnings of the men for candles ?—The miners pay for their candles and for their powder ; we supply a few of the candles, but not many ; they buy them principally at the shops, but we supply the whole of the powder, and the net earnings of the men, after these deductions had been made, averaged in the half-year ending 30th June 1861, 4*s.* 4*d.* a man per day ; in the half-year ending December 1861, 4*s.* 2*d.* per man per day ; and in the half-year ending 30th June 1862, 4*s.* 3½*d.* per man per day.

16,515. How many hours a week do the men work ?—I should think that the average time will be about 11 days a fortnight.

16,516. About how many hours a day ?—They go in about seven o'clock, and come out at three o'clock or four, according as they finish their work ; about 11 days a fortnight.

16,517. Should you say that these miners are a healthy class of men ?—I cannot answer the question from not having given particular observation to that, but I hear no complaints from the doctor. My own view, in looking at the men, would be, that they were healthy, but there has been no time to test the longevity of the miners working in the mines I have referred to ; they were opened out in 1853, and it is therefore only nine years since they have been in operation.

16,518. Do you have many men on the sick list at any one time ?—Not that I am aware of.

16,519. Do the men ever complain of shortness of breath ?—I have never heard any complaints of that kind.

16,520. Are the men subject to any special complaint connected with their working in the mines ?—I never heard of any. Most of our men are in clubs, the Foresters or Odd Fellows or Free Gardeners.

16,521. Do the men reside near the mines, or at what distance from them do they live generally ?—I should think about one-half of the men reside within half a mile of the mines, and the other half reside about a mile and a half from the mines in the town of Guisborough.

16,522. Should you say that there is a want of accommodation for the men in the way of dwellings ?—At present in Guisborough there is a surplus of houses ; the place is rather over-built.

16,523. What annual rent do the miners pay for their cottages ?—From about 2*s.* a week to 2*s.* 6*d.* There is kept on the mines a log-book in which is entered all the accidents and anything that occurs during the day, the pressure on the boilers, the horses employed, and men, and any general observations that the different foremen think ought to be recorded during the day.

16,524. Is that book often submitted to the inspection of the manager ?—Yes, it is his book, in fact ; and when he comes on to the mines, if he has not been there the whole of the previous day, he knows everything of importance that has occurred. I was going to say that there is on these mines a school, which has cost about 1,200*l.* The Committee of the Privy Council on Education granted about one-half of that money, the Commissioners of Woods and Forests providing a site at a very low rate.

16,525. Do the men generally contribute to that school, or only those who send their children to it ?—Only those who send their children ; they contribute 2*d.* a week per scholar, and the rest of the expenses are borne by the owners of the mines. There is also a reading room which is called the Mutual Improvement Institution, which is well frequented in Guisborough ; and there is on the mines another to which we have largely contributed ; the reading room is generally well filled.

16,526. Is there any compulsion used with regard to the men ?—No ; the school is on the British and Foreign principle ; there is one in Guisborough, a National school ; some go to one and some to the other. We give a subscription to the National school ; for although it has an endowment, it is not entirely independent.

16,527. Referring now to the Upleatham mine, will you have the goodness to state whether that mine is entered in the same way ?—The entrance is in the same way.

16,528. What is the length of the longest level ?—About 800 yards.

16,529. Do you adopt there the same plan of ventilation ?—Yes, the same plan of ventilation is carried out ; but the stratification varies from 10 to 11 feet in height ; as compared with the other, it is rather higher.

16,530. Have you one furnace at work there or two ?—There are four shafts, producing a current of air equal to about 50,000 cubic feet of air per minute to each furnace, all of them having furnaces in them.

16,531. Is the mode of working the mine different from the other ?—There is no difference in the mode of working, but the height of the stone has made it rather more dangerous on account of the men having a greater temptation to work under the stone, and to bring large quantities over.

16,532. Do you leave a certain proportion of the stone to serve as a roof ?—Yes, a small portion of the stone is left as a roof.

16,533. Is that taken out afterwards or left ?—It is generally left in.

16,534. The support is given by leaving a part of the stratification as a pillar ?—The roof is at present supported by the stratification being left as pillars ; there is of course in the main ways a great quantity of timber used, and we have worked very few of the pillars out, and shall not work them out until we abandon that part of the mine which is at present standing in pillars.

16,535. Do you ever use stones for arching your principal levels ?—We have used bricks where there has been any fear of the roof not standing permanently in the main drifts under the bed of ore, so as to keep the roof perfectly good over the main ways and horse ways. This mine is entirely worked to the dip, and the ore is raised to the surface by means of standing engines.

16,536. Is it drawn up by wire ropes ?—Yes, by steel wire ropes.

16,537. Do they run upon pulleys?—They run upon rollers or sheaves.

16,538. Have you had any experience as to the wear and tear of the iron rope?—The wear and tear in these mines has been exceedingly favourable. I think that one iron rope on the outside incline drew upwards of 1,500,000 tons before it was removed; it is a round rope 3 inches in circumference, and the load is 27 tons; it draws 27 tons on a self-acting incline at a gradient of 1 in 11.

16,539. What kind of rope is that which draws the waggons out?—A steel wire rope. We never had more than one yet, and that has lasted 14 months.

16,540. How does the wear and tear of the wire rope show itself?—By the single wires breaking; they are inspected every day. If the wires are found to be breaking they are removed; but all the wire-rope makers will furnish a spare rope, free of cost, in order to get a fresh order, so that we have always a spare rope on the place.

16,541. Do you repair the wire ropes on the spot?—Yes, with a "long thimble," as it is called; we repair it by laying in a splice of about 15 yards, so that you can work the two ends into the new piece that is placed in the middle. There are six wires or six turns in the rope, six strands, and six wires in each strand.

16,542. Suppose you saw one of those wires or one of the strands giving way, would that be sufficient notice to you to repair it?—No, only to fasten the strand into it.

16,543. When do you consider a rope to be dangerous?—When we see four or five of the wires in a strand broken, then it is at the point of danger. With regard to the wire ropes, I may mention that we are drawing up something like 24,000 tons of coals a week, and we have not a place but that has one of the wire ropes, both underground and above.

16,544. That is in the coal mines?—Yes.

16,545. Where they are drawn perpendicularly?—Yes, or along inclines underground.

16,546. Have any accidents occurred from the breaking of the ropes?—We have had an accident from the tubs running away on one of the inclines below, but not more than one or two fatal accidents; not from the breaking of the rope; it was from the tubs, as the balance weight not being properly fastened on; they were not on at all.

16,547. Have any accidents arisen during the conveyance of the men down these pits by the breaking of the rope?—I am not aware of any. I do not recollect any.

16,548. Over how long a period does your recollection extend?—We have worked with wire ropes more or less for the last 14 or 15 years.

16,549. Do you ever use any hempen ropes?—Yes, constantly.

16,550. Can you speak as to the comparative safety and the comparative expense?—Yes; I can say that wire ropes are much more economical and quite as safe. I do not hesitate to say that.

16,551. Are they not safer?—I should say so; but, without looking at the statistics, I should not like to give a decided answer to that.

16,552. (*Mr. Holland.*) Can you say that the wire rope is quite as safe as the other?—I have no hesitation in saying so; I go down with them constantly.

16,553. (*Chairman.*) With regard to accidents happening in the mine, is any provision made for the immediate care of the men?—Yes; we have furnished a small hospital in the village of Marske, to which Lord Zetland subscribes very handsomely, and that is attended by a nurse, whom we got from the infirmary at Newcastle, and she has the common hospital stores by her.

16,554. Have you any means of conveying the men to the hospital in case of accident?—We have procured two of the Government ambulances to be at the mines in readiness.

16,555. Is there any case in the hospital now?—There has not been one for four or five months, I believe.

16,556. (*Mr. Austin Bruce.*) Do you take any but cases of broken bones to the hospital?—Yes; cases of broken limbs, or a crushed foot or hand, or anything of that kind, they are taken at once to the hospital. We found that in the cottages the nursing was of so inferior a description that we thought many of the men who were lost, were lost from want of proper nursing, soon after the accident.

16,557. You do not send cases of sickness to the hospital?—No. From 2nd July 1858 to 26th September 1862 we have lost eight men; three from the roof falling, and five from their pulling stones over upon themselves; these were all fatal accidents. The number of the men employed in those mines is at present 320, and the vend is going at the rate of about 428,000 tons a year.

16,558. Have you any prejudices to overcome in inducing the men to go to the hospital?—None at all; they went, after the first man or two had been in, and found the nurse so efficient that they liked her better than the doctor, and they come to her to get their fingers dressed, or anything of that kind.

16,559. (*Mr. Kendall.*) How many men have you ever known to be in the hospital at the same time?—Two; one with a broken leg, and the other with a crushed foot.

16,560. What amount of accommodation is provided there?—There are five beds. The smart money that we have paid in these mines from 30th June 1858 up to 26th September 1862 has been 24*l.* 15*s.* 8*d.*; and the same rule as to the doctor applies there as it does in the other mines.

16,561. (*Mr. Austin Bruce.*) Was the establishment built as a hospital, or did you simply convert cottages into a hospital?—We built it for a hospital in connexion with some cottages that we were then building.

16,562. (*Chairman.*) How are the men provided with dwellings in the neighbourhood of that mine?—Some of them hire, and others live in our own houses. I think that all the men have gardens of about 22 yards square; the men who are living in our houses have their houses and coals for 4*s.* a week; the coals, we consider, cost from 1*s.* 3*d.* to 1*s.* 6*d.* a week.

16,563. (*Mr. Kendall.*) How many rooms do the houses consist of?—Two rooms upstairs and two rooms downstairs; and connected with the house there is a pantry and small offices, besides a coalhouse.

16,564. Do you know what the height of the bedrooms is?—Eight feet to the eaves, and about a foot or a foot and a half more out of the roof.

16,565. What is the size of the rooms?—The size is 14 by 16, and 14 by 10.

16,566. Would it be desirable do you think to have a third bedroom; there being two rooms downstairs they sleep in one of the downstairs rooms, which is equivalent to a third room.

16,567. Have any accidents occurred in the mines from blasting?—No fatal accidents from blasting.

16,568. The stone does not give out fire?—No, not even in drilling. The net wages at these mines were 3*s.* 9*d.* for the half year ending 30th June 1861; 4*s.* 1½*d.* for the half year ending 31st December 1861; and 3*s.* 11*d.* for the half year ending 30th June 1862 they run very much the same.

16,569. Have you any boys working underground?—Yes, driving the horses and trapping, that is to say, shutting the ventilating doors; we have no limit as to age, but we have none employed in the mines under 10.

16,570. What is the youngest age of those who perform the labour of a man?—At a guess I should say not younger than 19.

16,571. Do the miners work single or double handed?—There are two men in a place, double handed.

16,572. Are you troubled in the mines with water at all?—No, the mines are perfectly dry; we had a little water some time ago, but we put in a bore hole at

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the top of our workings several hundred yards beyond the point that we attained, and the water sprung through the bore hole and flowed out from the surface of the hole, the section of the hill under which we work being a cone.

16,573. (*Mr. Austin Bruce.*) Where does your population come from?—I believe principally from the surplus of the navvies after the railways in the neighbourhood had been finished; very few of them were originally miners, some few of them came from the mines in the west of the county of Durham, and a few from the collieries; I think that the principal part of them have been educated in this district.

16,574. They have come from all parts?—Yes, from all parts; Staffordshire and Wales have sent a few.

16,575. Do you observe much difference between them and the more stationary population of the district?—Our men have now been gradually weeded out of the rougher hands; those we have sent away, and we have now, I think, a very orderly set of men; or else you never do in a newly settled district get the cream from the other districts.

16,576. Upon the whole you consider them a steady and orderly set of men?—On the Upleatham mines inside and out there will be about 500 men, and there is one policeman in the village of Marske who is paid by Lord Zetland and ourselves, and I believe he is deficient of employment. There is also in Marske a new reading room to which Lord Zetland has contributed very handsomely; the rest has been done by private subscription; and there is a British school to which most of the children go.

16,577. In the favourable circumstances under which your workmen are employed underground, do you consider that their health is at all worse than that of the men who are employed on the surface?—I am not able to answer the question from any data, my own judgment would be that they must necessarily suffer from working in less pure air. I cannot say that I have any reason for saying so, beyond the general impression that I think we should all entertain that that must be the case.

16,578. Do you observe any difference in the appearance of the men?—No; I think on a Sunday, when they are washed, they look as well as the outside men.

16,579. Do they not look more pale?—I should say that they were looking more pale when they come out of the mines in the afternoon, but that is after doing their day's work. I very seldom see them when they are going in.

16,580. What is about the age of the older workmen who are engaged underground?—There are old men at the furnaces; men who are working at 15*s.* or 16*s.* a week, who are I should think from 60 to 70 years of age.

16,581. They are doing the light work?—Yes; there are miners from 55 down to the age I have named, 19.

16,582. If they do not continue to be miners above 55, is that because the work is too hard, or because their health and strength have failed them?—From the district being newly settled it hardly affords me sufficient statistical information to enable me to answer the question, it would be merely opinion or a guess.

16,583. I think you have stated that there are no cases of men suffering from asthmatic complaints?—I never heard of any; I never, in going through the mines, met with a man who complained of asthma.

16,584. (*Mr. Kendall.*) What do you call an outside man?—A man who works on the mines on the surface; there are two or three locomotives, for instance.

16,585. Are the wages earned by the men outside equal to those earned by the miners below?—Almost all our men are paid a tonnage price, it depends upon their position and skill. I think that generally speaking the wages run rather higher in this district than in others.

16,586. Were you obliged to weed the men much in order to get rid of the rougher hands?—We did it gradually; where we saw that a man was unsteady, and only working for three days a week we got rid of him.

16,587. Do they change about or not?—Very little.

16,588. Are they becoming denizens here?—Yes; where a man has got a house furnished he has got it furnished to his own taste, and he has his garden, and he keeps a pig, and the men settle very much down.

16,589. Do they live well?—I think they live very well.

16,590. Do they live upon any peculiar kind of food?—No. I think they are all fond of meat; the best meat. I do not think they have the Cornish taste here for paste.

16,591.—Do they save money?—We have a penny savings bank, and a number of men subscribe to building societies; but, as a class, I should not say that they are very saving.

16,592. Do any of them keep a cow?—I do not think any of them do; we allow no man in any authority to keep a shop.

16,593. You have nothing like the truck system here?—No; the only trade there is in it is in the provision of powder and candles, out of which we obtain no profit.

16,594. What quantity of powder do you use?—At Upleatham we use about a ton and a half a week.

16,595. And notwithstanding that that immense quantity of powder is used, your ventilation is excellent throughout the mines?—We consider it exceedingly good.

16,596. Have the men to wait at all until the smoke clears away?—I was in yesterday with a large party, Lord Zetland, Mr. Gladstone, and others, and we heard a blast when we were about 10 yards off, and we were in in three minutes.

16,597. What is the average charge of powder and the depth of the hole?—It varies from half a pound to $3\frac{1}{2}$ lbs.

16,598. Suppose you used 3 lbs. of powder, how long would the smoke be in clearing away?—That would take generally less time than a smaller charge, for it would be deeper down, and it is more effective then—it is better consumed.

16,599. Your mode of giving support is by letting some of the stone remain—by forming arches. I suppose the arches must depend entirely upon the nature of the stone?—The arch, I think, has only been adopted in case of the working going through the adjacent strata.

16,600. Are there not many arches?—No.

16,601. (*Mr. Holland.*) Do your miners look as healthy as the colliers do?—I think more so.

16,602. Have you ever heard them complain of their appetites being injured by their work?—Never.

16,603. Which of the two earns the most, the colliers or the miners?—I think there is very little difference; I have known the colliers to earn as much as our highest men. The working prices that I have given have been averaged over all the earnings; I have known men earn in these mines 6*s.* 6*d.* a day, and I have known colliers do the same.

16,604. That is rather high in both cases, is it not?—Yes, that is decidedly above the average. There was one man, and I was present when he came out of the pit, who made this remark, "That is 12 days for "this fortnight, and 6 times 12 are 72."

16,605. Are the miners provided with dwellings at as cheap a rate as the colliers are?—In the collieries the men are almost always found with houses, in South Durham.

16,606. Are they charged less than their value?—No, they are charged no price at all; a man is found with his house and coals.

16,607. Is that the case with the miners?—No; with regard to these mines they all pay rent.

16,608. Then in effect the colliers are better paid,

as they save their rent?—Yes, if they work the same number of days.

16,609. You have said that four accidents occurred from the stone falling and the roof falling; do you think that is about a fair average?—In the Hutton mines there has been no fatal accident since 1859.

16,610. Are a large proportion of the accidents caused by the stone falling?—Yes, from the men's carelessness generally; the higher the seam, I think, the greater the danger.

16,611. Are the accidents in a large proportion from the stones falling down?—Yes.

16,612. Are the miners provided with long tools by which they could avoid the falling stone if they were careful?—Yes, they are.

16,613. Is any punishment inflicted by the owners of the mine if the miners, contrary to orders, expose themselves to danger?—We have discharged two or three men who we thought were constantly and unnecessarily exposing themselves, but we have no other punishment.

16,614. Is that done always, or only very rarely?—We thought that they were cases in which we ought to make an example.

16,615. In ordinary cases would no punishment follow, provided a man escaped from injury?—No.

16,616. Would it be just or politic do you think to make reckless exposure an offence?—I do not think it would; it is always said that self-preservation is the first law of nature, and you can hardly do much more than to impress upon the miners the necessity of caring for their own lives, and to follow it much further, I think, would almost bring the mines into disrepute amongst the men.

16,617. Are the men more deterred by the rather remote chance of severe injury to themselves than by the certainty of a small punishment?—I think so.

16,618. Does your experience confirm that?—I cannot say that we have tried it, and therefore we have treated only one side of the question.

16,619. You are not aware that experience has confirmed the reverse?—No, I am not aware of that.

16,620. Has any inconvenience arisen from changing the pay day from Saturday to Friday?—I am not aware of any.

16,621. Has great convenience to the men accompanied that change?—Yes, and we thought to the masters too, in this instance, that where the men were paid on a Friday, and spent their money on the Saturday morning, there was less temptation to drink on the Saturday night and on the Sunday.

16,622. Has experience confirmed that, that there is less temptation to drunkenness, because they are paid on a Friday night instead of Saturday?—Yes, I think so; but we have also employed on these mines a visiting missionary, and I think that his influence over the men has been decidedly good; our men are much more temperate than they were.

16,623. Do you attribute part of that effect to a change in the day pay?—Yes.

16,624. There has been no inconvenience to counterbalance that convenience?—No, they come to work on the Saturday morning as they did before.

The witness withdrew.

After examining other witnesses the Commission visited the Upleatham mines.

Mr. JOHN MARLEY examined.

16,625. (*Chairman.*) Will you be good enough to state the mines of which you have charge?—The Eston mines are the only mines in Cleveland of which I am the consulting mining engineer and manager for the lessees, Mr. Wm. Spencer, who is present, being the resident manager.

16,626. What is the name of the company?—Messrs. Bolckow and Vaughan are the proprietors.

16,627. Will you just state what the ore is that is raised in these mines?—Iron ore.

16,628. Will you be good enough to state to the Commissioners the number of men who are employed altogether, and next, the number of men who are working underground?—The number of men and boys employed at present in connexion with the ironstone mines is about 810, 618 of whom are employed underground.

16,629. What is the quantity of stone that is raised?—About 600,000 tons per annum, the maximum having been 638,620.

16,630. Do the men enter from the day level or horse level?—They enter entirely by adits or levels.

16,631. What is the length of the longest level?—The longest level is in connexion with the new mine we are opening, where there is a shaft, and it is very nearly a mile—1,672 yards—from the entrance of the adit to the shaft.

16,632. How many shafts are there in connexion with it?—There is only one shaft at present in connexion with the centre of the mine; but near to the adits there are other three or four shafts, of which we have taken advantage to get furnace power for ventilation.

16,633. The mine is ventilated, then, by means of a furnace?—Yes.

16,634. How many furnaces have you?—We have three furnaces, one of which is a double furnace. No. 1 furnace is 18 feet long by 9 feet broad, and is fired from the side. The double furnace is equal to a furnace of 18 feet broad by 9 feet long. The third furnace is only a small one, and is not at work at present, and of that I have not the dimensions.

16,635. Is the double furnace so constructed that it communicates, as it were, from back to back?—No, they are two separate furnaces in connexion with one shaft.

16,636. For what extent of level should you say that one of these furnaces is sufficient to drive away, not only the foul air, but the powder reek?—It would be almost impossible to give you an answer to that question, unless you defined the rise and the dip of that level. In fact, there is no rule that will apply to it. The way in which we ascertain whether we have sufficient ventilation or otherwise is to test the air per cubic foot per minute that we have per man, and seeing what that is, we then judge as to whether that is sufficient to take away both the powder smoke, and to move any gas or anything that might be impure. The average ventilation in our mines for the last three months has been 77,555 cubic feet, the minimum being 70,920, and the maximum 96,895, one furnace not being at work. Taking the number of men and boys underground at 618, and putting 80 horses down, making an aggregate of 780, we have 111 cubic feet per minute per man, boy, and horse, driven through the various furnaces and circulating through the mine. Then, inasmuch as a man requires only about a fifth part of a cubic foot per minute for actual inhalation, to enable him to live, if you have 111 cubic feet that gives a very large margin beyond. But inasmuch as these are never all in the mine at the same time, the margin is greater still.

16,637. In driving a fore end, do you think that that ventilation is sufficient?—Yes, quite sufficient.

16,638. How long would the powder smoke hang in one of those ends after the blasting had taken place?—It would vary somewhat in the different parts of the mine. In our mines perhaps a little longer, on account of the great height of the mine, that varying from 12 to 15 feet. But although we obtain a large number of cubic feet per minute, yet, on account of the large area, we do not attain the great velocity that there would be in a thinner mine. Hence the powder smoke is a little longer in getting away, although it is diluted to below the injurious point much more than even in a thinner

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mine, still it is a little longer in getting away; I should think about 10 minutes.

16,639. Owing to the larger space in which it is, of course you cannot exhaust, as it were, the air so rapidly?—Suppose a given quantity of powder smoke to be given out at a shot, I should say that in a seam of three feet thick, and having the same quantity of air, it would move much quicker than in a seam 12 feet thick, although you may get it diluted to a greater degree you do not get it away quite so quickly.

16,640. (*Mr. Holland.*) It is a larger but a thinner cloud?—Yes; that is it.

16,641. (*Chairman.*) How are the bargains made with the men?—Bargains are not required to be made at all often with the men; for instance, the same ton prices have been going on for four or five years, and unless there is some very extraordinary demand for men, or some very great depression of trade, those prices continue; they are all by the ton, except in Fore Winning, where the places are narrow and require to be driven of a less size than usual, in which, as well as the ton price, they have a price per yard. All those prices are fixed prices, so that a man knows what the price is, and every man is paid his own price.

16,642. (*Mr. Austin Bruce.*) When was your last reduction in wages?—In 1857.

16,643. And the price has been the same ever since?—There have been slight variations in prices since 1857, but no general alteration; what there has been has been a tendency upwards.

16,644. (*Chairman.*) How often are the men paid?—Once a fortnight.

16,645. On what day in the week are they paid?—On the Saturday, and they are paid up to the Saturday previous; their balance is struck and everything is included up to the Saturday night; the bills are made out, and it takes between the two times for the passing of the accounts, checking them, and so on. Each individual man is paid his own money; if they are working in pairs, there must be an authority or an understanding who is to draw the money.

16,646. What are the wages?—From December 1861 to June 1862 the gross earnings upon the average of every man were 5*s.* 2*d.* per day, less powder and candles, reducing it to 4*s.* 4¾*d.*, they paying for the houses and fuel themselves.

16,647. What is the case with regard to the supply of candles?—A man gets them where he likes; of course we know that he must pay for them, and we put down the sum of 2*d.* per day as an approximate cost.

16,648. He does not necessarily get them from you?—We do not supply them at all.

16,649. Do you supply powder?—When the Eston works commenced, consuming about a ton of powder a week, we found it impossible for the small shopkeepers to comply with the Act of Parliament, so that we have a powder magazine, not directly in connexion with the mines, a powder magazine where the men can get supplied; but they can get the powder where they like.

16,650. With regard to their tools, are they supplied or do they supply themselves?—The tools are entirely found by the owners.

16,651. And do men not pay anything for wear and tear?—No; if they lose them or damage them through carelessness they pay, but they pay nothing for the use of them if they have used them properly.

16,652. Do you use much timber?—In what we term the pillar or broken working a good deal of timber is required; in the whole mine very little.

16,653. That is to say, when you are taking out the pillars a good deal of timber is required?—Yes, from the height of the seam, but in the rest of the mine very little indeed is required; they leave a portion of stone to form a natural roof where possible; the cost for timber in the whole mine is trifling; the cost for timber in the pillars is large.

16,654. Are the men liable to accident from the falling of the roof or falling of the stone after blasting? Principally from stone falling after blasting; few from the roof falling.

16,655. Where the men are working?—Yes; it cannot be called the roof exactly, but at the face where the roof is in course of formation.

16,656. What would you call it?—The technical term would be the jud; it is in point of fact the bulk of stone which is partly prepared for coming down, and after the shot is fired a portion perhaps has not come down, and it comes down unawares afterwards; that comes down from the face of the work.

16,657. In the last year how many accidents have you had?—During this year, *i.e.*, 1862, we have only had two fatal accidents; we have been freer this year than we hitherto have been.

16,658. (*Mr. Austin Bruce.*) That is one death for every 300,000 tons of stone raised?—The stone which has been raised during that time is 456,000 tons, and is equal to 228,000 tons.

16,659. (*Chairman.*) It is two deaths out of 618 men underground?—Yes.

16,660. Is there any particular precaution which you adopt?—We have adopted all the precautions I think that we know how to adopt; we have established rules similar to the coal mine inspection rules; we are carrying out all the rules of the coal mine inspection, although we are not under inspection. We can show you the rules which we have established. We have what we term our safety rules and commercial rules; the former are divided into general and special rules. In some half dozen collieries which are under my charge for Messrs. Bolckow and Vaughan, we have adopted all the requirements which the Government inspection of the coal mines requires, and we also have adapted them to our ironstone mines. The only rule to which I think it necessary to call particular attention is as to miners, shifters, and putters. Rule 6 was a rule which we had found to answer very well in our coal mines, and it is to this effect: "That should the "working place of any man or boy become unsafe "from any cause he is to discontinue working in it, "and immediately to send for the deputy; but if "unsafe from want of timber being set, then in the "absence of the deputy, there being sufficient timber "in the place, the miner is to set it, in order to prevent "any accident, and report the same to the overman or "inspector." I have had occasion to vary that rule in one colliery, for which I was consulting engineer, in the same way as we have varied it here. This is the addition to rule 6: "After the word 'inspector,' read "and in all cases, *whether considered dangerous or* "*not*, the miner, when taking out a leg or using the "hack" (that is one of his tools) "underneath stone, "to set a punch-prop or sprag-prop so as to prevent "any accident; such props of suitable lengths will be "provided in each working place ready to be set." My reason for calling attention to that change of rule is this: In the first instance you will see that a man was to do this in case it became unsafe; of course the man was to judge whether it was safe or not, and in many instances, owing to its being more economical for his own pocket or from error of judgment thinking it safe, he did not set those props; and we have had, we may say, the bulk of our accidents originally arising from this cause, namely, that in carrying forward the heading or excavation after the shot had been fired, and a certain part had not come down, instead of setting the sprag-prop, the result was that they did not set these props when left to their own discretion to say whether it was dangerous or not. It was impossible, of course, for an officer to stand over every man, and notwithstanding verbal and positive orders to the contrary, we had three fatal accidents within a fortnight, I believe from that very cause, it being proved to the coroner's satisfaction that orders had been given, and hence you have the change of rule. We had deputations and a threatened strike in consequence of this change of rule, but one of the owners, and myself and the other agents, met the deputations, and we showed

to them that we must carry out the matter in that way whether the place was considered dangerous or not. We now enforce that rule.

16,661. These props are not at the men's expense ?—No.

16,662. (*Mr. Holland.*) How is the rule enforced ?—A breach of that rule would be followed either by dismissal or by a fine, or by being taken before the magistrates.

16,663. Do you find that virtually the rule is obeyed?—I believe that now the rule is virtually obeyed, although two or three men have been fined lately for a breach of that rule. I will now put in the commercial rules, in which all the fines for everything are set forth.

16,664. What are the deputy's duties ?—By way of properly illustrating more particularly what they are, I will begin with the getter of the stone, who is called the miner. The deputies are the persons who have to superintend the putting in of the timber and to see that every place is safe. Above those are the back overmen, then the overmen, and then the underviewer ; so that the deputies have to set the timber and to see that everything (under the other officers) is safe.

16,665. What proportion do the deputies bear to the number of men employed ?—About 1 to 12 ; it will vary a good deal according to the quantity of pillar working, whether it is a whole mine or a broken mine.

16,666. In the case of pillar working you have more deputies in proportion to the men ?—Yes ; but that answer embraces both pillar working and whole mine working. It perhaps should be explained that on account of the height of the seam and the extra difficulties, it takes three deputies to work at our mines what one deputy would work at other places.

16,667. Is the stone drawn from the mine and put into the waggons by the use of a steam engine ?—By stationary hauling engines, and by self-acting inclined planes down to the putting it into waggons, and by horses to the various stations.

16,668. For this purpose do you use a wire rope ?—Yes, entirely.

16,669. Is the wire rope used along any incline going into the mine or drawing up, that is to say, any ascending or descending incline ?—Yes ; about two inches to the yard ascending, and up to six inches descending.

16,670. How long have you used a wire rope in these mines ?—From the very commencement ; the wire ropes were first used in 1851 ; 11 years.

16,671. Have you found them fully efficient ?—The most satisfactory of any kind.

16,672. Should you consider the wire rope in regard to safety as safe as the broad hempen rope and the chain ?—In connexion with the inclines much more so. There is only one vertical lift at Eston at which we use wire ropes, all the rest being nearly horizontal, the greatest dip being two inches to the yard, and we prefer wire ropes.

16,673. (*Mr. St. Aubyn.*) What is the depth ?—It is in course of sinking ; it will be 90 fathoms ; it is now 52.

16,674. What is the size of the rope ?—Three and a half inches in circumference.

16,675. What is the weight of the material raised ?—Not more than 6 or 7 cwt.

16,676. Including the cage ?—Yes ; it is sinking where there are men below the rope. If you ask me as to the experience of raising weights with wire ropes elsewhere, I can give that independently. It is a much thicker rope than at present needed, but that is the rope which we should use for raising much heavier weights if we required it.

16,677. (*Chairman.*) How do you judge when the wire rope becomes worn so much as to be unsafe ? — The mechanical engineer on the works, whose duties are to examine the ropes every day, will soon see if any single wire is broken ; and if so, it is time to examine the rope carefully. Of course there is the usual length of duration, and there are the number of tons which those ropes have raised, and a conclusion can be formed as to whether the rope has been worn sufficiently long to be within the margin of safety. There are exceptions not only with wire ropes but with hempen ropes ; where a rope will show no change and will break. I have heard of a new 9-inch hempen crab rope which had not been on above six days breaking.

16,678. Would the wire rope be liable to clink ?—Not more than other ropes. Under the head of "Enginewright," a rule is "Once a day to examine "with the banksmen the shaft and ropes, shackles, "bolts, and engines, main and cage chain, and to see "that the rapper and wires are in good repair."

16,679. Do the men who are sinking that shaft go down ?—Yes ; they have to go down occasionally in connexion with the shaft from the surface, but they have access to the shaft by a drift about 50 fathoms from the surface.

16,680. From your own experience can you state anything to the Commission with regard to the use of the wire rope in vertical shafts ?—My experience upon that subject is that wire ropes are safer than hempen ropes ; but with this difference, that when we have got to a depth of from 100 to 150, or say 130 fathoms, we have departed from the round wire rope and have adopted the flat wire rope instead of it.

16,681. (*Mr. St. Aubyn.*) For the whole depth ?—Yes ; we never have a flat rope in connexion with a round one.

16,682. (*Chairman.*) Then for a greater depth than say 130 fathoms you would recommend the flat wire rope in preference to the round wire rope and to the flat hempen rope ?—I would.

16,683. Would you recommend that not only as regards the safety but also as to the more economical working ?—As to both.

16,684. And with that description of rope you would consider the ascending and descending quite safe ?—Perfectly so.

16,685. Can the wear of a wire rope be as well seen as in a hempen rope ?—Quite as well, in my opinion.

16,686. (*Mr. Kendall.*) Is a flaw in the wire more easily detected on a flat rope or a round rope ?—I should think that there would not be much difference, because a flat rope is composed of a series of round rope to a certain extent ; they are made of different strands.

16,687. (*Chairman.*) Will you state to the Commission your reason for recommending a flat rope for the greater depth ?—As you increase in depth you require the engine end of your rope to be thicker and stronger, having a greater length of rope to support. The manufacturers can increase that strength, and taper the rope much better in a flat rope. It is entirely a mechanical difference, and there is the winding on the engine-drum as well.

16,688. A flat rope would not occupy so much space on the drum ?—No, but that is not exactly the reason. You can coil any number of turns with a flat rope, but with a round rope it has to coil backwards and forwards, so that in going over the pulley it is many inches out of the direct line ; whereas at a great depth you are always in the direct line with a flat rope.

16,689. Should you consider that a wire rope was likely to suffer injury from any description of copper water or other mineral waters which it might have to encounter in its passage up and down the mine ?—I should think not. I believe that we have a case in the county of Durham where there has been the most deleterious water hitherto met with in connexion with metal pumps and tubbing and everything of that kind, and in that same place they were able to work wire ropes with safety. That is at a coal mine in the county of Durham, where they had very deleterious water indeed. They were obliged to use working barrels of different alloys of metals. In the volume of the "North of England Institute of Mining Engineers" for the year 1858 you will

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find a paper on that subject by Mr. William Armstrong, a mining engineer. In answer to that question, taken alone, I do not apprehend any difficulty at all; and I think that that is a good case in point where the water was such that in connexion with the pumping they were obliged to use means to counteract it. But in connexion with flat wire ropes, at that particular place there was no such instance.

16,690. Supposing that there was anything deleterious in the water, could it not be obviated by passing the wire rope through a mixture of grease or other preparation?—Yes, to a certain extent, by keeping a mixture of oil and grease combined very little water would adhere to the rope; but still, of course, if it came in contact to such an extent, there are waters which would be deleterious. I would, however, remark that there is no reason why it should be brought in contact with those waters, that is to say vertically; and even in an underlie, although there is more difficulty to keep clear, I do not think that any practical detriment would take place. There might be drops of water upon the rope, but I do not think that it would come upon it to such an extent as to cause any detriment.

16,691. Will you state your reason for that opinion?—Partly from the grease and oil upon the rope, and also from the constant moving of the rope over the sheaves, its influence would be very different to what it would be supposing it were lying steeped in water of that kind. I do not think that it would be kept upon it, or that there would be anything of that kind for a sufficient length of time to cause any practical detriment. I think that if there was water to such an extent as to cause detriment of that kind it would have a much greater effect upon a hempen rope. If you had water to such an extent coming upon it, it would have to be always what we may call poured down, and even under those circumstances I should prefer wire to hemp as a matter of economy.

16,692. (*Mr. St. Aubyn.*) Do you use wire rope in drawing the waggons along the levels?—Yes, and we have it at work in very wet places. That answer is in connexion with my practice as a mining engineer generally, and not with the Eston mines only.

16,693. Will you state the amount of difference which you have observed in the wear and tear of ropes used in those places, and of those used in perpendicular shafts where the water does not fall on them?—I am afraid that any answer which I should give would be mere guess-work.

16,694. Can you state approximately?—I cannot even state approximately.

16,695. Would they last half as long again?—The circumstances are very different, and the load to the wire ropes is very different upon the vertical to what it is upon the horizontal or nearly horizontal.

16,696. (*Mr. Austin Bruce.*) The friction is much greater upon the horizontal than upon the vertical?—Yes, and the loads are also different.

16,697. (*Mr. Holland.*) Is there any considerable wear of the rope if it is well held up by pulleys in the underlie?—No.

16,698. Is it not easily guarded from any great wear?—Certainly.

16,699. I notice in these rules that you have many for the protection of men from accident; are they enforced by your own regulations or by any general law?—There is a portion of the last Government Inspection Act which applies to all mines; that of course is enforced under the law. Those rules which you may term of our own making, but which are based upon the other, are enforced under the general law of the land; they are enforced partly by our fines, but if we think it a grievous case or a case of great importance, we have only to summon the person before the magistrates for a breach of that particular rule, which rule is made for the safety of the workmen, and they are punished by the law of the land.

16,700. (*Mr. Austin Bruce.*) The rules therefore become a part of the workmen's contract with the master?—Exactly so.

16,701. (*Mr. Holland.*) The particular rule to which you have called our attention, which states that all stone work underneath shall be propped, whether thought dangerous or not, is a special contract?—Yes.

16,702. You say that you call in the assistance of the magistrates; what assistance can the magistrates give you to enforce a special contract?—The magistrates will fine them or send them to prison.

16,703. Under what law?—I am not sufficiently a lawyer to answer the question.

16,704. You told us that you had a threatened strike by insisting upon the regulation?—Yes.

16,705. You considered the regulation very important?—I considered it extremely important; it has diminished the number of accidents.

16,706. Do you think it probable that in all mines a regulation, though so very important as this, would be insisted upon by the employers in the face of a threatened strike?—It is not applicable to all mines. In one colliery which we have to do with, one of Messrs. Bolckow and Vaughan's collieries, where a similar rule is requisite, the inspector has asked us to amend our rules, carrying out the very same thing in principle as we have done ourselves. That is an exceptional state of circumstances which requires that rule.

16,707. My question applied to mines which are not under the Colliery Act?—All mines do not require that special rule; it is not of universal application. Speaking from my experience, I should say that when they found that it involved a question of life and death they would do so.

16,708. Had you not yourselves some doubt as to the expediency of enforcing this rule in face of a threatened strike?—Not the slightest; with a possible verdict of manslaughter before our face, the question is to consider safety first.

16,709. If you had considered the danger to be guarded against less important, would you have yielded?—I would not sacrifice anything in connexion with safety for the sake of commercial prosperity. I may say that I have nothing to do with other people; I am answering for myself.

16,710. (*Mr. Austin Bruce.*) I suppose your population is like that which Mr. Pease has described as a mixed one, not drawn exclusively from this neighbourhood?—Not at all; we are very much better now than we were at the commencement of the mines. At the commencement of the mines they came from Staffordshire, and from all parts of the country; railway labourers came, and men not belonging to the district. We are now getting what I perhaps may designate as well-bred and proper settled miners.

16,711. And you have found an improvement in their conduct in consequence?—No doubt of it.

16,712. You have had experience both among colliers and among miners, which of the two would you say was the healthiest occupation. I am speaking with reference to the miners of this district?—I do not know that there is any particular difference. I could not make any difference between the health of the coal miner and the health of the ironstone miner. The only difference between the two employments, as far as regards the health, is, that having reference to the Eston mines, there is not the requirement of stooping or travelling in low heights, and hence that exertion is done away with; but taking it altogether, I am not aware that I could make any difference between the health of one and of the other.

16,713. Do you think that they are able to work for as long a period of life in one employment as in the other?—I should say quite so.

16,714. Are the wages the same in both employments?—No; in the ironstone mines they hardly will average quite as much; some men will make more, but as an average the coal miner will have a higher rate of wages on account of the free house and fuel.

16,715. To what cause do you attribute the difference?—I do not know, except this, that it requires in some works of coal mining a more ex-

perienced class of men on the one hand, and it is not so easily learned as the getting of ironstone; they require to be trained up to it in coal more than they do in connexion with ironstone. One is done more by the force of gunpowder than the other.

16,716. Has the danger from the explosion of gases anything to do, in your opinion, with the difference of wages?—No; we are not liable at all to explosion from hydrogen gas in connexion with our mines; we have seen such a thing, but I do not think that it has anything whatever to do with the difference of wages; of course there are coal mines equally free from gas as our ironstone mines are, and practically speaking there is no difference in the wage.

16,717. Have you observed among the miners any of that difficulty of breathing which is so common among the lead miners of this district at a certain age?—Never.

16,718. (*Mr. Holland.*) Are the ironstone miners quite as healthy as the colliers?—Quite so.

16,719. (*Mr. Austin Bruce.*) Can you give us the ratio of deaths to the quantities of stone raised in your mine?—Yes; since the commencement of the mines the total deaths in connexion with the machinery quarries railway outside have been 19; the total deaths inside have been 50, making a gross total of 69. The proportion for the inside deaths is one for 105,285 tons; the proportion for the outside is one for 277,066, making a gross average of one in 76,293.

16,720. (*Chairman.*) Are there any clubs connected with your mine?—There is a provident fund, to which all the fines from the men go.

16,721. Do the men subscribe to that provident fund?—They do.

16,722. What amount per week?—4*d.* a man and 2*d.* a boy.

16,723. Are they all obliged to subscribe?—Yes; unless they have previously provided for themselves by joining two duly authorized benevolent societies.

16,724. Is it for sickness?—For sickness, accident, and death.

16,725. Are the families attended?—Yes, the wives and children.

16,726. Is there a doctor?—Yes; 2*d.* a week for a man, and 1*d.* a week for a boy, is charged for the doctor besides.

16,727. Is a separate account kept of the doctor's fund?—Yes.

16,728. And of the other fund?—Yes.

16,729. Is the money which is received from the men and from the fines sufficient to meet all charges?—It has been so far.

16,730. Have the men an opportunity of examining the account?—Yes; there are officers appointed by the men at a public meeting once a year.

The witness withdrew.

Mr. ADDISON L. STEAVENSON examined.

16,731. (*Chairman.*) Will you state the names of the mines of which you have charge?—The Normanby mines and the Skelton mines.

16,732. Who are the proprietors?—Messrs. Bell Brothers, of Newcastle.

16,733. What number of men do you employ altogether on those mines, and what is the number of men underground?—I cannot state the number of men outside, I can state the number inside; the number of men underground is 100 at Normanby and 60 at Skelton.

16,734. How do the men enter the mine?—At Normanby they walk in and out, at Skelton they have been going up and down a shaft, but I have now put a drift out to the surface, we are walling it, and it will be finished in a fortnight, and they can then walk in and out as they choose.

16,735. When they went down the shaft, by what means did they descend?—By engine power.

16,736. By cage?—Yes.

16,737. A safety cage?—No.

16,738. Was the cage wound by wire rope?—Yes.

16,739. A flat or a round rope?—A round rope.

16,740. What was the depth which they had to go down?—20 fathoms.

16,741. About what is the quantity of stone in a year?—The Normanby mines have been producing 160,000 tons per annum. We are now opening the Skelton mines and getting about 100,000 tons per annum, we commenced in March last.

16,742. What is the height of the seam?—Normanby 8½ feet, Skelton 9½ feet.

16,743. Have you to use much timber?—Not more than the average in the district.

16,744. From what do the accidents arise to the men?—Principally from getting the stone down.

16,745. Is that after they have blasted?—Yes.

16,746. Do you take any precautions?—We have a printed rule, amongst the other rules, that before removing the portion supporting the weight of stone they shall prop it.

16,747. Have you had any difficulty in enforcing that rule?—No, I have not had any difficulty; I have had one case of a man killed in that way.

16,748. But you have had no difficulty in enforcing the rule?—When I have seen it I have told them, and they have immediately done it; I am not aware of any cases where they have not done it, excepting when this man was killed.

16,749. What means have you of enforcing it, by fine or otherwise?—Fine or discharge; I prefer discharging.

16,750. Amongst your rules are there many cases where men are fined?—We fine only in extreme cases; I am not aware that I have fined a man during the last six months.

16,751. Have you any fund in case of sickness connected with the mine?—No.

16,752. Or accident?—No.

16,753. Have you any doctor especially appointed?—We have a special doctor, whom we pay.

16,754. Do the men pay?—The men pay 3*d.* a week to the doctor. This is for general medical attendance.

16,755. But there is no club?—There is no club.

16,756. Do the men purchase their candles and powder from you?—They purchase the powder.

16,757. Not the candles?—No.

16,758. Are they supplied with tools, or have they their own?—We supply the tools.

16,759. Do they pay for the wear and tear of the tools?—No, they give them in when they leave; if they lose any they pay for them.

16,760. Do you pay every fortnight?—Yes.

16,761. Are there any schools attached to the mine?—None. I may state that I have been only six months in charge of these mines; matters of that sort I have yet to go into. It is the wish of the employers and myself that we should carry out everything which would be of any benefit to the men.

16,762. Are you engaged in carrying out any alterations?—I have not done so yet.

16,763. (*Mr. Austin Bruce.*) Do you ever have any complaints from the men as to deficient ventilation?—Nothing of any moment; for two or three days perhaps a place might be rather slack, until it got holed in another place.

16,764. In those cases do you apply any special means of ventilation?—Yes, we have a pump going in one case pumping 200 feet a minute for two men.

16,765. (*Mr. Kendall.*) What is the distance off?—About 30 yards from the main airway; it is owing to the large amount of stithe which is given off in that particular case, that is, carbonic acid.

16,766. (*Mr. Austin Bruce.*) Have you ever found the health of the men affected by breathing that gas?—My experience has not been long enough; I have

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Mr. A.L.Steavenson.

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not seen any men any worse for it, they have not complained to me.

16,767. Where has your experience been ?—Among collieries.

16,768. Do you observe any difference between the physical appearance of these men and of the colliers that you have been accustomed to ?—They are bigger and stronger men in this district and more of the character of the navvie. The colliers generally have a whitish pale appearance, and these men not so much so.

16,769. Then you consider these men to be a healthy class ?—I do, very.

16,770. Have you, from the records of the mines with which you are connected, any return of the number of deaths?—I can tell you the number, but I have no particular information as to how they occurred. There have been seven lives lost at Normanby during the time that we have been in operation.

16,771. How long is that ?—Nine years.

16,772. And in that time what has been the quantity of stone raised ?—It would average about 130,000 tons per annum, that is 1,170,000 tons.

16,773. (*Mr. Kendall.*) Have you more carbonic acid gas in your mine than in the mines in the neighbourhood ?—I should think that we have; we have rather more troubles in the strata, and we are putting through what is called a trouble where this is coming off.

16,774. How does it come off, is it through fissures ?—Yes.

16,775. Do you ever apply your candle there to see the effect of it ?—Yes.

16,776. Does the candle go out instantaneously ?—Yes.

16,777. Supposing that you put your candle in the centre of your fore-head, would it generally burn there ?—It would burn dimly ; that is in the place of which I have been speaking, of pumping the air in.

16,778. But when you pump the air in, does it burn well, or does it always burn dimly ?—It generally burns dimly if the pumps are not going, but if we set the pumps going it makes the place fit to work.

16,779. Although it is diluted largely, is it perceptibly different from the other ends?—No ; I cannot say that it is.

16,780. Though you are in a trouble, still by the application of this pump you so dilute this carbonic acid gas that the men are able to work freely ?—Yes.

16,781. (*Chairman.*) Is this at the Normanby mine or at the Skelton ?—The Normanby mine.

16,782. What is the length of the level ?—About 40 yards. When I speak of "the level" I mean this single place.

16,783. What is the breadth of the level ?—It is nine feet wide.

16,784. Have you any furnace ?—We have two small furnaces, and I am putting up a new one which is arger.

16,785. Do you think that the two furnaces are not sufficient ?—In the summer they are not sufficient.

16,786. Have you made any calculation as to the size of the furnace required ?—I am going to put up one six feet square.

16,787. Do you make any calculation of the number of men working as to the size of the furnace ?—I have not done so ; I know pretty well the effects of the furnace ; it varies according to the circumstances of the mine.

16,788. Will that furnace, in your opinion, be sufficient to extract this carbonic acid gas ?—Yes ; it will pass off as soon as we get holed to where we intend to go.

16,789. But even with the furnace it would not be sufficient without putting in air to that point where you say the carbonic acid gas is ?—The furnace would be sufficient.

16,790. Supposing you had another furnace in now would that be sufficient without introducing air ?—Yes ; this is a drift which is going to hole into another mine in the course of less than 100 yards.

16,791. It has no communication with the rest of the mine at present ?—No.

16,792. It is a new drift ?—Yes.

16,793. How far is it from the day ?—700 yards, and it is there that we meet with the stithe.

16,794. Does not that drift communicate with the other parts of the mine ?—We can walk into it from the other parts of the mine.

16,795. Cannot you extract the air ?—When you go into a single place without any communication the air falls dead.

16,796. If you bratticed that would it not have the desired effect ?—We have not yet sufficient furnace power to draw it through.

16,797. If you had sufficient furnace power, then you think that a brattice would be beneficial ?—Then we could draw it through.

16,798. How long do you think you will be in getting to this state of things ?—By the end of the year.

16,799. In the meantime will not the men, in your opinion, suffer ?—I will take care that they do not.

16,800. How will you take care that they do not ?—By pumping in sufficient air.

16,801. How is the pump worked ?—By hand.

16,802. Where is it placed ?—About 40 yards back from where the men are working.

16,803. Is there any communication with the outside air where it is placed now ?—Yes.

16,804. At the point where this hand machine is placed, how near is the communication with the day ?—I do not quite understand the question ; it is 700 yards from the day.

16,805. And this is 40 yards from the pumping ?—Yes.

16,806. Then, I suppose, it is 660 yards from the day where the men are pumping ?—Yes.

16,807. And you are quite satisfied that at that 660 yards the air is perfectly good ?—Yes ; it is at the bottom of our main intake.

16,808. Has it any communication perpendicularly?—No, not at that point.

16,809. Where is the nearest perpendicular communication in this level ?—We have no perpendicular communication.

16,810. Have you any level driven alongside of that ?—Yes ; up to within 30 yards.

16,811. How soon will your furnace be at work ?—In the course of a month.

16,812. And then you will brattice it ?—Then we shall brattice it if necessary.

16,813. And you would not think that it would then be necessary to have a fan ?—We can very soon see.

16,814. Do you take the men out when you find that the candles will not burn ?—Yes.

16,815. But the candles now when you pump air will burn perfectly ?—Yes, on ordinary days. There are some days when the air is exceedingly slack, and then we take the men out.

16,816. How long in this year have you had to take the men out ?—It has only been going three weeks.

16,817. Have you had to take them out during that time ?—Merely while we put in the boxes.

16,818. You mean the boxes for the air ?—Yes. What I have mentioned is quite an exceptional case ; I never met with the gas before, *i.e.* in these mines, except in small quantities.

16,819. Have you ever been in an iron district before ?—I served my apprenticeship to Mr. Marley who has been examined, and I then had an opportunity of examining Eston regularly.

16,820. Is there anything further which you wish to state ?—Not that I am aware of.

The witness withdrew.

Adjourned to Monday next at Wire Gill Mine.

WIRE GILL MINE.

Monday, 13th October 1862.

PRESENT:

The Right Hon. Lord KINNAIRD, K.T.
NICHOLAS KENDALL, Esq., M.P.
JOHN ST. AUBYN, Esq., M.P.
RICHARD DAVEY, Esq., M.P.
P. H. HOLLAND, Esq.

The Right Hon. Lord KINNAIRD, K.T., in the Chair.

The Commissioners inspected and entered the mine, after which they took the following evidence.

Mr. WILLIAM LEE examined.

WIRE GILL MINE.

Mr. W. Lee.

13 Oct. 1862.

16,821. (*Mr. Kendall.*) Are you an overman of the Wire Gill mine?—Yes.

16,822. Before you were an agent did you work here as a miner?—No, not at this mine.

16,823. But you worked under the same company?—Yes, for 15 years in the mines.

16,824. I wish especially to ask you as to the ventilation of this mine. How long has this mine been working?—Perhaps some nine years.

16,825. To-day we have been into the fore-end of the level. What distance is that fore-end of the level from the entrance here?—Between 600 and 700 fathoms.

16,826. About how far in from the day level is it before you come to a shaft which communicates with the surface?—265 fathoms.

16,827. Is that an upcast shaft generally?—Yes, generally speaking.

16,828. Does it ever become a downcast shaft?—Occasionally.

16,829. But seldom?—In the summer season, perhaps.

16,830. In what months of the year does that occur?—In the latter part of July as much as any time.

16,831. You use a great deal of powder, do you not?—Yes.

16,832. You blast all?—Not all.

16,833. Nearly all?—There has been a time when we did not blast so much as we do now.

16,834. In the latter end of July, when it becomes a downcast shaft, where does the powder smoke go?—Out of the level mouth.

16,835. Then, as you are blasting all day, you must have a continued flow of smoke out through the level?—Yes.

16,836. Do the men suffer much going into the level at that time?—I think not. They do a little, but when the smoke has come that distance the bad effects are partly gone.

16,837. It having been scattered through such a distance?—Yes.

16,838. How long does it take to come through that level?—Eight or ten minutes.

16,839. How long is it from the before-mentioned shaft before you come to another shaft?—Perhaps it would be some 80 fathoms.

16,840. How is your ventilation generally carried on in the different workings?—The principal ventilation is by day shafts from the surface, and from open levels at a higher random communicating with the level at the lower random.

16,841. The communication being from one random to the other, and there being every now and then a communication with the surface?—Yes.

16,842. In your experience does that create a sufficient ventilation for the men?—Yes.

16,843. How do you manage when your fore-head is a long way off from the last air point?—We place a water blast so as to throw air into the fore-head.

16,844. Have you a water blast now in your fore-head?—We have a water blast in the levels where you have been, which is 120 fathoms back from the forehead, and air is forced by the blast in pipes to within about a fathom of the fore-head.

16,845. Your fore-head is 120 fathoms from any air communication?—Yes.

16,846. And the whole of that supply of air is driven by a water blast?—Yes.

16,847. How many men work there at a time?—Two.

16,848. How long does the powder smoke lie there?—It is rather difficult to speak positively about that; perhaps we throw in nearly 100 cubic feet of air in a minute.

16,849. How long is it before the men enter again?—Ten minutes or a quarter of an hour; they are not tied; it is at their own discretion.

16,850. Do they go in too soon?—I do not think that they are apt to go in too soon. They seem to have a regard for their health, and a knowledge of what is beneficial to their health.

16,851. Are they a more careful body of men than they used to be?—Yes, much more. They are much more careful since I commenced working in the mine as a miner.

16,852. What is the level for?—One object is to communicate with the level from the adjoining mine.

16,853. What is it called?—Little Eggleshope mine.

16,854. Have you a jet of water there?—Yes.

16,855. What is the difference between the two points?—130 fathoms.

16,856. How long will it be before you communicate?—A twelvemonth.

16,857. You will have no communication with the surface before that?—We have not arranged to have it. If we find our blast sufficient we go through without any other communication.

16,858. Do you think that the blast will be sufficient?—I think that it will be perfectly sufficient.

16,859. How many men are there working at each end?—Eight at each end, two to be in each eight hours at a time; their time is specified as eight hours; they are not exactly tied to that; they may make it shorter; the men get something like seven hours each, taking it in that rotation, for the week; we cannot get the 40 hours in those leading places. If you take the time from Sunday to Sunday we cannot get 40 hours in a week, so that the average time may be taken at something like seven hours.

16,860. (*Chairman.*) Will you state why?—Because there is not time between; two men commence, and during the time for four sets of men there are not so many hours as that they can get in the whole time, and we allow our men to be at home on the Saturday night, so as not to interfere with the Sabbath, and not to leave their homes till the Sunday has gone.

16,861. When the one pair go out do the others go in?—Yes.

16,862. How soon afterwards?—Perhaps those who are in may come out to the mine shop, and the others will go into their place, or if they are a little longer than the time, these may leave the mine shop and change with them, or they may meet on the way.

16,863. Do they work night shifts?—Yes, in this case; they must. As a general rule, they change at the place, but has to give time for the fore-head being cleared of smoke by the blast, we require eight hours where it is practicable.

16,864. (*Mr. Kendall.*) According to your calcula-

WIRE GILL MINE.

Mr. W. Lee.

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tion, how long do you think that you will be in communicating from one mine to the other?—Twelve months, according to the best of my judgment.

16,865. From your experience, as far as it has gone here, do you think that you will be able to give these men by the water blast a sufficient quantity of air to work there with safety?—Yes.

16,866. Do you think that you shall be able to keep up pretty nearly as good air as we had to-day?—Pretty nearly; we shall lose a little with the friction of the pipe.

16,867. You have sufficient fall and sufficient water in order to increase the power, if necessary?—Yes.

16,868. You have no doubt that the men can work there without injury to their health until the communication is made?—Yes, so far as the air goes; there will be a little injury from the smoke and the dust, and we cannot prevent the fume which arises from the candle.

16,869. Do they suffer much from the dust?—Not so very much; they do a little; for instance, at the commencement of the boring operations they must suffer a little from the dust, and they must suffer from the fume.

16,870. To-day we tried the thermometer, and it was 60° in the end; have you ever had it tried before?—We do not do much in that way.

16,871. Generally speaking, is it much the same as to-day?—Yes, much the same.

16,872. Winter and summer?—Yes; there is not much change in it.

16,873. The men do not complain of heat or of cold?—No, the temperature is very much the same.

16,874. (*Chairman.*) In your opinion you will be able to supply sufficient air, but if not, you might join with the upper level?—If we found it not sufficient we could do that; but I have no doubt that what we are doing now will be sufficient.

16,875. What distance would it be to join with the upper level?—Perhaps about 20 fathoms.

16,876. In driving a rise, how do you supply the air?—In a similar way; we have a blast, and we take a column of pipes up to the rise top, to where the men are working. We divide the rise with a partition.

16,877. Would that sized pipe be sufficient to supply air for the rise as well as for the end?—Yes.

16,878. (*Mr. Kendall.*) You do not at all anticipate going to the surface?—No; we have no reason to think but what we can throw sufficient air into the place otherwise.

16,879. (*Chairman.*) When you rise, you turn the iron pipe up and carry it up as the men go on?—Yes, we have an angular pipe or a circular pipe.

16,880. To enable you to take it up the rise?—Yes.

16,881. What precautions do you take against the pipe being filled up while the men are working?—We have what we call a cap to the pipe, which is on when they fire a shot, and if anything comes down we have an opening at right angles, and so we can let it out.

16,882. You depend entirely upon the men putting that cap on?—Yes; when they are working for a blast they can take it off altogether.

16,883. In winter, when the water freezes, what do you do?—We sometimes cover our watercourses over.

16,884. But the water does freeze sometimes?—It is very rare that we are ever stopped in winter.

16,885. Supposing it to be frozen, what should you do?—Of course we could not have water; but we protect ourselves against that. We cover our watercourses with wood, and the water comes away; and supposing it is frozen over, a spring underneath will come through. We have men to look after it.

16,886. You are never obliged to stop working owing to the water freezing and not being able to supply the blast?—That very rarely occurs, but occasionally it may occur, and in that case we should temporarily remove our men.

16,887. You say that the men suffer from the dust; is that merely stone dust or lead dust?—Not so much from the lead dust; the principal dust from which they suffer is stone dust; there may be a little of the other as well, but its own weight makes it fall more rapidly than stone dust.

16,888. (*Mr. Holland.*) You have said that sometimes the shaft becomes a downcast?—Yes.

16,889. Is your draught as good then as when it is the upcast?—There is a tolerably good draught then.

16,890. How long was your air pipe when you first began using the water blast?—Perhaps 10 fathoms.

16,891. How long is it now?—120.

16,892. Is the blast much weaker now than it was at first?—It is a little weaker; there is the friction that the air has to contend with.

16,893. Is there any considerable leakage, in your opinion, from the pipe?—Not much of that; we look after that.

16,894. Is it very much weaker, or only a little weaker?—Just a little.

16,895. Then you may carry it another 100 fathoms?—We have driven with a blast similar to this, I believe, 600 fathoms.

16,896. With the same fall of water?—Yes.

16,897. And a good blast?—A tolerable blast.

16,898. Have you measured the quantity of air driven and of water flowing?—Perhaps 18 gallons of water a minute.

16,899. How much air?—From 90 to 100 cubic feet may flow in a minute.

16,900. Have you measured that?—We have measured another one, and it was 103 cubic feet; it is on the same principle, and I think that this would be a little less, say 95 cubic feet.

16,901. You have said that as far as the air goes the blast does very well, but that there are powder smoke, candle smoke, and dust?—Yes.

16,902. Do you mean that there are more of those annoyances than in the ordinary workings?—There is a little more in the leading fore-heads than in the open workings.

16,903. Is that because it is more confined, or because the ventilation is worse?—It is more confined.

16,904. Do you attribute the greater annoyance of powder smoke, candle smoke, and dust in the headway to the confined space, or to some little deficiency of ventilation?—It is principally from the confined space.

16,905. Were those men whom we saw in the mine fair specimens of your miners?—Yes.

16,906. They were not more healthy than the rest?—There is not much difference; they were a fair specimen; they are a little younger than some men.

16,907. (*Mr. Kendall.*) But the men whom you had there to-day were men in the regular turn?—Yes; this is a distant mine, and we let the younger men come here on account of the distance, and we keep the older men nearer home, so that they may have less travelling.

16,908. (*Mr. Davey.*) Have you any lodging houses connected with this mine?—Yes.

16,909. How many men occupy them generally?—Perhaps in the shop which you have seen there may be some 80 or 84 men; there is another lodging house as well.

16,910. How many of those men sleep in one room?—That is according to the size of the room; two men sleep in one bed.

The witness withdrew.

Mr. JOSEPH PATTINSON examined.

Mr. J. Pattinson.

16,911. (*Chairman.*) Of which mine have you charge?—Little Eggleshope mine.

16,912. How many men have you there underground?—70; we call them pick men.

16,913. What is about the extreme length of any level which you are driving from the day?—530 fathoms, I think.

16,914. And you are driving now to form a communication with the mine on this side of the hill?—We have a communication already by means of a rise between the two levels, that is to say, the west end of our Little Eggleshope mine and the east end of this (Wire Gill) mine have a communication between the two levels.

16,915. Your men are now driving to form another communication, are they not?—Yes, at a lower level.

16,916. How far have you driven that from any communication with the surface?—In opening up the vein to the extent of 530 fathoms, I believe that in those 530 fathoms we have 13 shafts communicating with the surface.

16,917. How far are you driving from any communication with the surface that level which is to meet the other?—I would say 40 fathoms.

16,918. How is that ventilated?—By means of what we call a pressure blast; a water blast.

16,919. How far do you think that it would be safe to drive with that means of ventilation, in your experience?—It depends upon circumstances; by means of a water blast we have driven as far as 500 fathoms; not with this identical blast, but another blast.

16,920. With what sized pipe did you drive the 500 fathoms?—I cannot say exactly; I should say five or six inches.

16,921. (*Mr. Holland.*) Such a pipe as that which we saw?—Yes; a metal pipe.

16,922. (*Chairman.*) You think that that is quite sufficient?—That is an extreme case; we generally do not drive more than 100 fathoms without a communication.

16,923. But you found this pipe quite sufficient?—Quite sufficient; we have done that.

16,924. Have you taken the same thing up a rise? Yes; we generally rise so far, and sink to meet the rise to get a communication with the surface.

16,925. When you sink or rise do you always apply the pipe?—Yes.

16,926. (*Mr. Holland.*) Is that level always as pure and as fresh as we found it to-day?—Yes; it is not more than an average to-day.

16,927. It is a fair average?—It is a fair specimen.

16,928. (*Chairman.*) Have you always plenty of water to work the water blast?—We have not perhaps sufficient always, but we endeavour as far as we possibly can to have sufficient.

16,929. Does it run short in summer?—Not often; they are generally ever-running springs.

16,930. But it does sometimes run short?—A little.

16,931. In winter does not it sometimes freeze?—We try to prevent its freezing; we cover it over.

16,932. But it does freeze sometimes, does it not?—Not often.

16,933. (*Mr. Holland.*) Is it stopped by frost sometimes?—I do not know that it is; we cover it over and have a close conduit, so that the frost cannot affect it.

16,934. How long have you been a miner?—I have been connected with mines, as a working man and in the capacity that I am now in, 45 or 46 years. I went underground at 14. I was for 22 years a pick man, and I have been nearly 24 years an agent.

16,935. Are you convinced that much more attention is paid to ventilation now than was paid to it when you began?—There is no comparison; the mine is not like the same sort of work.

16,936. As regards ventilation?—Yes.

16,937. In what other respects has it been much improved?—The water blast has been of great benefit.

16,938. About when was that introduced as a general thing?—As nearly as I can tell, from 35 to 40 years ago.

16,939. Has it become much more general now than it was 20 years ago?—It is quite general now; when I first began as a working man there was no such thing as a water blast in the country.

16,940. Can you drive such a level as we were in to-day without a water blast?—No; except by means of a fan blast.

16,941. A water blast or some other equivalent?—Yes. For a temporary purpose we sometimes make use of the fan blast where we cannot have water.

16,942. Do you consider the water blast where you have a sufficient supply of water one of the best modes of artificial ventilation?—Yes, as far as our experience goes; we have tried the fan blast and the pumping.

16,943. What is the great advantage in the water blast?—The purity of the air. When we have a fan machine it is generalty worked by boys, but the water blast goes perpetually, night and day, weekday and Sunday.

16,944. Can you depend upon the continuance of the water blast more than upon other means?—Yes; it is a certainty.

16,945. Would you prefer a water blast to a fan worked by water?—I think that we should; we have tried both.

16,946. Would a water blast, from its great simplicity, be less likely to get out of order than anything else which you use?—I think so; because it is not so complex as a fan; nothing can be more simple than the working of the water blast.

16,947. Then where you have a sufficient fall and a sufficient quantity of water the water blast would be your favourite?—Yes; and I think that that is the favourite with all.

16,948. Have you considered that the miners have been more healthy since the use of the water blast?—Yes; most decidedly.

16,949. You think that it has kept them in life for some years longer?—I should say so.

16,950. Has it considerably diminished the quantity of dust which the men have to breathe, by driving it away?—I suppose that it must do so; it is taken away just as smoke is taken away.

16,951. Has it not diminished the quantity of smoke which they have to breathe more than the quantity of dust, the smoke being lighter; does that correspond with your observation?—I think that it does; excepting where we have shale we have very little dust; in the shale they work a good deal with the pick, which creates dust.

16,952. Is the dust from the shale light enough to be carried away quickly by the water blast?—A great part of it will fall, but the lighter particles will be taken away by the blast.

16,953. Do you think that miners are a better-conducted body of men than they were in your youth; more steady and more sober?—Yes, decidedly so; they were a great deal more addicted to drinking formerly than they are now; the morals of the people are better generally.

16,954. Are they steady workers?—Yes, they are steady well-behaved men.

16,955. Are they better in those respects than they were in your youth?—Decidedly better; in fact they are under stricter regulations.

16,956. Do they lodge better or worse than they did in your youth?—Decidedly better; and for one reading man among miners when I was a lad there are perhaps 20 now; they have libraries in most of the villages, and there are in some of them reading rooms at the masters' expense, and we generally have books at the mine shops as well, such as the British Workman and Chambers' Journal occasionally. Bibles also are supplied to all the mine shops by the masters.

The witness withdrew.

Mr. Mark Pinkney examined.

Wire Gill Mine.

Mr. M. Pinkney.

13 Oct. 1862.

16,957. (*Mr. Davey.*) What situation do you hold in this mine ?—Engineer.

16,958. Have you measured the rooms at the lodging houses ?—I have measured the two which you requested should be measured.

16,959. Will you give the measurement of those two rooms ?—They are rather peculiarly formed. There is a slight plan of them (*producing the same*). The length of one room is 16 feet 8 inches by 15 feet 3 inches. The height of the side wall is 8 feet, and the height to the ridge 13 feet 4 inches.

16,960. How many beds are there in that room ?—There are 10 bedsteads standing there ; there is provision for 10 beds. I cannot say whether the beds are all occupied.

16,961. Those beds are occupied each by two miners ?—Yes, when they are occupied, that is the usual practice.

16,962. Is it the case that they sometimes occupy them by day as well as by night ?—Some of them do ; I cannot say which of them do ; that is an exception ; there is a very small number that occupy them by day.

16,963. But do they occupy the same beds as have been occupied in the night ?—I cannot say ; the mine agent would be the proper party to give you that information. I am not acquainted with that point.

16,964. Will you give the measurement of the other room ?—The other room is 10 feet by 13 feet 2 inches.

16,965. And what is the height ?—It is what we locally term a T fall, it is 7 feet 6 inches in height on one side, and 2 feet 3 inches on the other.

16,966. How many beds have you in that room ?—Three.

16,967. (*Chairman.*) You have taken the measurement ?—Yes.

16,968. Is the ceiling plastered below the slate ?—No, it is open to the slate in the large room, and there is a ventilator on the top as well. The small or T fall room is boarded beneath the slates.

The witness withdrew.

Mr. William Lee further examined.

Mr. W. Lee.

16,969. (*Mr. Davey.*) We have the dimensions of the rooms now ; one room contains 10 beds, how many have you ever known sleep in that room at one time ?—I cannot say ; if all the beds were occupied there would be two in each bed.

16,970. That would be 20 men ; have you ever known it to be full ?—No, I do not know what numbers sleep in that room.

16,971. What is the greatest number of beds that you have known to be empty out of that ?—Perhaps they may all be full, I am not prepared to say that they are not.

16,972. I presume that you have some levels working the whole of the time, three shifts ?—Only one.

16,973. In those shifts do the men after a day shift occupy the same bed ?—They have another bed ; of the four men, two are at work and two are out, but they occupy two beds. There are only four men out of the eight there at one time, two are working at one time and two are in the shop.

16,974. What becomes of the other four ?—They do not come from home till these are done. On Monday morning two men come and they commence their work.

16,975. At what hour ?—In the forenoon, at two o'clock, or from that to a later hour, just as is convenient ; those who go in the afternoon change those who went in in the forenoon; these forenoon men come out and rest eight hours, and those four go on in that way till the Thursday morning when they have done their work ; two fresh men come on upon the Thursday morning, and they work from six on the Thursday morning till two in the afternoon, and two other men who have not been to work take their place and work till 10 at night. Those four men get each four eight-hours shifts by 10 o'clock on Saturday night ; they are eight hours at work and eight hours at rest. The first four have done at six o'clock on Thursday morning, and they go away home, and stop at home for a week till the Thursday comes again. That is what we call back end and fore end.

16,976. (*Chairman.*) Then two men never sleep in a bed one after the other ?—It is not the rule to do so, but they might choose to do so ; the rule is that four men have two beds.

16,977. (*Mr. Davey.*) How are the rooms ventilated ?—By ventilators at the top and at the side as well.

16,978. Who has the management of the ventilation ?—I have, under the direction of the Superintendent, Mr. Bainbridge ; we have shop managers as well.

16,979. Do you ever go there in a morning before the men get up or just as they get up ?—I am generally here after they get up ; they rise perhaps at five in the morning.

16,980. Do you ever go into their bed rooms ?—Yes.

16,981. In what state is the air then ?—It is pretty fair.

16,982. Do you ever find the ventilators stopped up ?—They have been, perhaps, stopped up in the winter season.

16,983. But not at this season of the year ?—I think not.

16,984. I saw some to-day stopped up ?—That is the fault of the men.

16,985. (*Chairman.*) Does the air come down and go up, or only go up ?—When the air is not heated in the room it will be a down draught ; the heated air will escape upwards.

16,986. (*Mr. St. Aubyn.*) The number of men allotted to each room would be too large for their health, would it not, if it were not for the perfect ventilation of the apartments ?—Perhaps it might.

16,987. And therefore you have provided a sufficient number of holes for ventilation ?—Yes, such as to make them comfortable.

16,988. But if those holes for ventilation are not used the health of the men must suffer ?—Perhaps it may a little ; but they generally are used.

16,989. The Commissioners to-day observed that most of the side holes for ventilation were filled up with heather and straw ?—I observed one or two in that way.

16,990. Who is responsible for that ?—The manager of the shop ; there are two men appointed to look after all these things ; they take the management of the shop, and we assist them.

The witness withdrew.

Jonathan Morton examined.

J. Morton.

16,991. (*Chairman.*) How long have you been a miner ?—Thirty-eight years.

16,992. (*Mr. Kendall.*) What age are you now ?—Fifty-four.

16,993. Are you a working miner now or not ?—No, I am not at present.

16,994. Why are you not a working miner now ?—I have been out of health about 22 weeks.

16,995. (*Chairman.*) How are you affected so as to be off work ?—It is in my chest.

16,996. Have you been to the doctor ?—Yes.

16,997. What does he say that it is ?—He says it is

a weakness in my chest. I started with an inflammation in my chest, but it has left a weakness in my chest.

16,998. Did you ever suffer in your breathing before ?—Yes ; I was affected in my breathing, but not in a great measure.

16,999. At what age were you first affected ?—About four or five years ago.

17,000. But you were not laid off work then ?—No.

17,001. You were not laid off work till the inflammation in your chest ?—No.

17,002. Did the doctor say how it arose ?—I think that it arose by cold.

17,003. Did he say that it was in consequence of your having been affected in your breathing before ?—No, he did not say anything of the sort.

17,004. Do you think that the affection of your breathing was brought on by any work that you were engaged in ?—Yes, in a measure.

17,005. What was the cause ?—I think that it was affected by the stour ; that is to say, the dust.

17,006. In what mine were you then working ?—At Hudshope Head and Steer's mines.

17,007. Are they both the Lead Company's mines ?—Yes ; I wrought under no one else.

17,008. What was the description of work that you were engaged in there ?—Driving in levels.

17,009. Was the stour worse where you were driving a level ?—Yes.

17,010. What were you driving through ?—Plate.

17,011. Were there any artificial means of ventilation used ?—Yes, a water engine.

17,012. Was the air quite good ?—Quite good ; it was quite clear, good air, and it cleared the reek well.

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17,013. How long was it before the reek was cleared ?—It might be about a quarter of an hour, and then it was clear.

17,014. But it did not get rid of the stour ?—No.

17,015. Was it very dry ?—Yes, quite dry.

17,016. How long were you working in that before you felt anything ?—I wrought in that level four years.

17,017. And at the end of four years was that the first time that you felt it ?—No, I did not feel it for a good bit after that.

17,018. You do not know where it was that you first felt the affection ?—No.

17,019. Did it destroy your appetite ?—Yes, it took away my appetite.

17,020. Do you think that you swallowed the dust in the stomach, or that it went into the lungs ?—I think that it went into my stomach.

17,021. Did you give it out much ?—No ; I do not smoke, and never did.

17,022. Was your mouth full of dust ?—Yes.

17,023. (*Mr. Davey.*) Did you suffer before you had this attack of inflammation of the lungs ?—No.

17,024. You never felt any inconvenience from working in those close ends ?—Never.

17,025. And the doctor did not tell you that it arose from that ?—He told me that it was weakness, from the effects of mining.

The witness withdrew.

Adjourned.

REETH.

Tuesday, 3rd March 1863.

PRESENT :

The Right Hon. Lord KINNAIRD, K.T.
NICHOLAS KENDALL, Esq., M.P.
Sir PHILIP GREY EGERTON, Bart., M.P.
The Hon. F. LEVESON GOWER, M.P.
P. H. HOLLAND, Esq.

The Right Hon. Lord KINNAIRD, K.T., in the Chair.

Mr. ADAM BARKER examined.

17,026. (*Chairman.*) Of what mines are you agent ?—Whitarside Mine and Summer Lodge Mine.

17,027. Are those both in the neighbourhood of Reeth ?—Yes.

17,028. How many men have you employed in the two mines ?—On the average for the last six years we have had about 15 on Whitarside Mine. The other mine only began in last October, a year last October, and there have been four men employed there. They are only driving a level.

17,029. Have you ever had charge of any other mines besides these ?—No.

17,030. Have you ever worked as a miner yourself ?—Yes, all my lifetime, till I came to be agent of these places.

17,031. In what mines have you worked ?—I have worked in the Surrender mines a long time.

17,032. Did you work by the bing or by the fathom ?—Fathom-work and fother-tail ; fother-tail it was in those days, 25 cwt. went to the fother, delivered at the mill in lead.

17,033. Have you ever worked in those mines in bad air ?—Yes, I have.

17,034. Do you mean want of air or carbonic acid gas ?—We wanted fresh air.

17,035. How did you find the want of that ; by your your own feelings or by the candle ?—By the candle chiefly.

17,036. Could you tell the want of air yourself without trusting to the candle ?—Yes, I could. It was a very hard place that I was working in at Surrender, a place called North Vein. It was about some three or four feet wide between the sides and nothing but vein, with the exception of a little ore, of about half an inch wide, which struck up and down, and we had that to hew out, and then we had to bore a hole in the vein to shut that off to make our dirkway, and it was done by craft, one man having a better idea than another in it. Some men used to come into that place that could not make the picks penetrate it, and it caused a dust to blow about a good deal ; and some men used to come out of that place with their whiskers and their hair as if they had been powdered. Strong muscular men without craft could not do it at all, and some men would fetch it off every time they struck by craft.

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17,037. Did you ever know men suffer from working ?—I suffered a great deal from it. When I was about 40 years of age I began to want wind very much.

17,038. Have you got quite over that now ?—No ; I never shall get over it.

17,039. Do you attribute it entirely to working in that one place ?—I attribute it to nothing else but that very place.

17,040. Were there any means taken to improve the ventilation when you were working there ?—Yes.

17,041. What means ?—Rising up to get to another place that we could come to above, an old drift.

17,042. But till that was done were any artificial means used ?—Not any.

17,043. Why was the air so bad in that end ?—For

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want of ventilation; another opening to bring us fresh air to it.

17,044. Then some artificial mode was necessary to bring the air till you got the rise driven?—We had none. We had no communication whatever with any other place to get a draught.

17,045. You had no fan or other mode?—We had no fan in that place.

17,046. How long ago is this?—It would be 30 years back. It is 29 years since I commenced it, I believe. I was in it four years. Lead was very low, and wages 7*s*., 8*s*., and 9*s*. a week only.

17,047. Was not the system of having a fan worked by a boy in use at that time?—Yes; but we had not one there. It was a long way from the shafts; it was at the east end of the field.

17,048. Do you suppose that anybody would now attempt to drive an end without having some artificial means of ventilation?—No; they have quite a different mode altogether of working.

17,049. At that time was there a low horse level, or did you descend by shaft?—We descended by shaft. Nearly all of the workings at Surrender were by shaft. Mr. Robinson got possession of Surrender mines and put up a level out of Arkendale, and they holed to the very level that I am speaking of.

17,050. Does the opening up of that level give sufficient ventilation without any artificial means?—Yes, I think so. It has been very beneficial.

17,051. Would it be sufficient to drive a rise on the forehead without any artificial ventilation?—No; it could not be done for a very long distance. The furthest that I ever knew was at Whiterside; we drove about 350 fathoms, and we had a single air place—a single rise that gave us fresh air; and after that we drove about 200 fathoms in the vein, and then we put up a rise 27 fathoms in grit and plate.

17,052. Have you now ventilation completely at the end?—We are out at the surface at that place by rising.

17,053. In driving in a maiden or new mine you are subject to the want of sufficient air?—Certainly.

17,054. More, perhaps, than in an old mine which has a horse level?—Quite so.

17,055. What means do you adopt in the mine of which you have charge where you are driving beyond a rise?—We put up a rise to give us air.

17,056. But if you wanted to drive beyond the rise what means would you adopt for ventilation?—We should adopt a machine what is called a windy king, that is a fan with a boy to drive it.

17,057. Is that quite sufficient?—Yes, it answers very well in general. We did not use that in our place. I drove a very good level, and I got a door made to fit the end of my waggon, such a one as I never saw tried before in any mines, and I never heard of it. I named it to Mr. Robinson, of Richmond, and I had it attached to the waggon. It was a very good level, and the men carried it with that velocity that it drove a current of fresh air which it carried into the forehead.

17,058. (*Mr. Holland.*) How did the air get out?—I do not know how it came, but they always had plenty of air.

17,059. (*Chairman.*) I suppose that this board did not fit close to the sides?—It did not. They came back with the same velocity. It answered beautifully; it is a most excellent thing. Mr. Robinson admired it.

17,060. I suppose that you could always put it to a certain extent; that is to say, a solid screen in the front of the waggon of the proper size, and that would be an advantage?—Yes.

17,061. Was this straight or were there any curves?—There was very little curve indeed.

17,062. (*Mr. Holland.*) You said a little while ago that there was a great deal of dust in the level where you were working 30 years ago; that the men had not craft enough to bring the ore down without making a great deal of dust?—I did; some men had no craft.

17,063. Was that dust very distressing to you?—Yes; it was very pernicious and very heavy.

17,064. Did it distress you very much?—Yes, sometimes it did.

17,065. Do you attribute much of the illness which you suffered then to the dust or to the close air?—The illness is the want of more breath; I found it out when I was 40 years of age. I cannot say that I felt anything. I was then about 24 years of age, just in what you may call the prime of life, and what I used to think was about as beneficial as anything for me was a piece of fat beef, fat mutton, or bacon.

17,066. I understood you to say that you got an illness 30 years ago from which you have not recovered yet?—Certainly I did; I only wanted more breath.

17,067. What do you think was the cause of that illness?—Nothing but the dust from this very vein.

17,068. The dust or the bad air?—Both combined. I had bad air and I had this dust to contend with.

17,069. Is much more attention paid to ventilation now than there was 30 years ago?—A very great deal.

17,070. Are the men more healthy than they were when you were a boy?—I believe that they are healthier in general. In fact a mine is nothing now to what it was when I was a boy.

17,071. Your fellow workmen now are more healthy than they were 30 years ago?—Yes.

17,072. Are you sure of that?—Yes; I am certain of it.

17,073. (*Mr. Leveson Gower.*) At what age did you begin working?—14.

17,074. What is the youngest age at which boys work now in the mines?—I believe that they do not do anything in the mines in a general way till they are about 10 years old.

17,075. Do they work underground at 10 years old?—Yes, some few. These cases happen where there is a strong man, and he has a strong robust sort of boy, and he gets the boy out in order to make his earnings rather more. His father takes him along with him.

17,076. There has been no change as to the age at which they go into the mines?—No; I do not know that there has been any change in that way. When I was a boy, boys had to carry their work a very long way to the bottom of a shaft with their feet in clay, with the trapping on, and a bucket behind them, and they had the skin off their shoulders and other places. The trapping was made of leather. They now go in, and they have what are called dirks and iron rails; they had wooden rails at that time, and it is three times as easy work for boys at the present day as it was at that time; and the mines, in a general way, are far better ventilated than they were 30 years ago.

17,077. Have boys who begin so early now any opportunity of going to school?—The fathers could not afford to allow the boys to go to school longer than that time.

17,078. When they begin working they leave off going to school?—They do.

17,079. How do the boys get up and down the stemples?—They are assisted by their fathers; the father guides their feet. I have done that myself many a time when I had charge of boys.

17,080. Do you remember any accident to boys going up the stemples?—Yes, I remember one; a boy who tumbled down a place at Surrender, and he died from it.

17,081. Is that the only accident which you remember happening to a boy?—No, there was another, a little boy with his father. He slipped past him at Surrender New shaft. That may be about five years ago.

17,082. Do you remember any other cases?—I do not remember any other cases. These are things which I have never looked at in that shape. I think that I have heard my father tell of a boy at the same shaft tumbling past his father.

17,083. (*Mr. Holland.*) Were all those boys killed?

—Yes; and I remember very well catching a boy of about my age. Three of us were coming up at Surrender mines and we had got near to the top and he slipped, and he said "Ho!" I had him upon my shoulders.

17,084. (*Mr. Leveson Gower.*) Do the fathers ever take any precaution to prevent the boys falling?—Yes.

17,085. What precaution?—They have had them strapped to their bodies. They get these little boys into the waggons to ride up the level if they possibly can.

17,086. Do the boys usually go up the stemples?—Yes; but they let them down by rope where a rope is on.

17,087. I thought you said that they guided their feet?—Yes, they do, when climbing.

17,088. (*Sir Philip Egerton.*) When you come to any hard material now, such as you have described in Surrender mine, do you still work it by craft or by wedges, or by blasting?—It is forced to be worked by craft; we cannot do it otherwise.

17,089. You cannot get the shots bored?—We cannot get the shots to work so well without they have liberty.

17,090. But the ventilation is provided for now, whereas it was was not provided for heretofore?—It is a great deal better provided.

17,091. (*Mr. Kendall.*) What is your age?—I am 55.

17,092. Do you go underground now much as agent?—Yes, I go when I am wanted, occasionally.

17,093. How often do you go underground upon the average?—I should say about two or three times a week.

17,094. Do you go up and down these stemples much?—No; we have not much stemple work where I am at the present time.

17,095. Taking the mines on the average in this neighbourhood, have you improved in the mode of ascent and descent as to the stemples; have you any other mode now, or do you still use stemples?—I believe that in some places here they have ladders.

17,096. Do you consider them an improvement upon the stemples?—I do not consider them any improvement at all.

17,097. Do you know any bad ends in any mines in this neighbourhood at the present moment; any place where the air is bad?—No, I cannot name one.

17,098. Do you see more old miners now walking about than you did in your younger days?—Yes, I think that there are.

17,099. They live longer?—Yes.

17,100. What is the average number of hours that they work a day?—I cannot speak to that in all mines.

17,101. Take your own mine; how many hours in a day do your men work?—They work here from six to seven hours, in a general way, I believe.

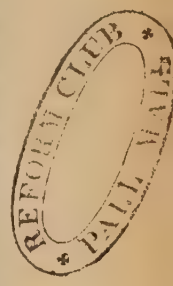
17,102. Underground do your men average six hours?—I am quite certain that they do.

17,103. In your younger days did they average more?—No; in my time they did not work more than about three or four hours; if they stayed six or seven hours it was considered two days work or shifts in a general way when I was young.

17,104. Was that because the men did not like to work so much as they do now, or because the air was bad?—It was the custom.

17,105. It was not because the air was bad?—No, I do not know that it was.

17,106. (*Mr Holland.*) How many days a week do you work?—Six.



The witness withdrew.

Mr. JOHN RICHARD MCCOLLAH examined.

17,107. (*Chairman.*) Have you been engaged long as a medical practitioner in this district?—I have been here 28 years.

17,108. You attend the union I believe?—I do.

17,109. Are there many old miners in the union; meaning the house?—No, there are not at the present time.

17,110. What parishes compose the union?—Reeth, Muker, Melbecks, Grinton, Marrick, and Ellerton Abbey.

17,111. Are there mines in most of these parishes?—In all of them.

17,112. Have you an opportunity of examining many cases where the men are what is termed broken-winded?—I have attended very great numbers of them.

17,113. Have you ever had a post-mortem examination?—Not in cases of that kind.

17,114. Do the miners come to you in the earlier stages of the affection?—They very frequently do.

17,115. Do you know cases where you have been able to effect a cure in the earlier stages?—Yes; it generally begins as chronic bronchitis.

17,116. But the men continue to work at the mines, and still may get over it?—I generally caution them against working in mines which are ill ventilated; the lead miners call it working in a windless groove; I caution them against that when I see that there is any affection of the breathing.

17,117. On a miner coming to you do you inquire as to the place in which he is working?—Yes, that is generally the first question I ask.

17,118. Do you ever yourself go underground?—No.

17,119. Can you point out many cases now where men are affected and still are working on in mines?—Yes.

17,120. Do you suppose that they die earlier from this affection?—There is no doubt of it.

17,121. At what age should you say generally that miners so affected die?—Very few of the lead miners are able to work after they are 50 years of age.

17,122. Do you think that from going early to work as boys they are more liable to be affected, or that they become acclimatized to it?—There is no doubt that they are more liable to be affected by going into the mines very young, because the exciting cause is going on in youth just in the same way as it is in mature age.

17,123. Is there anything besides the want of air in working in the mines which you think injurious to the men?—I am not aware that there are any noxious gases to which the men can be exposed.

17,124. Do they suffer at all from the dust?—Yes.

17,125. Have you ever examined any of the sputa to see the dust?—Yes.

17,126. Is that dust injurious from being merely the dust of the grit, or from having particles of lead in it?—I think it is merely from the dust.

17,127. Do you think that the water is at all impregnated with lead?—I do not think it is.

17,128. Then you think that the injury is not owing to the ore, but that it arises from the dust?—From the dust and from an insufficient supply of atmospheric air in many cases.

17,129. (*Mr. Holland.*) You have said that you have practised 28 years?—I have.

17,130. Have you noticed any improvement in the health of the miners in that time?—Yes.

17,131. Is it marked?—Yes. In some parts of the district in which I have practised, scrofulous disease used to prevail to a very serious extent.

17,132. Was that among the children?—Children and grown-up people too; and I can see a marked improvement in the constitutions of the people in that locality since I commenced practice.

17,133. To what do you attribute that change?—I should say to a better mode of living; better diet.

17,134. Have their habitations been much im-

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proved?—Yes, their habitations have been a good deal improved too.

17,135. Have you noticed any marked change in their habits of cleanliness?—No, I cannot say that I have; the people in this part of the country are generally a very cleanly people.

17,136. And they were 28 years ago as cleanly, were they?—Yes.

17,137. Is their sleeping accommodation much better than it was?—It is.

17,138. Very decidedly better?—I think it is very much improved.

17,139. You feel satisfied that there is a diminution in scrofulous disease, do you?—Yes.

17,140. Is there decidedly less of the peculiar miners' disease now than there was 20 or 30 years ago?—I think that there is a diminution of it.

17,141. But you are satisfied that there is a peculiar disease among the miners?—Yes.

17,142. A well recognised form of lung disease?—Yes; this I believe is entailed upon them by working in the mines entirely.

17,143. And which you do not see among any other people but miners?—No. Of course where there is a tendency to tuberculous disease, where there is a tuberculous constitution, in those kind of cases it generally ends in consumption; but in the common run of cases it ends in miners' asthma.

17,144. At what age does miners' asthma generally show itself?—At different ages; I have seen men from 26 to 30 years of age badly affected with that disease; but sometimes it will not show itself as a permanent affection till a man is between 50 and 60.

17,145. Does it frequently first show itself after 30?—Yes it does.

17,146. Does it come on very slowly?—Sometimes it does and sometimes it does not; sometimes it comes on in a very chronic form, with a little cough and expectoration, and the man perseveres in going to work; if he happens to be working in a place which is not particularly well ventilated, the affection continues until he is obliged to discontinue work.

17,147. It may go on for many years before it lays him up?—Yes, it may.

17,148. Does it frequently begin like a cold?—It does.

17,149. From which the man recovers?—Yes; it begins just as a case of common bronchitis.

17,150. Do you agree with the evidence which has been given to the Commission, that it is to a great extent produced by a succession of colds; have you observed that. Some medical men think they have observed that it has been produced by a succession of colds, to which they think that miners are liable, more liable than other men; does that correspond with your observation?—Yes.

17,151. Have you noticed whether men who work in the grit rock suffer more or not from the dust than those who work in the limestone rock?—I believe they do; they generally complain of suffering more in working what the miners call the plate.

17,152. I suppose that the true miners' asthma is quite a distinct disease from consumption, is it not?—Entirely so.

17,153. Does it very closely resemble ordinary chronic bronchitis?—It resembles ordinary asthma.

17,154. (*Mr. Leveson Gower.*) What is the earliest age at which you have seen this miners' asthma?—I cannot positively say as to that.

17,155. Are boys affected by it?—No; they frequently die from bronchitis.

17,156. Which is caused by working in the mines?—Which is caused by working in badly ventilated parts of the mines.

17,157. It never gets to miners' asthma at that early age?—No.

17,158. But you believe that the seeds of the disease are formed?—There is no doubt of it.

17,159. (*Mr. Holland.*) The early cases would probably be acute catarrh?—No; it comes on with coughing and expectoration.

17,160. (*Sir Philip Egerton.*) Is it an inflammatory disease?—Yes.

17,161. Are the membranes affected?—Yes.

17,162. Does it sometimes become tuberculosis?—If there is a consumptive tendency it is very apt to bring on consumption.

17,163. In the opinions which you have given do you include the persons employed in the smelting works as well as those in the mines?—I see less disease of that kind amongst the smelters than amongst those working in the lead mines.

17,164. But in the evidence which you have given do you include those who are employed in the smelting works as well as the miners?—Yes.

17,165. Is the disease common to both?—It is common to both, but it is not so common to the smelters as it is to the lead miners.

17,166. Are the smelters exposed to dust, which you say to a great extent causes miners' asthma?—No, they are not.

17,167. Then how can you account for their having the disease?—The construction of the smelting mills is now very much improved, and the ventilation quite superior to what it was thirty years ago; consequently you rarely see the disease amongst young men working in the smelting mills, whilst among the older men it is a common complaint.

17,168. I understood you to say that the dust had a considerable effect in producing this disease?—It has.

17,169. But the smelters are not exposed to dust?—They are not exposed to dust, because the smelting mills are generally well ventilated.

17,170. But still they are subject to miners' asthma?—They are.

17,171. Do you think that climatal causes have anything to do with this disease?—No.

17,172. Then I cannot understand how you account for the smelters being subject to the miners' asthma, although they are not exposed to those influences which you say induce it in the miners?—You occasionally see it among the smelters, but not nearly so frequently as among the men who have to work under ground.

17,173. Do you suppose that it is infectious or contagious?—Not at all.

17,174. Are the smelters exposed to any noxious vapours from the operations which they conduct?—Not that I am aware of.

17,175. You have no cases of lead poisoning?—I have often thought that there is a possibility that they might suffer from absorption by wearing their flannels too much without washing. Indeed, I believe that the lead miners themselves do not attend sufficiently to the bath. I think that if they were to have a bath once or twice a week to cleanse the pores of the skin, they would suffer less from bronchial disease.

17,176. Do you find any diseases peculiar to the smelters?—No, not here; I never remember having seen more than two cases of paralysis which I attributed to smelting.

17,177. (*Mr. Holland.*) Lead paralysis?—Lead paralysis.

17,178. (*Sir Philip Egerton.*) As a whole you think that the smelters are a more healthy set of people than the miners?—Yes.

17,179. (*Mr. Kendall.*) Do you think that miners' asthma now is as prevalent as it was when you first commenced practice 28 years ago?—I do not think it is.

17,180. Is there a very sensible diminution in it?—There is.

17,181. That you attribute to better ventilation I suppose?—I do.

17,182. Have you ever made a post mortem examination of any of the miners who have died from the miners' disease?—No.

17,183. I suppose there is an objection to it?—They will not allow it here.

17,184. But still your impression is that the disease is different from tubercular disease?—Yes, decidedly.

17,185. With regard to the dust; you have never seen men working underground?—I was never but once in a lead mine.

17,186. You have never seen the dust?—No.

17,187. And you have never seen any expectoration?—I have, frequently.

17,188. There is no mark in it at all?—No.

17,189. Have you ever heard them complain that they suffered more when working in the plate than in the lime or elsewhere?—I have heard them say that they suffer most from working amongst the plate, black plate as they describe it.

17,190. Taking it as a whole, do they say that they suffer more from the air or more from the dust?—They suffer more from the air; from the want of air as I understand them.

17,191. Is the air in plate worse, or have you ever heard that there is any carbonic acid which comes from plate?—No. I think that there must be carbonic acid, because they say that it is a kind of black damp which they especially believe injures them.

17,192. You fancy from the feeling which the men describe that it is not at all unlikely that carbonic acid gas may arise when they come to plate?—I should think that it is very likely.

17,193. (*Chairman.*) When you say that you have observed the men when they have come to you spitting up black sputa, does that continue for any time?—Yes, it will continue for months together after they have ceased working; it is dark-coloured sputa.

17,194. Have you ever examined that sputa with a microscope?—I have not.

17,195. You say that you advise men when they come to you in the first instance to leave the part in which they are working, have you found that they have done so generally?—Very frequently.

17,196. But I suppose that sometimes they cannot afford to do so?—No; sometimes if they happen to be earning tolerably well, they have a great objection to leave the place, and they continue until their health will no longer admit of it.

17,197. Do they earn more money when they are working in bad places?—I am not aware that they do generally speaking. If they are taking a good quantity of ore, and making what they call pretty good wages, of course they have a great objection to leave it.

17,198. You say that there is a great improvement in the cottages; have you seen the cottages at Hurst?—Yes; there is great improvement there, more especially; during the last 15 years there has been a great improvement.

17,199. In the way of drainage or what?—An improvement in the cottages.

17,200. I believe that there was fever there at one time to a great extent?—Yes; typhus continued there for nearly ten years.

17,201. But you think that since improvements have been made there has been less fever?—I do not think that there have been any cases of typhus there during the last ten years.

17,202. (*Mr. Holland.*) Do the men complain of powder smoke?—Yes.

17,203. Do they complain much of candle smoke?—No.

17,204. Was the black spit, which you spoke of just now, carbonaceous matter?—No.

17,205. What was it?—It was merely common expectoration.

17,206. (*Chairman.*) Do you think that the men suffer at all from the carbonaceous matter arising from the smoke of candles or the blasting of gunpowder?—From the powder very likely they may, but not from the candles.

17,207. (*Mr. Holland.*) Are you satisfied that there is more scrofula here now than in most districts?—I was never in a district in England where there was so much scrofula as there is here, but it is almost entirely confined to one particular locality. At Hurst they are almost exempt from scrofulous disease. Intermarriage it is said has a great effect in producing scrofulous disease. I should say that Hurst must be an exception to that rule, because its inhabitants are nearly all relations; they have intermarried generation after generation, and still you can hardly go among a finer body of men or women than they are, and they are, generally speaking, very healthy.

17,208. And there is no excess of scrofula among the children?—No.

17,209. To what do you attribute the excess of scrofula in the district where you say it is peculiar?—I hardly know what to attribute it to, it may be partly from the limestone water. I believe that formerly in that locality they brought up their children almost entirely on oatmeal; that might have some tendency to lay the foundation of the disease.

17,210. Is that a damper place than the rest?—No.

17,211. Is the bed-room accommodation worse?—No.

The witness withdrew.

Mr. RALPH MILNER examined.

17,212. (*Chairman.*) Of what mines have you charge?—Whiterside and Summer Lodge and Beldihill.

17,213. Are you the underground agent there?—I am a shareholder. I attend underground.

17,214. You are only a shareholder?—I am only a shareholder.

17,215. Then you are not the managing agent?—Mr. Barker is general manager, I am director.

17,216. Have you resided long in this district?—Yes; I have resided all my time in this district.

17,217. Have you had anything to do with other mines besides these?—Yes, with some little concerns, but nothing of any moment; some little bits under Sir George Denys.

17,218. Have you had to do with mines in this district, working them for some time?—Yes, for 40 years or nearly 50.

17,219. Always these same mines?—Yes.

17,220. Any others?—There was Stagsfell, but it is done away with, it was under Lord Wharncliffe.

17,221. Do you know of men suffering at all from working in mines?—Yes; I have seen men suffer. Different veins have different effects upon men.

17,222. What is the effect?—The hard veins they have to hew out with picks and different things and wedges; the stour comes from it wherever it is; let it be ventilated, it still affects the miners a great deal.

17,223. (*Mr. Holland.*) What do you mean by "stour"?—Dust.

17,224. (*Chairman.*) In what description of strata is that, in the lime, or the grit, or the plate?—In all.

17,225. Which do you think is the worst?—I think that the plate is the worst.

17,226. Have you been down a mine when the men have been working in the plate?—Frequently.

17,227. Is it a small dust?—It is a small dust.

17,228. Is there any carbonic acid, do you suppose, in the plate, or anything in the plate besides this dust which is injurious?—There is sometimes sulphur in the plate.

17,229. How do you ascertain that?—There is what we term "catheads."

17,230. (*Mr Holland.*) Is that pyrites?—Yes; it is sometimes sulphur.

17,231. Does it give off a smell?—Yes.

17,232. (*Chairman.*) Ventilation will not get rid of the stour?—It will improve it a great deal, but will not finally do away with it.

17,233. Do the men ever use water in working?—Yes; I have seen water used for boring holes.

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17,234. But not by way of getting rid of the stour?—No; I never saw any case of that.

17,235. Have you ever known the men obliged to leave the place from the dust when working in plate?—No; I have seen them working hard, but not give it up; wind has generally got to them by some means, what we call a "windy king."

17,236. Does that completely remove it?—No.

17,237. So that they must inhale a certain portion?—Yes.

17,238. Have you heard the men complain long afterwards of it?—I have heard them complain of spitting out a black stuff.

17,239. (*Mr. Holland.*) You have been acquainted with miners for 50 years, I think, you said?—Yes.

17,240. Have you noticed that their health has altered as a class in those 50 years?—They have improved. There are better way-gates, as we call them, and shafts; formerly they were very little.

17,241. Do you think that the health of the miners has improved?—Yes, no doubt it has, from good levels and shafts being put down.

17,242. Do miners attain a higher age now than they did in your youth?—Yes, I think that they do; but still it takes a good bit off their lives.

17,243. At what age do you consider a miner an old man?—I have known one 84.

17,244. But at what age is a man thought to be an old miner?—At about 50 or 55.

17,245. A small proportion survive that age?—A very small proportion.

17,246. At what age does the health generally begin to fail?—At 30 to 40 years of age.

17,247. Do they then begin to show the miners' asthma?—Yes.

17,248. Is that miners' asthma generally attributed to the stour which you speak of?—I think that it is the dust which comes off the rock which is the cause, in some hardish mines they have to work with the pick and a stour comes off it, even if it is well ventilated, which affects men.

The witness withdrew.

Mr. THOMAS COATES examined.

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17,249. (*Chairman.*) Of what mine or mines have you the charge?—Arkindale and Fell End.

17,250. Have you charge of the Old Gang?—I was there when the inspectors were about, but I am not there now; the Old Gang agent is here, and I have brought the Old Gang plan.

17,251. But you have had charge of that mine up to lately?—Yes, up to about a fortnight since.

17,252. Can you tell the number of men employed altogether in each of those mines?—Yes, we have about 200 men and boys altogether in Arkindale.

17,253. How many of those are working under ground?—They are all working under ground.

17,254. Are there any women employed at the surface?—Yes; at the washings, chiefly women; the men's labour is too dear; but nothing like so many women are employed as there used to be; some will not go to the washings at all, they will rather go to service.

17,255. Do they work under cover when they are at the washings?—Some do and some do not. We have some places covered in, but when they are covered in, generally speaking, in winter time, it is too soon dark and too long in getting light in the mornings under sheds, it cuts an hour off either end.

17,256. Therefore it is not profitable to work under sheds on account of the light?—No.

17,257. They have never tried putting glass on the roof?—No.

17,258. At what age do the boys go down?—It just depends upon circumstances; if a goodish man has a lad, and he is badly off, and has a large family and only his own hand labour, we generally let him take him when he will; but we generally like them to be about twelve.

17,259. But still you would not prevent a man if he wanted to take his boy at an earlier age from doing so?—I would not if he was a good man, and I thought that the boy was likely to work for him. It is just for the sake of earning a bit of money; he would get just half wages.

17,260. How many men have you at Fell End?—Six.

17,261. Is that a new or maiden mine?—It is an old mine, but we are going now into maiden ground.

17,262. What is the longest horse level in the Arkindale Mine?—I think about $1\frac{1}{4}$ miles.

17,263. Are there any workings below that level at all?—Yes; we sink down when we have a chance to try the beds.

17,264. How do you get rid of the water in that case?—Sometimes we have none at all, and sometimes we have it to draw.

17,265. How do you draw it?—In tubs which will hold perhaps six gallons.

17,266. And the men wind it up?—Yes.

17,267. How many fathoms have you ever gone down in the Arkindale Mine below the level?—In some mines we have been down below the same level 40 fathoms; there are two levels, one 20 fathoms below the other. Danby level is 20 fathoms below, and Danrigg level is 20 fathoms below Danby level.

17,268. What beds in the district are generally most productive?—The 12-fathom lime; they have all been productive; the under-sets have been very productive in certain places, but the 12-fathom lime is the principal.

17,269. Do you think that by going deeper they will find ore?—They may; but I think that it will never pay here.

17,270. You must then adopt some means to get rid of the water?—Yes; you want a level to carry.

17,271. Are the levels now at the lowest part of the valley?—No; we could get, I should think, 30 fathoms.

17,272. How many shafts direct with the surface have you?—We have none; the Old Man worked them before I was born, and sometimes we rise to those workings and sometimes we sink down to the levels.

17,273. Do you know how many of those are in direct communication with the level?—I can go in at Danby level and come out at Danrigg level, and go in at Danrigg level and come out at another level, and so from one to the other.

17,274. Is there any particular up-cast or down-cast?—We have sunk a shaft at the Foregill level; there is only one.

17,275. Is that an up-cast or a down-cast?—It just changes as the weather changes. If it is going to be droughty weather the air will go out at the mouth, and in wet weather it will be the contrary.

17,276. What is it in very hot weather?—It draws out at the level mouth.

17,277. Then there is a time when the air is stagnant?—Very seldom. I never recollect it when there has been a thoroughfare in that way; there is more in windy weather.

17,278. When you have been driving a forehead, have you been obliged to adopt any artificial means for ventilation?—Yes, we use every means that we can; we have windy kings and water blasts.

17,279. Does the water drive a fan, or does it act as a blast in itself?—We have tried both ways.

17,280. Which do you prefer?—I prefer having both of them together; having a fan inside the water blast, the tub and the air likewise, because the air beats on the top of the fan and carries it. We have tried it two or three times, and I have always found a stronger current when both were going together.

17,281. When you have a windy king you are entirely dependent upon a boy?—Yes.

17,282. What security have you that the boy does not go to sleep, and that he continues to drive the

fan?—We always take the fan close up beside the men, and we suck the air in that case; the boy is sitting within a certain number of fathoms of the men.

17,283. So that the men can then look after the boy?—Yes; I have been a miner myself for about 30 years, and I principally worked in the close fore-heads. I had a good deal to do with these boys, and I have known one put his finger in, being perhaps half asleep, and when we came up to him he was crying out; it was suddenly crushed. This is about 20 years ago. He happened to be at a sumpt; the sumpt was about 15 fathoms; it was rather inconvenient, so that after that we contrived to have the boy beside us, so that if he did not blow we could go and make him blow.

17,284. In your opinion it is better to adopt that mode than to have him several fathoms off at the end?—Yes.

17,285. You say that you have often worked in close fore-heads?—Yes.

17,286. Did you ever suffer from it?—No never. I have worked as a worker, and have worked hard as an agent ever since I was an agent. You caught me yesterday, and I go on so every day.

17,287. What age are you?—53.

17,288. Have you ever known men suffer from working?—Yes, I have known some men that I have worked with 30 years since who died when they were not above 40, and they were working in the same place with me; very likely they were born rather asthmatical.

17,289. Do you think that, if a man was perfectly healthy he would not be affected by working in bad air?—If he worked a long time in bad air I have no doubt that it would affect him and affect his wind; but as the mines are now, generally speaking, I do not think that he would take any harm.

17,290. You think that working by levels has given a better ventilation?—Yes; and they have taken a good deal of hard labour off.

17,291. Is there any place about here that we could see where a candle will not burn?—I do not know of one, if I did I of course would have taken the Inspectors to it; I was never afraid about the Inspectors coming.

17,292. How many men work in a partnership?—Sometimes eight; generally from two to eight; sometimes we may have nine.

17,293. How many hours do they work?—Some three, and some five, and some eight, just as it happens.

17,294. Those are the men who are working by bing?—Yes.

17,295. How is it with the men working by fathoms? They are just in the same way.

17,296. Do you set the bargain?—Yes.

17,297. What deductions are made from the men's pay?—Half a stone of candles a month, and powder, and drawing, and tools.

17,298. For sharpening tools?—No. They pay 3*d.* a lb. for their iron, and we pay the blacksmiths ourselves; they have nothing to pay for that.

17,299. But they pay for the wear and tear of the tools?—Yes.

17,300. Where do you get your candles?—We make them ourselves. I have brought some with me.

17,301. Why do you make them yourselves?—Because we can make them better.

(*The witness produced some candles.*)

17,302. In making the candles do you mix anything with the wicks besides cotton?—There is nothing that I am aware of but the bare cotton.

17,303. You do not think it necessary to mix flax or tow in the wicks?—I think that we cannot put in so good a thing as is in them.

17,304. Have you ever seen a candle the wick of which has been mixed with cotton and tow?—Never in my life.

17,305. (*Mr. Kendall.*) Are the candles made of Russian tallow?—Russian and American; both North and South American, I believe.

17,306. There is no English tallow?—None.

17,307. You charge 8*d.* a pound for the candles?—Yes.

17,308. What does it cost you?—6*d.*, and sometimes a fraction more.*

17,309. Do you limit the men in quantity?—We deliver them out once a week.

17,310. Do you limit them?—Yes, rather, or else they would sell them; we allow them six pounds a month.

17,311. What do they sell at?—They will sell them at 3*s.* and 4*s.*

17,312. And they pay 8*s.*?—Yes; but it does not make any difference to them about paying the 8*s.* I am talking now as a miner. I have never been married, and I have had my candles myself to sell. If I am working with three or four married men and there are single-handed men as well as me, I have not a house to find candles for but those married men have; and they have a wife, and when the packman comes round she wants something, and she will give a penny candle for half a farthing's worth of thread; they must take what they can get for them.

17,313. (*Chairman.*) But the man who makes them or the owner of the mine does not lose?—No.

17,314. The Danby level is very wet, is it not?—It is in very wet weather.

17,315. Are there any ladders in the Danby level?—No; we climb by feet and hands.

17,316. By stemples?—Yes.

17,317. Would you prefer ladders or stemples?—Stemples.

17,318. Why?—For this reason. I have been down in Craven visiting some mines, the first that ever I saw, and when I saw the ladders I may have been nervous, but I dared not have gone down them if I had had all Craven, because I was afraid; if the cramp had taken my hands I had nothing to support me but my bare hands, whereas in our way-gates I can tumble myself in any shape that I like.

17,319. What security have you that the stemples are fixed firm?—We drive them between two sides.

17,320. Do the two sides get loose?—Never, unless the work is too heavy in the hopper or something of that sort.

17,321. Suppose a man misses and does not find the stemple?—He contrives to catch with his foot or something of that kind, but I never miss.

17,322. But if a stemple is out a man may fall?—If a stemple is out he may look out for a corner to put his foot too.

17,323. How do boys manage to go down?—If a boy is a very young one his father takes him on the top of his back.

17,324. Does he attach him to himself?—It just depends upon circumstances; if it be a deep shaft or a deep sumpt he will do so; but they do not take them to work when they are so young, but they take them to receive the money.

17,325. Do not they take them down to hold the jumpers sometimes?—Yes, when they can do so.

17,326. What is the youngest age that you have known?—About 10 years; they will come when they are about nine.

17,327. How will the father take such a boy down?—He would not take him down the shaft at all.

17,328. But suppose he has to go down in a shaft or up a rise?—He will take him on the top of his back.

17,329. (*Mr. Kendall.*) Your stemples are two or three feet wide?—Yes.

17,330. Does not a boy of about 12 years old contrive to go after a while as fast as you can?—Yes; he will beat me now a good bit.

17,331. (*Chairman.*) Did you never hear of any boys being killed from falling from the stemples?—I

* This difference in the cost price and price charged enables the masters to give the cost of the candles and powder to such of the miners as do not make wages and are unfortunate in their trials.—K. M. JAQUES.

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never heard of a boy being killed by falling down in that way.

17,332. (*Mr. Leveson Gower.*) Which would be less expensive, to put up ladders or stemples?—We are obliged to put up stemples to keep the mine up, and if we put up ladders they would be an unnecessary expense.

17,333. Are ladders never used in this district?—There is not such a thing in this district.

17,334. (*Chairman.*) Where they go down at Danby level it is about nine fathoms, is it not?—Where they are now working up Danby level it will be about nine fathoms.

17,335. Do the men get wet in going in and out there?—In wet weather they are sometimes stopped, they cannot get up at all, and then they object.

17,336. They could not carry the candle?—No.

17,337. The light would be put out by the wet?—Yes, and then they come out.

17,338. In Danby you depend upon the cracks for ventilation do you not?—Yes, and the Old Man.

17,339. Is Stang another portion of your mine?—Yes.

17,340. Which is the worst part for ventilation?—We have no part which is bad.

17,341. Which do you think is the worst?—I think that we are as badly off at Damrigg as at any place, and there we expect to hole into the Old Man directly.

17,342. But till you hole into the Old Man you depend upon the windy king?—Yes, and a trap door as we call it.

17,343. What is the trap door?—We put in two cheeks, and it is made air-tight, when you take hold of it it will send in a draught like a bullet.

The witness withdrew.

Sir GEORGE WILLIAM DENYS, Bart., examined.

Sir G. W. Denys, Bart.

17,344. (*Chairman.*) I believe that you reside near Reeth?—I do.

17,345. A part of the property round here belongs to you?—Yes; Lord Pomfret, Sir Francis Shuckburg, and myself are the three proprietors of the whole of Swaledale mines.

17,346. Not of the Arkindale mines?—No; they belong to Mr. Gilpin Brown.

17,347. Old Gang is yours?—Yes.

17,348. Do you work any of the mines yourself?—Yes, at present; it is only about a year ago that I took a mine in hand; it was thrown on my hands; in fact, I was obliged to do it, or I would much rather have left it alone; they are called the Blakewaite mines that I am at present working, jointly with some other gentlemen.

17,349. Have they been worked by the Old Man?—They have been worked like all the rest of the field for centuries.

17,350. Are there many men employed at the Blakewaite mines?—At present we have between 60 and 70.

17,351. Who is the managing agent?—Mr. Place.

17,352. Was he a miner before?—Yes, he has been a miner all his life; and was the head agent at Old Gang for the Old Gang Company for some years before I took him.

17,353. Does he report to you regularly as to the state of the mine?—Yes; I have conversations with him, and I go down myself; I was down two days last week.

17,354. Is it a dry or a wet mine?—A good deal of water comes out of the different levels; in fact, they are almost as useful for arterial drainage as for bringing the work out.

17,355. But the work comes out?—Yes, all of it; but we dispense with working by machinery altogether, that is the advantage of working by levels in contradistinction to the Cornish plan.

17,356. Do the men go in by the levels?—Yes, always.

17,357. Do they carry their tools with them or leave them there?—Generally after each shift they bring out their tools to the smith's shop, as jumpers require sharpening every time.

17,358. Have they waggons for bringing them out, or do they generally carry them out?—They generally carry them out, or, if a waggon happens to be coming out at the time, they put them into the waggon.

17,359. Have you seen any difficulty in ventilating any of the mines with which you have been connected?—Until a mine gets opened, of course just at first when you drive a single level you can go 100 or 150 fathoms or 200 fathoms without any great difficulty. Then of course, unless you are going to make a rise to the surface, or to connect this level with some other level which happens to be above you, you must bring your air in by some artificial means; we generally use air troughs or a water blast.

17,360. What is called a windy king is worked by a boy?—I do not know anything of that term here, it may be a mining term, it is probably a local term.

17,361. Are these machines worked by water or by hand?—Both, sometimes one way and sometimes another; but whenever we can get water power of course it is preferred, because you have not to pay for it.

17,362. Does the water turn a fan, or does it convey the air by a blast by pressure?—Generally by a blast.

17,362. Do you know of any men being affected by working?—I think that all the miners are more or less affected by it after a certain number of years.

17,364. Do you think that that is from the air or from the dust?—Partly by the confinement, and the quantity of gunpowder which they are obliged to use; it affects the lungs.

17,365. Have many of the men small holdings?—Almost all of them; their great desire is to have land enough to keep a cow.

17,366. How many hours do they work generally?—Six.

17,367. Does the amount of wages depend very much upon the price of the ore?—There are several ways of paying the men; when there is ore to be got, they make what are called ore bargains, and of course it is diamond cut diamond between the agents and the men. The agents go in and look at the forehead and see the nature of the vein, and judge pretty well how manny bings of metal a man can get with his partners in a given time. Then the agent lets them a bargain of 20, 30, or 40 bings, or whatever it may be, at a certain price, and of course when they have got that bargain their endeavour is to get the metal out as quickly as they possibly can. When you have been working a level without any ore at all, that is called dead work, and the men are paid so much per fathom for it. Then again, if they are working in a very poor vein indeed, which is not profitable, you give them perhaps a little additional money. We will say 40*s.* per bing and 10*s.* per fathom over and above to supplement their wages in that way, so as to encourage them.

17,368. Then it is not put up to competition?—No, there is nothing of that sort.

17,369. It is settled by the agent at the mine?—Yes; generally speaking, most of the companies have, when in good working order, fortnightly meetings. Of course, in a small concern like mine, where we only employ 50 or 60 men, it is not necessary, but the other companies have fortnightly meetings, and the men come in with their proposals, proposing to make a trial at such a place for so many bings at such a

price. Then the masters and the agents decide whether they will take the offer or not. Sometimes it is taken at somewhat less.

17,370. How often are the men paid?—Once a month

17,371. Are they cleared off in full at the end of the month?—Yes; all the men are under deductions for powder and candles.

17,372. But it is not carried on for a year's bargain?—No.

17,373. And no money is retained on it?—No.

13,374. (*Mr. Holland.*) They are paid at the end of March for the March work?—Always; a man may have a bargain that will last a year, but he is paid every month for what he has got during that month, subject to deductions for candles and powder and drawing; the men pay for the work being drawn out of the mine, and the washing of it.

17,375. (*Mr. Kendall.*) Were you ever affected yourself by bad air?—Never.

17,376. You have never had occasion from what you have heard to warn your agents to be more careful with the men?—Never.

17,377. You think that they are careful?—Yes.

17,378. As far as you can judge, whenever you have a long way to drive before you communicate with the surface or some shaft, the appliances of machinery, and so on, are always effectual?—Yes; in fact, the men would not work without it, they would strike.

17,379. Supposing a man is in the least affected by it, would he complain at once?—Yes; and then the masters would immediately put in a rise to get air into the place as fast as possible.

17,380. And during that time he would be quite sure to have all the appliances necessary for air?—Yes, until the rise is completed the men are working in a confined atmosphere; till a communication is made the men more or less suffer during the time of their working.

17,381. But at the same time everything is done to alleviate that suffering?—Certainly; it is to the interest of the masters as well as of the men.

17,382. Supposing that a man gets an ore bargain which turns out after a while to be very profitable to him, do you allow him if he likes it, or the pair, to work extra hours or not?—Yes; they may work as long as they please.

17,383. Suppose that that ore bargain is in a part of the mine where, notwithstanding all your appliances, the air is still defective, you have no power to say to those under, "You shall not work there?"—No. If a man has a bargain for 500 bings, of course, he may work all day and all night too if he likes; but they do not do so, because they are frequently in partnerships of eight men, and there are very few places where more than two men can work at a time, so that two men go in for the six hours and two men for the following six, and so on.

17,384. You do not require the men to work more than a certain number of hours where the air is bad?—No.

17,385. Still, if they choose, in consequence of some discovery, to work 12 hours each instead of 6 hours, you have no power to prevent it, though the air may be bad?—We have not.

17,386. (*Mr. Leveson Gower.*) Have you enlarged your workings?—We began with very few men indeed at first; it was an abandoned place, and we are gradually getting more in. I think that by this day twelvemonth we shall get twice sixty in.

17,387. Have you any difficulty in obtaining more men?—No; there are scores of them waiting for work every day.

17,388. In this district?—Yes, the mines have been poor for several years, and numbers have gone to America in consequence.

17,389. People have left the district?—Yes.

17,390. And none have come to it?—None have come to it.

17,391. (*Chairman.*) Are the poor rates high?—No; the mines are not rated to the poor.

17,392. But still the men may come on to the poor rates?—Yes.

17,393. (*Mr. Leveson Gower.*) Have the wages decreased in consequence of the diminution of work?—No; we are paying higher wages than any of the other companies, solely to induce the men to get into poor places. Until quite lately 40*s.* a bing was what they call the head price. We are now paying 50*s.* and even 55*s.* a bing.

17,394. (*Chairman.*) Is it a great advantage to get experienced men?—Yes.

17,395. (*Mr. Holland.*) Are you able to get as good ventilation by fan as by hooling?—I do not understand what is meant by hooling.

17,396. But during the temporary arrangement the air is bad?—Yes; we do not get enough of it.

17,397. Would it not be worth while to have larger fans?—The companies are anxious to do things as economically as they can, and they would not be at the expense of putting in an expensive fan for perhaps a few weeks or months, when on getting to a certain point the mine would be ventilated in the regular way.

17,398. Are you satisfied that it would not pay to do so; is not the loss of wages in bad air very great?—No, I do not think that it is. They manage it by giving the mine a certain number of hours to get clear of smoke. Of course, there is loss of time, which is loss of money.

17,399. A larger fan would avoid that, would it not?—Yes; the water coming out of the mine would keep the thing going; the levels are generally at the bottom of gills, and there is invariably a beck in the gill. I have been in all directions, and never except just in the forehead of a level have I felt the least want of air.

17,400. (*Mr. Kendall.*) You go in more as an amateur?—Yes; I lived here during my father's time for many years before I had any personal interest in the concern myself, and being a bit of a geologist I rather like the thing.

17,401. (*Mr. Holland.*) Are miners much off work from illness?—When once they begin to fail, they generally give up altogether.

17,402. Not till then?—No; I think that generally speaking they are a fine, healthy class. The smelters have an unhealthy appearance, but that is an unhealthy occupation. If the mill is ever so well ventilated they must inhale a certain portion of the sulphur during the process of smelting.

17,403. (*Sir Philip Egerton.*) Is there a good deal of iron pyrites in the black plate?—Yes; we dislike that exceedingly. There are no noxious exhalations here like what there are in the coal mines

17,404. (*Chairman.*) Have you not carbonic acid gas sometimes?—Not that I am aware of.

17,405. (*Mr. Holland.*) Have you any jets of gas which put the lights out?—No; of course, I will not answer where a mine has been closed up.

The witness withdrew.

Mr. ROBERT DAYKIN examined.

17,406. (*Chairman.*) You are agent of the Hurst Mine?—Yes.

17,407. How many men are employed underground?—About 67 pickmen.

17,408. How do they work chiefly; is it by blasting or picking?—We have both ways.

17,409. Are any women employed?—None in the mines.

17,410. Are any employed on the surface?—We have a few on the surface.

17,411. Do the men go to their work by the level?—Yes.

REETH.

Mr. R. Dayhin.

3 March 1863.

17,412. What is the distance of your longest level ?—The longest level that we have is Queen's, level that is 700 fathoms,—1,400 yards.

17,413. Then there is Pryes level ?—Yes ; that will be about 220 fathoms from its mouth. I am speaking off hand, and in the absence of any plans.

17,414. Which is the richest level ?—Pryes level.

17,415. How many partnerships have you at Pryes level ?—About 30 men.

17,416. Do they work night shifts ?—Yes, when required they do so.

17,417. In working per bing do they work night shifts ?—Yes, when required; but when they can work their work in the daytime they do so.

17,418. Have you many night shifts ?—Yes; about eight or ten men, working six hours each, night shifts at present.

17,419. Do you depend for ventilation a good deal upon the fissures ?—No ; principally in that level, by shafts.

17,420. The Old Man's workings ?—These are useful for ventilation when open; we have not those, we make new ones for that purpose.

17,421. But there are swallows in your mine?—Yes ; the Commissioners saw yesterday a very great one, in Pryes level especially.

17,422. Does the air come down the swallows ?—Both ways sometimes.

17,423. Water comes down the swallow sometimes?—Yes, that swallow has taken 140 gallons a minute, it is a regular fissure in the 12-fathom lime.

17,424. That helps to ventilate it considerably ?—Yes ; but we have a shaft there as well, called East Close shaft, and many sumps therefrom, and that convey wind underneath that level, and we put up rises to ventilate it completely.

17,425. There was one part where the candles did not burn ?—That was when the Commissioners were down. At that time the great Swallow was overset, and the lower way-gates there flooded through the wet weather, which prevented the pure air either coming on them from East Close shaft or Swallow ; but as soon as the rough weather abated, the water therein passed off ; wind came.

17,426. (*Mr. Kendall.*) The water had risen there?—Yes.

17,427. And that prevented the circulation of air?—Quite so; it was during that wet weather.

17,428. (*Chairman.*) Have you seen that happen before ?—It happens occasionally ; but it is generally in extreme weather when there is a great deal of wet or anything of that sort.

17,429. That stops up your fissure which is your means of ventilation ?—Yes; but there are some shafts further west which we intend to open out as we go along.

17,430. But till you get to those shafts you may be liable to that stoppage ?—Yes; but it will not be long before we get to them. There are, however, means of getting air by a machine, which we now use.

17,431. That you call a windy king ?—Yes.

17,432. That is worked by a boy, is it not ?—We have one driven by water and another by a boy, that is to say when they are wanted, but not always.

17,433. When it is worked by a boy, where do you put him ?—Generally at the side of the level.

17,434. That is at a considerable distance from where the men are working ?—Yes; it is always at a considerable distance, we put him where there is good air, and convey it in wooden boxes.

17,435. The boy forces the air on, but he does not draw it on ?—He does not draw it on, but forces it on ; we can do it both ways by these hand machines. We do not use any boys at present. It is pretty well ventilated.

17,436. Do the men all go in by the levels ?—Yes.

17,437. What are the deductions which are made in the men's wages ?—They pay for their own candles, powder, tools, and the drawing of their work to the bank ; but we charge them only a little more for these things than what they cost us.

17,438. What do they pay for candles ?—8*s.* a dozen.

17,439. Where do you buy them ?—In Richmond.

17,440. What do you pay for them ?—I think somewhere about 5*s.* 6*d.*, at present; but they have been more.

17,441. Are you particular as to the quality ?—Always ; we have them 12 to a lb., and with a good wick.

17,442. Have you ever had to return them from the quality not being good ?—Sometimes ; but they are generally good candles. They know near about what we want.

17,443. Have you known of men broken-winded from working in the mines ?—Yes, we have some ; but I am afraid that a great deal of this arises partly from constitution and habits ; some men are not very cleanly, and it sometimes happens in that way ; I have found fault with many miners on that account, not in our mines particularly, but in other places as well.

17,444. How do you mean, not cleanly ?—They do not wash before they eat, &c., and perhaps they do not take proper care when they come out of the mines. I think that if they would wash before they ate, it would be much better.

17,445. Is any part of your mine dusty ?—Yes ; where it is hard, and we have to blast, it is dusty.

17,446. Do the men ever complain of the dust ?—They complain of the dust, of course, and where blast reek is ; but where there is a good ventilation of air that is soon driven off.

17,447. How long is it in blasting before the powder reek gets away ?—It varies ; I have seen it stay a long while, and I have seen it pass away immediately where there is a good current of air.

17,448. But where there is not a current of air it is a long time ?—Yes.

17,449. How long ?—It varies, sometimes it passes away in an hour, and sometimes it takes six hours.

17,450. And where it does not pass away quickly it affects the men ?—Yes.

17,451. Have you ever any carbonic acid ?—Yes, especially in the lower workings.

17,452. Do you come upon it suddenly, or is it from accumulation ?—I have known it accumulate, especially from change of weather, and when the weather has changed again I have known it all to have passed away.

17,453. (*Mr. Holland.*) Do you mean a change of weather checking the draft?—Yes.

17,454. (*Chairman.*) How do you know that it is carbonic acid ?—I have known it because the candle will not burn. It is well understood to be there. It is called choke damp with us.

17,455. Have you observed it low down or high up the level ?—It has been in all places where there has not been a free circulation, and especially where there has not been a double way-gate.

17,456. Have you ever seen it come out of the rock ?—It will come out of all fissures. I have found air come out, and most likely it would be mixed with carbonic acid as well.

17,457. Have you ever seen it put the candle out when you have held it to it ?—I do not know that ; I have never noticed that in the lead mines.

17,458. I suppose that the candle is the only means which you have of judging ?—There are other means of judging in the mines. The cautious miners can soon tell. It will affect their limbs and cause a drowsiness and lassitude ; it affects their head.

17,459. Do the men come out at once when they find that to be the case ?—Generally when the candle will not burn they are obliged to come out ; they cannot stop long in it ; but that soon passes away when there is a draught.

17,460. Do you use zinc pipes ?—We have not any in our mine, but they are used. We use wooden boxes four inches by six, and they carry wind pretty well.

17,461. Does the timber decay at all in your mine ?—Yes, very much.

17,462. Do you arch with stone ?—All with stone in our place.

17,463. The timber would not last ?—No.

17,464. Have you ever found any effect from the decayed timber ?—I have found effects from the decayed timber, and especially where there is not a free circulation, you will find a sourish smell of carbonic acid, and a taste as well.

17,465. Do you think that there is any accumulation where the Old Man has been ?—No, not much. When there is a free circulation that passes away ; but you can never ventilate where the way-gates are driven in plates so well, because they are not so porous as other strata.

17,466. The plate is generally the worst, is it not ?—Yes.

17,467. Is that from the dust ?—No ; not so much from the dust, but from crumbling. It seems to crush and crumble, and fills up the place, consequently you cannot keep those way-gates so long open as you can with stone, because, generally, rock is full of fissures, and plate is not so.

17,468. (*Mr. Holland.*) Have you known it fill up the way-gate behind you entirely ?—No ; but if you have a double way-gate for ventilation it will crumble, but you must keep open your main way-gate where you work at whatever expense it may be.

17,469. (*Chairman.*) If an old working or way-gate has been left for ventilation, unless it is arched, if it is through plate, it will fill up ?—It will.

17,470. And will, therefore, stop that means of ventilation ?—Yes.

17,471. This mine has been a poor mine for some time, has it not ?—It has been poorish for some time.

17,472. I suppose that in a mine yielding a good return many improvements could be adopted which you cannot adopt in a poor mine ?—Yes. Sometimes we are led to carry our leading foreheads a long way from our air shafts ; the wind is conducted in wooden boxes ; but if the mine had been paying we should have made a new air shaft near to the forehead. But sometimes when things are poor, you do not carry everything up to the mark as you would do otherwise.

17,473. (*Mr. Holland.*) You say that the timber in the mine decays very much ?—Yes.

17,474. Much more than in the open air ?—Yes, except where there is a great deal of water. It is what we call the dry rot.

17,475. It is fungus, I suppose ?—Yes.

17,476. Does it decay much more in some parts of the mine than in others ?—Yes.

17,477. Is that affected by the ventilation ? — I thinkso, especially in dry places; it decays very much.

17,478. In dry places with bad ventilation ?—I do not know exactly as to the ventilation. I have seen good ventilation in dry places, and the wood has decayed.

17,479. You have not noticed whether the amount of ventilation in different parts of the mine affects the timber very much ?—I have not exactly noticed that, but especially where there is a great deal of water the timber will last longer.

17,480. You say that you know that there is carbonic acid in the mine because it puts the candle out? —Yes.

17,481. But the poor air will put the candle out, will it not ?—We have never to contend with anything in the mines but carbonic acid and smoke from gunpowder used in blasting.

17,482. Have you noticed that that gas is more at the bottom of the level or at the top ?—Always at the bottom.

17,483. Very markedly so ; the candle will burn at the top, but not at the bottom ?—Yes. When we have it it will burn better at the top than at the bottom.

17,484. Is the dust in the mine so much as seriously to affect the men ?—Where it is a dry place perhaps it might ; but I have not heard men complain very much about dust. It is chiefly from want of pure air.

17,485. Chiefly of poor air ?—Chiefly of pure air.

17,486. (*Mr. Kendall.*) Before you were an agent did you work as a miner yourself ?—Yes.

17,487. How early did you begin ?—About 10.

17,488. What age are you now ?—48.

17,489. How many years have you been an agent ? 22 I think.

17,490. Did you ever work in any close ends ?—Yes.

17,491. How is your health now ?—My health is pretty well now.

17,492. You are as strong as ever ?—Yes.

17,493. You can do any work ?—Yes.

17,494. From your recollection do you think that miners live longer now than they used ?—No, I believe not. I do not think that there is any alteration whatever.

17,495. Do you think that they are a short-lived class of men as compared with the agriculturists, or not ?—I think that they are shorter lived.

17,496. Do they live imprudently ?—No, I do not think that they do ; but I think that the mines to a certain extent may affect them, and besides that they have not always good accommodation in their houses.

17,497. Taking the agriculturists and the miners, the agriculturists have better accommodation and more ventilation in-doors than the miners ?—This I cannot properly define.

17,498. Are they cleaner as a body ?—I do not know ; I am not much acquainted with the agriculturists.

17,499. (*Chairman.*) Are the cottages in your district good ?—They are pretty good of the kind, but small.

17,500. (*Mr. Holland.*) Do your men live near to the mine, or some distance off ?—Near to the mine. I think that it is an evil to have the cottages so near, a man is always better for having to walk a certain distance ; I have remarked it, a man thrives better and gets his lungs more cleared by walking a short distance from work previous to eating. I think that he ought to walk two or three miles.

17,501. (*Mr. Leveson Gower.*) Do the miners give a great rent for their land ?—No ; I think that it is let in our parts at much about the same as in other districts ; it will let for rather more in a mining than in a farming district.

17,502. (*Mr Kendall.*) Some time since there was very bad ventilation in consequence of the rise of water ?—Yes.

17,503. Did it ever happen to be so bad before ?—It might ; I do not remember it.

17,504. That is the only instance during your agency that you recollect bad ventilation in the mine? I have seen other mines as bad or even worse, but this water was an influx during wet weather, as I said before ; but that part of the mine you perhaps refer to, viz., Pryes level, has only been in working during the last three years of my agency.

17,505. And it does not occur frequently ?—No; I should say not above once in a season. We have a shaft which ventilates the whole independently of the swallow ; it is to ventilate the mine independently of everything.

17,506. (*Chairman.*) Is that shaft up-cast or down-cast ?—It depends upon how the wind blows.

17,507. (*Mr. Holland.*) Whether the wind blows up the adit or not ?—Just so.

17,508. (*Chairman.*) Have you ever thought whether it is advisable to make it constantly an up-cast shaft ?—We can do so; it is a matter of no consequence which way the air passes ; we don't suffer much from the want of air there.

The witness withdrew.

Mr. Francis Taylor examined.

Reeth.

Mr. F. Taylor.

3 March 1863.

17,509. (*Chairman.*) You are agent for the Old Gang Mine ?—Yes.

17,510. How many men are employed underground in the Old Gang Mine ?—I should think about 200 men, and about 50 boys.

17,511. Do you make any limit as to the age at which boys shall go underground ?—We generally keep them working upon the bank till they are 11 or 12 years of age; unless it be a father who wants to take in his boy himself, and then we allow him to take him at 10 or 11.

17,512. But I suppose the father sometimes takes a boy younger ?—No, we keep them employed at bank; that is a rule of our company.

17,513. You would not allow the father to take a boy down any mine under that age ?—It is generally about 11 if their fathers are with them themselves. I can give a statement of near about the ages of all the boys.

17,514. What is the length of the lowest level ?—The level that we were in yesterday is the longest that we have; that would be within about 170 fathoms of the far end, where it communicates with another level which comes up from the other side of the hill.

17,515. Do you know how long it is ?—Not exactly, but I think that it is a mile and a half.

17,516. Do the men always go in by the level, or do they go in by the shafts ?—They generally go by the shafts; unless they may meet with a horse going up, and he takes them up.

17,517. And they go down the stemples ?—Yes.

17,518. Have you ever had an accident from the stemples ?—Never since I have been agent.

17,519. How do the boys go down the stemples ? They can go down as well or better than men; boys take no harm.

17,520. You think stemples quite safe for the boys to go down ?—Quite; because they generally go above their fathers, and the father is there to shew them light.

17,521. The father helps them down ?—He never has much occasion to do so.

17,522. Have you ever been in a mine with ladders ?—No, not for any length of ladder; I have for a few fathoms.

17,523. Would you prefer to have ladders or stemples if you had to go up and down ?—Any person that I have ever talked to about the matter who has worked where others were has quite preferred stempling.

17,524. (*Mr. Kendall.*) Those who have tried both prefer stemples ?—Yes.

17,525. Supposing you had a ladder must you not have stemples also ?—It depends upon the length of the shaft.

17,526. (*Chairman.*) How are the stemples fastened ?—The stemple is put into the hard side, and it is driven tight.

17,527. Do not they sometimes come out ?—Never as long as they are sound.

17,528. But if the wood decays they will ?—If the wood decays we employ wood men to look after the waygates, and they are repaired; one is knocked out when it is worn by the men or boys' feet, and they put in a new one.

17,529. You have men specially to look after the way-gates ?—Yes, six to look after the Old Gang way-gates.

17,530. Do you use much timber ?—We use timber in the workings, but not so much in the main levels; we wall and arch the main levels.

17,531. If men want timber when they are driving a forehead, to whom do they apply ?—They generally apply to me, to tell me that they want timber, and what sort of timber they want, and then I write to the wood agent.

17,532. How often do you generally inspect the mine ?—I go inside three or four times a week, and I attend every day upon some business.

17,533. Is there much dust in any part of the mine ?—No; the mines are quite different from what they were when I began to go into them; they are better ventilated, and more communicated one with another.

17,534. (*Mr. Kendall.*) The ventilation itself would not at all interfere with the dust in the workings ?—No, not in the close workings; but by machines we can work with better air.

17,535. (*Chairman.*) Is there any part of the mine where it is so dry that there is a great deal of dust in the workings ?—There is in certain places where we have cross cuttings.

17,536-7. What is the dust most in ?—In grit and shale there is the most unhealthy dust with us; it is worse than lime.

17,538. Is what you call shale the same as plate ?—Yes.

17,539. Which is worst, plate or grit ?—Grit, if you have to work it with pick; but we generally blast it.

17,540. But the plate you work with pick ?—Generally.

17,541. So that it makes more dust ?—Yes, and it is more unhealthy for the workers.

17,542. More unhealthy in what way ?—From the dust.

17,543. Is there more of it, or is it from the kind of dust ?—It is from the kind of dust.

17,544. You think that it affects them more ?—Yes; and there is more of it in working with pick than with blasting; after the blast has gone you do not find so much of it, but the men are more exposed to it from being nearer the pick.

17,545. How long is the powder smoke getting away ?—It is not very long in some places; a great deal depends upon whether you have wind or not.

17,546. When you have the windy king going, how long is it ?—You can blow it out in a quarter of an hour or twenty minutes.

17,547. What is the price which the men pay for the candles ?—They pay 8*s.* a dozen lbs. with us—8*d.* a lb.

17,548. Where do you get them ?—Our company make them; they buy their own tallow and employ a tallow chandler.

17,549. Do you know at what cost they can be had in that way ?—I do not.

17,550. What do the men pay for the powder ?—6*d.* a lb.

17,551. Are there any deductions for club or doctor ?—No.

17,552. You did not get so far as the Bunting level?—No.

17,553. That is wet ?—Yes.

17,554. Should you say that that part of the mine was not so well ventilated as the rest ?—I should say that it is better ventilated, because the air can go through in the old workings anywhere.

17,555. Is there any one particular shaft which is the up-cast shaft ?—Yes.

17,556. Is it always that ?—It does sometimes change, it will change in summer with a drought or a change of weather, or something of that kind. The deepest shaft which I showed the Commissioners is generally an up-cast shaft.

17,557. But in some weathers it will change ?—I have known it to do so but very seldom.

17,558. Have you ever had a place in which men have been working there lately, where the candles would not burn well ?—No not lately.

17,559. But I suppose, in your experience as a miner, you have known that to be the case ?—Yes.

17,560. What does that arise from, in your opinion?—Scarcity of air.

17,561. Not from carbonic acid gas ?—Those are terms which I do not exactly understand.

17,562. Have you seen the candle not burn well

when it has been held up near the top of the level or, at the lower part of the level ?—I know that there is a difference.

17,563. (*Mr. Holland.*) At which part has it burned best, top or bottom ?—It has burned best at the top.

17,564. Always ?—Not always.

17,565. Does it ever happen that when you lower the candle it goes out quite suddenly ?—No, not in workings which we have now; but I have seen it formerly where it has died out blue.

17,566. Just as if you put it into water ?—Yes.

17,567. What does it cost to work a blower ?—The boy who turns it has 8*d.* a day.

17,568. Is the expense of that blower saved in the saving of the men's labour who are supplied with air ?—The company pays that.

17,569. But do the men work better for it ?—Yes; you may say twice over.

17,570. It is more than twice over, is it not ?—Yes, I should think so.

17,571. (*Chairman.*) The company pays the boy ?—Yes.

17,572. Where do you put the boy to work the machine; do you put it near where the fresh air is, or do you put it near where the men are working ?—We put it not quite to where the fresh air is, and we have pipes back into it and pipes forward.

17,573. How far should you say it ought to be from where the men are working ?—Some persons prefer its being very near, but that is very unhealthy for the boy; we never carry ours so near. I should think that where we were up yesterday it was about 28 fathoms off the men, and some six or seven fathoms off where the fresh air went.

17,574. How can you be sure that the boy will always keep working ?—The men can tell that by hearing whether the machine is working, and putting the candle to the pipe end; when they are feeling rather scarce of air they will give him a tap at the pipe, and it comes very soon to him, and he goes on working it.

17,575. Have you ever tried a water blast in that mine ?—Yes.

17,576. A water blast, or to turn the fan with water ?—A fan will carry a stronger wind if it be near, but a water blast is regular, and will blow a long way.

17,577. You prefer a water blast ?—Yes, for a mine which has to be wrought a long way off. I should think that we drove as long a cross cut on our field as has ever been driven by the water blast.

17,578. How many fathoms ?—I should think 300 fathoms.

17,579. With what sized pipes ?—I should say four inches or four and a half in diameter.

17,580. Made of zinc ?—Yes.

17,581. How long do the zinc pipes last ?—They do not last very long in some situations, they corrode and wear in holes where the water drops, and where they come in contact with holdfasts; we leave them under holdfasts; when that happens a new one is put in.

17,582. (*Mr. Holland.*) You mean an iron holdfast ?—Yes.

17,583. Do not you hang them by leather ?—No; we put them upon an iron crook, and a piece of wood to keep them off.

17,584. (*Sir Philip Egerton.*) How long before we went up the stemples yesterday had the shots been fired ?—The men heard of our coming after they had fired the holes.

17,585. (*Mr. Kendall.*) We were up within 20 minutes ?—Yes; we stayed nearly 20 minutes sending the men up to return the work down.

17,586. No, we were not so long as that; the men said a quarter of an hour; and I think that we must have been in within 25 or 30 minutes after the blast ?—Yes, I think so.

17,587. (*Sir Philip Egerton.*) Did it not happen that the strap of the windy king broke while we were there ?—The strap broke while we were there.

17,588. So that if the windy king had been in working order, the smoke would have been more cleared away than it was ?—I should say that it would have been near about clear when we got to the top.

17,589. The candles burnt quite clear when we were there, notwithstanding ?—Yes; I believe that if the strap had not broken you would have seen very little smoke; the boy was turning it when we got out of the waggons, and when we went by him it broke.

17,590. Do your miners live near the mine, or have they some distance to walk ?—Some of them have two miles to walk.

17,591. Are they in the habit of changing their clothes when they come out of the mine, or do they go home in their wet clothes ?—They do not change them unless they be working in a very wet place; if they do, they perhaps carry a change with them, but we have none who are working who require that now.

17,592. (*Mr. Kendall.*) How long have you been an agent ?—About seven years.

17,593. How long have you worked as a miner ?—About 39 altogether, agent and miner.

17,594. Did you ever work in any close fore-heads ?—Yes; I was always a dead work or cross-cut workman.

17,595. You worked in close fore-heads ?—Yes, as long as I wrought in mines, and after that I wrought the dressings five years before I was agent.

17,596. Have you found your health fail from working in those close fore-heads ?—No, I never did much.

17,597. Did the health of any of the men who worked with you in the close fore-heads fail ?—Yes; they were older perhaps.

17,598. Do you know any men of the same age as yourself, whose health failed from working in the close fore-heads ?—Not exactly at the age at which I gave up.

17,599. But in some other close fore-heads have you heard men complain much ?—Some men break up at 60 and some men at 50.

17,600. But they take more care than they did in old times ?—Yes; there is much more care and much more ventilation made in the mines by the masters than when I was a worker.

17,601. (*Chairman.*) I suppose that that depends very much upon whether they are poor or rich mines. In a poor mine there is not so much done as in a rich mine in the way of ventilation ?—Of course, if it is profitable they will be able to lay more out; but our masters are very good for looking after that, and they always enjoin us agents to look after it.

The witness withdrew.

Mr. Thomas Raw examined.

Mr. T. Raw.

17,602. (*Chairman.*) You are agent and manager of the Surrender Mine ?—Yes.

17,603. What number of men are employed under ground there ?—About 120 men and boys.

17,604. How many boys ?—We have 33 under 20 years of age.

17,605. Do you make any rule about the age at which they shall be allowed to go under ground ?—We do not allow them to go until they are turned 12, unless they are very strong boys; and unless a father takes his son with him, if he is a strong boy. We endeavour to put him into a convenient place, so that he is not exposed to danger; he can be taken up in the waggons to a near place where he can get assisted up on coming out.

17,606. I suppose you would say danger from climbing ?—Yes, a boy of 12 or 14 or 15 is not so able to climb as one of 20, and so on; they are not so strong. We generally let them go up the levels where there is no climbing. In many places they work close to the level side where they have no ascending or descending.

REETH.

Mr. T. Raw.

3 March 1863.

17,607. But with a boy of 10 it would be dangerous to climb ?—A boy of 10 is too young.

17,608. Do you make any regulation about the boys having been to school ?—No ; we have not interfered with their scholarship.

17,609. Are there any women employed on the surface ?—Yes, in dressing the ores.

17,610. Is that a general practice here now ?—It is.

17,611. As much as it used to be ?—Perhaps not to the extent that it was formerly, some 50 years ago, or something like that, I think.

17,612. Do they work under cover ?—Yes, they have sheds generally.

17,613. Is there any objection to their having sheds? —No, I do not know that there is ; they shade off a little light, so that they cannot see their work quite so well, but they are so open that they manage to do it tolerably well.

17,614. I suppose you could make the sheds so that it would be light ?—They could be made a little more elevated in some cases, which would allow a little more light to get in.

17,615. You enter the Surrender Mine from Arkindale ?—Yes ; we go through the Arkindale royalty up the Arkindale level into our ground.

17,616. Did you know the mine before that communication was made ?—No ; I was not agent before that communication was made.

17,617. I suppose that that has improved the ventilation and facilitated the means of working ?—Yes.

17,618. Could it have been carried on without that? —Not to any profit or advantage.

17,619. In which of the beds do you find most of the ore ?—Generally the 12 fathom lime, and the chert which lies above it ; that has been the most productive in the Surrender ground.

17,620. Do you find any in the plate ?—Very seldom, unless we have limestone or chert opposite the plate side, that being the case we have sometimes found ore.

17,621. Is it a dry mine?—No; we have heavy water coming from above, but it is conducted in troughs down to the level, and runs out at the mouth of the level.

17,622. Are you troubled at all with the dust in the Surrender Mine?—Not much ; it is well ventilated, and free currents of air pass generally through our workings, having a good up-cast shaft.

17,623. Is it always an up-cast shaft ?—Yes, except in dry weather ; the men take it as an indication of its going to be dry weather when it is down-cast and the air draws out at the level.

17,624. To a certain extent the air is stagnant when that change is taking place ?—Yes, just for a few hours, at the time of the change, it is reversed in its course.

17,625. Which kind of dust is most injurious to the men ?—The plate.

17,626. In what way ?—It seems to be most heavy. I think that it lies most upon the lungs of the men. After they have been in the plate forehead, and have worked hard for a while, they will spit very black stuff.

17,627. Is it that there is more dust or that the nature of the dust is bad ?—There is more dust, and the nature of it is bad too ; it is heavy and black.

17,628. How long will they spit it after they have left work ?—For four or five hours. I should say some perhaps longer.

17,629. How do the men go into the mine ; do they go by the level or by the shaft ?—Both ways. The men who descend by the shaft work in the upper part of the ground, and they put their work down in hoppers to the level, and ascend back out of the shaft when they return home.

17,630. They go down the shaft by stemples ?—Yes.

17,631. Is the shaft used for drawing or anything besides ?—No ; it was formerly, but is not now ; it is now just used as a way-gate and for ventilation ; we keep it open for that purpose.

17,632. From your experience should you prefer stemples or ladders ?—I think stemples are as well. I believe that men will climb as easily on stemples as on ladders; they are not so contracted.

17,633. How do the boys manage the stemples ?— When they become 16 or 18 and sufficiently strong they do it tolerably well, but the father takes care that he is in front of his son, or if he allows him to go in front he attaches a rope to him so that if anything happens to the boy and he gets a slip, or anything of that kind, he has hold of him.

17,634. He ties the rope round the boy and round himself ?—Yes ; he does for the safety of the boy.

17,635. Have you ever had an accident ?—We have have had two accidents in that shaft since I became agent.

17,636. Were those from slipping ?—Slipping in the shaft. One was a young man over 20, his feet slipped and he was killed ; the other was a little boy, his father was with him, and he slipped and he lost his life by it.

17,637. Is it not sollered in any way ?—We have half buntings as we call them ; half the climbing way is covered over with planks, so that a person slipping or falling might catch upon them and be prevented from going further.

17,638. Have you any men specially employed to look after the way-gates ?—Three men are regularly employed (what we call our way-gate repairers) to keep the shaft and all the principal way-gates in proper condition for the men to pass.

17,639. Do they report to you at all upon the state of them ?—I inspect them.

17,640. Do they report to you, or do they on their own responsibility repair them ?—I direct them where to go to improve and repair if a place is getting wrong and dilapidated.

17,641. (*Mr. Kendall.*) If they saw any weak point would they at once repair it without speaking to you? —Yes.

17,642. They have no entry book ?—No ; we keep no entry book.

17,643. (*Chairman.*) You manage the whole ?—I do.

17,644. Do you pay the men ?—Yes.

17,645. How often are they paid ?—Monthly.

17,646. Both classes of men, whether they are working by bing or by fathom ?—Yes. We make our pays monthly—12 in the year.

17,647. What do the men pay for candles?—8*s.* per dozen.

17,648. Where do you get them ?—We make them ourselves.

17,649. Do you think that a good plan ?—I do.

17,650. Why?—We buy first-rate tallow and get a good wick and pay a tallow chandler so much per dozen for making the candles, and then we think that when he has good material to work upon he will put forth good stuff.

17,651. What do they cost per dozen ?—I am not aware of the cost of the tallow, but perhaps 5*s.* 6*d.* or 5*s.* 8*d.* ; I think that it stands at that at present.

17,652. You think that to ensure a good material for the candles is important ?—I do. When the air is bad in a mine and the men have a candle burning made of bad material where they are breathing I think that it is pernicious to their health, and I think that it is beneficial to the health to have good candles.

17,653. Do you mix anything with the cotton ?—I believe that it is pure cotton.

17,654. Does it give light enough ?—Yes ; quite sufficient light.

17,655. I suppose that the ventilation of a mine where you are communicating with the Old Man's workings is more easily effected than in a new mine? —Yes.

17,656. I suppose that a maiden or new mine costs more to ventilate it properly ?—Yes.

17,657. Have you ever worked where the air has been bad ?—I worked 17 years in the mines before I became a mine agent. In some places I have worked

where the air was not very good, but I never took much harm by it.

17,658. Have you seen a case where any gas coming from the rock has put the candle out?—In some cases where we have come at what we call a loff, or an incision in the rock, when it has just become bare, we have seen impure gases issuing out from those places, and it has sometimes put out our candle. We generally call it foul air in our mining term, or poor air; it just comes out of a fissure; and when we have been working in a mine and have laid bare a fissure in the rock in that way we have sometimes found it so.

17,659. What kind of rock was it?—I do not know that any particular rock is more subject to it than another.

17,660. (*Mr. Kendall.*) Did you ever in passing by any of those crevices hold up your candle to see whether or not it would put it out?—Yes, I have done so where we have been opening ground; but it does not continue long so because a current of air passing by extracts it and carries it off. In some places where you have a drift a few fathoms from what we call our air drift we have sometimes found the air very bad as though the foul air was confined.

17,661. (*Chairman.*) Where you have to employ artificial ventilation, which should you say was the best means?—I like the water blast the best when you have water power at your own place, a water blast being more serviceable.

17,662. Which would you think best, driving in air or extracting it?—We have tried both ways. I think that it is well, where you can, to form a vacuum, and the good air will then pass forward and fill up that vacuum. We had a long rise at Surrender for 30 fathoms, and we had no air but what we forced up, and as soon as I put water into the water boxes and brought it to the end of the 30 fathoms it forced all the foul air out; the good air rushed up the rise and we were well supplied; the water falling the 30 fathoms it had great power, and brought all the foul air out.

17,663. (*Sir Philip Egerton.*) Have you ever tried furnaces for rarifying the air?—No.

17,664. The cost of fuel, I suppose, would be too great?—Yes. Our shaft is a regular up-cast one, except in certain seasons, as I tell you, and you can see it smoking out as you pass by.

17,665. (*Chairman.*) If you put a fire in it, it would make it a constant up-cast, and a greater up-cast; you have never tried that?—No. In fact we have had no need of that in our shaft. There is quite a sufficient current of air, so that you could sift wheat from the chaff very nicely, and blow your candle out.

17666. (*Sir Philip Egerton.*) Do you work principally by pick or by blast?—Both ways. Where it is pickwork we work with pick, and where they cannot get it by picks they then blast it.

17,667. Are your blasts fired by fuses or by squibs?—Sometimes, when we have water, by fuse, and when it is dry by squib.

17,668. How are they tamped; is it by an iron tamping tool?—Yes.

17,669. Is there no copper at the lower end?—No; we make our needle of good iron, and what we call the beater is made of the same.

17,670. Have you found that the iron tamping rod is liable to make sparks when it comes in contact with the chert?—We have had very few accidents.

17,671. You have had accidents?—We have had accidents on some occasions, but I have always blamed the men. They have perhaps got the chert into the hole to tamp with.

17,672. Have you seen tamping tools shod with copper?—I have.

17,673. Do you not think that they are more safe to use than iron ones?—Perhaps they are safer; they will not fire as the iron will; but if the miner uses great care in his tamping there is no danger.

17,674. Is it usual to use iron tamping rods?—Yes.

17,675. Do the other mines use copper ones or with copper bottoms?—Not in this neighbourhood that I know of.

17,676. Have you had any recent accident from any explosion in a mine?—No.

17,677. When was the last that you remember?—It is a good few years ago since we had an accident, I should say eight or ten years, and the man was so foolish that he beat the hole before he should have done so.

17,678. Have there been any accidents in a neighbouring mine?—Not that I know of.

16,679. Is your mine a wet mine?—We have a good deal of water in our mine.

17,680. Do the miners get wet in working?—Not many of them. We have it so conducted that we have it tolerably dry.

17,681. Are the men in the habit of changing their clothes after coming out of the mine before going home?—No.

17,682. Are there places where they could do so if they were so inclined?—Yes.

17,683. But they do not?—No.

17,684. What distances have they to go?—From one to four miles.

17,685. Do they generally go home for their meals?—They have their breakfast in the morning, and take their dinner to the mine with them, and work up till the time when they come home.

17,686. What number of hours do the men generally work in your mine?—Six hours we look for the men working.

17,687. Have you night shifts?—Very seldom.

17,688. (*Mr. Holland.*) Do you use any precaution to prevent accidents in blasting?—Yes; we generally caution the men.

17,689. Do you put anything soft between the tamping and the powder, any hay or paper, or anything of that sort?—They generally put what we call dust if they have it.

17,690. You mean sandy material?—Yes.

17,691. (*Mr. Kendall.*) Do you recommend the men to tamp with oak at first; in some parts of the west of England for the first layer or two, until there is something between the powder and the iron, they use oak; do you use that here at all?—No. As soon as they have got the powder into the hole they put it up with what they call the scraper as close and tight as possible.

17,692. What is the scraper made of?—Iron.

17,693. No sooner is there powder than you have that iron in contact with that powder?—Yes.

17,694. And then you have dust or shale?—Yes; and then you put the needle, and you then put in the beater.

17,695. (*Mr. Holland.*) Is the needle an iron needle or a copper needle?—An iron needle.

17,696. (*Mr. Kendall.*) Notwithstanding all that, you have not heard of an accident for many years in the district?—No; we have not had one at our place for many years, and I do not know that there has been one in the neighbouring fields.

17,697. (*Chairman.*) Do you use the safety fuse?—Yes; we use the safety fuse when we are amongst water.

17,698. And cartridge?—Yes; what we call bags.

17,699. (*Mr. Holland.*) When you are not in water, do you use a common reed or straw?—We use what we call a squib, made with paper, when we are not amongst water.

17,700. Does not that frequently miss fire?—No; if they are properly made they never miss fire.

17,701. Are they very often improperly made?—That is the men's neglect if it is so.

The witness withdrew.

Mr. John Knowles examined.

Reeth.
Mr. J. Knowles.
3 March 1863.

17,702. (*Chairman.*) Do you reside in this neighbourhood?—About four miles from here up the Dale.

17,703. You are connected with some of the mines?—Yes; I am connected with Arkindale, Old Gang, and Beldihill.

17,704. Are these mines all entered from the level?—Yes.

17,705. You consider that the best way?—Yes, both for ventilation and for getting the work out.

17,706. And getting rid of the water?—Yes.

17,707. Are all these mines connected with the Old Man's workings?—Yes.

17,708. I suppose that it facilitates the ventilation?—Yes, very much.

17,709. Are these shafts of the Old Man's used for ventilation as up-cast shafts and down-cast shafts?—Yes; they are principally up-cast shafts, but the air goes in at the level.

17,710. Does it vary at all with the weather?—Sometimes it does a little in summer, but very seldom.

17,711. Have you ever seen a plan of having fire or anything in the shaft to make the draught stronger?—Yes, in the coal pits.

17,712. But not in this district?—No; we have no occasion for it.

17,713. I suppose that the difficulty in ventilation comes when you are driving a forehead?—Yes; that must be pushed forward, and we ventilate it with pipes.

17,714. Then you have to employ artificial means?—Yes, either by a water blast or by fans blown by hand; and then when we get to a workable vein, we air it by communication with a rise up to the day.

17,715. I suppose that in new and trial ground, or maiden mines, it is more difficult to get ventilation?—Yes. In working a vein in new ground we generally have our horse level forward of where the men are working at ore above, and we carry a way-gate above the horse level, and we keep it open, perhaps every 50 or 100 fathoms, we put up rises from the horse level, and we carry our wind forward in that way.

17,716. Most of the workings are above the horse level?—Yes; we always contrive that if we possibly can, and then the work comes down hoppers instead of having to lift it. Sometimes it may be five fathoms higher, or it may be 20. It just depends upon the strata that we are in.

17,717. The men complain, I believe, most of dust, do they not?—Yes.

17,718. In what place is the dust worst?—It is the worst in a hard, dry forehead where it is to blast.

17,719. Is that worse than where they are in picking?—No, I do not think that it is. Of course, where it is very soft there is no dust, but it is chiefly in a hard forehead.

17,720. (*Mr. Holland.*) In what rock is the dust worst?—In the lime and the chert. The chert is between the lime and the plate. It will not burn to lime, it is a kind of hard plate bed.

17,721. (*Chairman.*) Are the men much affected in their breathing?—Yes, they are, when they get to a certain age.

17,722. From what do you think that that arises?—From working in the mines there is the black and there is the dust as well. At the same time we have men now who are working in the mines upwards of 70 years of age.

17,723. Some men are affected when young, and others are not affected by it?—Yes.

17,724. Does that at all, do you think, depend upon the mines in which they have been working?—Yes, if it has been a hard forehead they are more affected.

17,725. (*Sir Philip Egerton.*) Are you a shareholder?—Yes.

17,726. Do your company take any steps for providing medical aid to your workmen?—No, we do not; but if a man should happen to receive any little accident we assist him.

17,727. Do you hold the surface land or merely the minerals?—Merely the minerals.

17,728. Then the houses of the miners and the cottages of that sort are held under the surface landlord?—No; some of the houses belong to the miners themselves, and the others belong to proprietors in the neighbourhood; a good deal of the land here is let to the miners as accommodation land; the miners and those who are married more especially are fond of a little land, and have one or two cows.

17,729. Are the leases from year to year at rack rent, or for a term of years?—From year to year.

17,730. Will they build a house upon a lease from year to year merely?—No; but the house is bought; there are a great many cottages where there is no land; perhaps they have saved a little money, and they either build a house, or buy one, or perhaps it has been left to them by their fathers.

17,731. Do they buy the freehold of the land upon which they build?—It is copyhold or lease, with some old house, or something of that sort.

17,732. A miner building a house must have possession of the freehold of the land to build it upon?—Yes.

17,733. How does he get it, by purchase?—By purchase; some of the miners have land of their own as well, just a few acres.

17,734. (*Mr. Holland.*) Freehold?—No, copyhold.

17,735. (*Sir Philip Egerton.*) Do the company encourage sick clubs, or clothing clubs, or anything of that sort?—In Arkindale they do as respects clothing clubs, and there is a very old custom here that we generally give the washers a flannel petticoat once a year. They usually make an application at the beginning of the winter, and it is generally given to them.

17,736. With reference to education, do any of the companies take steps for providing schools for the young persons?—We subscribe to the schools; we are very well up in the neighbourhood for schools.

17,737. (*Mr. Holland.*) Are they National Schools which you subscribe to?—Yes; under Government inspection.

17,738. (*Sir Philip Egerton.*) But you find great difficulty in keeping the boys in school longer than ten years old I suppose?—Yes.

17,739. How long will they sometimes remain in school?—They will remain longer, perhaps till 13 or 14.

17,740. (*Mr. Leveson Gower.*) Do the parents contribute to the school?—They do.

17,741. What amount?—2*d.* a week, perhaps.

17,742. The miners are generally a saving class, are they not?—Yes; a large number of them have money in the savings bank, and they are a saving class.

The witness withdrew.

Mr. Reuben Atkinson examined.

Mr. R. Atkinson.

17,743. (*Chairman.*) Of which mine have you the management?—Arkindale.

17,744. Are you one of the under ground managers?—Yes.

17,745. Have you worked as a miner yourself?—Yes.

17,746. How many years?—Nearly 30.

17,747. And how many years as an agent?—Ten, come June.

17,748. At what time did you begin to work?—At 12 years of age.

17,749. Did you ever work in any close places ?—Yes, I used to work in close places.

17,750. Did you ever suffer from it ?—I do not know that I did.

17,751. You have no difficulty in breathing now ?—A little at present, but not much.

17,752. Do you think that that does not arise in any way from your previous work ?—I do not know that it does.

17,753. Have you had it long ?—No, not to say long. I never suffered very much from it. I am not so good, in my wind, as I used to be.

17,754. You do not think that that has arisen from your having worked ?—No, I do not think that it has.

17,755. Did you ever know any man suffer from working ?—I think that they have all suffered from it in the way of breathing, or something of that sort.

17,756. Was that from the air or the dust ?—That I cannot say; it might be from the air or it might be from the dust, or partly both, I think.

17,757. Before you left off working, you did not feel anything in your breathing ?—I was not so capital then as I might have been. I was about 42 when I gave over.

17,758. And you began then to fail a little ?—I felt a difference in my breathing from what I was when a young man, and if I had never been in a mine I should have done that I think.

17,759. Did you ever consult a doctor about it ?—No, I never had any need of that.

17,760. Could you climb up the stemples as quick as before ?—I could climb up the stemples pretty quick, but not so quick as I could when I was 25 years of age.

17,761. Would you rather climb up stemples or ladders ?—Stemples.

17,762. It is more exertion to come up stemples, is it not ?—I do not know that it is.

17,763. Have you ever tried the ladders ?—Yes, we tried ladders in mines which I wrought; one place was at what we call Wesher Green Level, but I did not like it at all, it was too perpendicular.

17,764. You think that if ladders were put in the men would prefer the stemples to the ladders ?—Yes, I believe that they would. We have had ladders, and the men would as soon have stemples as the ladders.

17,765. (*Mr. Leveson Gower.*) Did they give over the ladders ?—No; in some places they had not been put in at all. There is only one place where they have been put in, and they never complained between the stemples and the ladders; it never made any difference. I like the stemples quite as well as ladders myself.

17,766. (*Chairman.*) Have you any very wet places in your mine ?—None particular. We have one mine which is rather wet when it comes heavy rain, or anything of that sort, and in a rise which we have in Danby it is a little wet sometimes, but otherwise we have no particular wet places.

17,767. Have the men ever to work in a wet place ?—Sometimes they have and sometimes not.

17,768. In Danby they have to go through wet at times ?—Yes.

17,769. Do they work all the time in their wet things ?—They never get them wet. If it was so very bad they would not go at all, they would turn back, and would not get a wet skin.

17,770. (*Mr. Holland.*) Did your complaint at first come on very slowly ?—I have no complaint on me, except when I am fatigued.

17,771. When did you first perceive that you were that way ?—A few years since, it may be ten or a dozen years since. When I was climbing up a hill, or a rise or anything of that sort, I was rather put out of breath, that was all.

17,772. I suppose you hardly know when it began ?—No.

17,773. Is it a feeling of tightness ?—No, I do not feel any complaint at all.

17,774. You have no pain from it ?—No.

17,774. No spitting ?—No.

The witness withdrew.

Mr. ROBERT LOWES examined.

17,775. (*Chairman.*) You are agent for one of the mines ?—Yes.

17,776. Which ?—Westswaledale Mine at present.

17,777. Have you many men ?—We have not any at present; the mine is abandoned, and has been for about 15 months.

17,778. Have you been long agent there ?—Twenty years altogether.

17,779. (*Mr. Kendall.*) Have you any agency at present in any mine which is working ?—No, I am under the company still; the engines are going, and I attend to looking after them, and that sort of thing, but there are no men underground.

17,780. (*Chairman.*) Are you acquainted with many of the mines in this district ?—Yes, a great many of them.

17,781. Have you ever been where the air has been bad ?—Yes.

17,782. How have you ascertained that ?—The candles burn very badly when the air is bad, and you feel your breathing rather heavy; it produces a sort of lassitude, a weakness of system, and also headache.

17,783. Have you known any cases where the men have suffered permanently from it ?—No.

17,784. (*Mr. Leveson Gower.*) How do the miners support themselves after they have been obliged to leave off work ?—They get parochial relief.

17,785. (*Mr Holland.*) Do not they take to any other employment ?—Sometimes; they will get day work now and then where they can.

17,786. (*Mr. Leveson Gower.*) They get out-door relief, so much a week ?—Yes.

The witness withdrew.

Mr. GEORGE A. ROBINSON examined.

17,787. (*Chairman.*) Your father was for many years connected with mines ?—Yes, for 50 years.

17,788. He was a medical man formerly ?—Yes.

17,789. And you have lately taken the management ?—Partly so of the Crown Mine in Grinton Moor, and Apedale, under Lord Bolton.

17,790. You consider it a great advantage to work the mines by means of the horse levels ?—Yes, compared with any other system it is better in every way, both for the health of the men and for ventilation, and for convenience of working and safety as well.

17,791. And economy in getting rid of the water ?—Yes, that is where we have the great advantage. We also find the advantage of levels in the supply of water for dressing the ore and for the smelt mills.

17,792. The level gets rid of the water, and turns it to the use of the mill ?—Yes.

17,793. And also it is the best means of ventilation ?—Yes, the water blast. At one place in Old Gang a cross-cut of between 300 and 400 fathoms was aired entirely by a water blast.

17,794. A water blast is the best means of ventilation ?—Yes, the best which we have; we have nothing to be compared to it.

17,795. Which do you think is the best means of ventilation, the driving in air, or extracting the foul air?

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—Are you speaking of a leading forehead or anything of that kind; do you mean when we are driving an adit in a leading forehead?

17,796. Yes.—I should drive out the air; I would make an alteration in the way that it is generally done. I would have my machine with the water blast placed in the forehead, and not at a distance from it, and I would have a double way-gate to force the air out in that way; I mean a double waygate for the air, and not for the men. I would have it bratticed off a little bit.

17,797. Then you must make your level either wider or higher must you not?—No, I do not think there would be any occasion for that. We tried it in one place. I would conduct it by means of wooden troughs or launders; I would fix that, according to the nature of the air, either at the top of the drift or the bottom; I would conduct it where there is choke at the top.

17,798. (*Mr. Holland.*) You mean a wooden air pipe?—Yes; I should like to see all our way-gates made higher. In the two chief levels which we put on lately, instead of carrying them six feet we carry them eight feet now, and from five to six feet wide, and we find that our mines are aired better, and that the men can work them cheaper in that way than they could before. We meet with so many more flats in working them in that way.

17,799. (*Chairman.*) Can you describe the working of a mine where the working had to be abandoned in the plate?—That was in a mine that we had driven up in the 12-fathoms lime, and we had to sink from that 14 fathoms, when we came into another lime, and then we wished to make another communication for air. When we came into the plate above the second lime our men could with very great difficulty get through it; they did manage to get through it, but the air was so very bad (it was to let off the water), that after we had proved that there was no water I would not allow them to go on any more. I found that in less than a fortnight it had injured their health severely. Our agents were in the other day and could not get a candle in at all; they have sometimes been obliged to put five or six candles together to see at all.

17,800. (*Mr. Kendall.*) How far are they from any opening?—The first level is just about a quarter of a mile long, and then they are 16 or 18 fathoms down; then another adit is driven about 36 fathoms, and a "rise" of six fathoms.

17,801. You had artificial means of ventilation?—Yes, we had both the water blast and the windy king at work, but all would not do.

17,802. (*Mr. Leveson Gower.*) Did the men themselves complain?—Yes; but they never care so long as they can earn extra wages; they do not care what they do.

17,803. (*Sir Philip Egerton.*) In which mine was that?—In Apedale; you would see the same sort of plate at Hurst, at Prize.

17,804. (*Mr. Kendall.*) Did you ever see a place where it was possible to work at all that a miner would not go in if you would pay him for it?—Never, except one, and that was for water—a place that my father drove up to let some water off, and there was such a great lodgment of water that the men were afraid of it, and he had to promise, if they required it, to go with them; they were not afraid of the air. The men complain, but they know that if it has to be done it has to be done, and they go and do it.

17,805. (*Mr. Leveson Gower.*) I suppose they complain more in order to raise the wages than to get out of it?—No, I do not think that our men are of that sort; they have a right to complain; but then they know very well that we never do a thing of this sort, except for opening out other workings, so that they will make sacrifices.

17,806. (*Mr. Holland.*) Will not men prefer a well-ventilated place even if the wages do fall?—Yes; the men will tell you that they will sooner work for 14*s.* a week in a well-aired place than they would work for 1*l.* in a badly aired place.

17,807. Will they act upon that?—Yes, and they will work eight hours a day in a well-aired place sooner than they will four in a badly aired place. I am wrong about men refusing to work. Some years ago some men did refuse, and my father could only get one man in the whole of his employ to do it, but he and his son did it.

17,808. (*Mr. Kendall.*) Did they suffer by doing it?—No, I do not think they did. They lived near the place, and they used to go and make their hole, and then fire it and come out again, and wait till it was cleared off.

17,809. (*Chairman.*) What do the men now earn generally?—The mines are poor. In some of the mines they will average about 10*s.* a week, in some about 15*s.*, and in others from 16*s.* to 18*s.*; in one mine I consider that the average is about 10*s.*

17,810. Why is that?—Because they have too great partnerships. I consider that to be one of the great faults in mining.

17,811. Can these men who merely earn 10*s.* a week on the average maintain their families properly upon that sum?—No.

17,812. Can they get the proper food for the hard work?—They get it, but they cannot pay for it.

17,813. Do the miners live well upon the whole?—They do not live as they ought to live.

17,814. Do they consume much animal food?—Yes; a fair proportion of that, but they do not use it in the best way, they do not understand cookery.

17,815. Are they fond of having good dinners once now and then, and then living very moderately afterwards, or how; for instance, will they have a very good dinner on a Sunday and stint themselves on other days of the week?—No, they do not do that, but supposing that a man gets what we call a hit, if he makes an extra amount he lives like a fighting cock as long as it lasts, especially in rich cakes, and all that sort of thing, you would be surprized to go and see them sometimes in that way, but they are steady livers on the whole as far as regards meat.

17,816. Do they drink much?—Not one fourth of what they did.

17,817. They are very much improved?—Very much indeed.

17,818. Are there many teetotallers amongst them?—Yes.

17,819. Do you attribute much of that to teetotalism?—Almost entirely to that and the Wesleyan Methodists. I attribute the entire improvement in morality to the Wesleyan Methodists and teetotalism; but the Church of England has lately paid more attention than before to education.

17,820. Is Wesleyan Methodism a new importation in this neighbourhood?—No; it was started by John Wesley: John Wesley preached in this neighbourhood; we have four and five generations of them.

17,821. (*Mr. Holland.*) Perhaps Methodism has made a large increase of late years?—No; you may call it the religion of the Dale.

17,822. Has it been so for 50 years?—Yes.

17,823. Then that will not have produced much change in the habits of the people during that time, because the effect was produced before?—I do not say that there is as much difference produced in the health of the people as there might be, it is a mistaken notion when people suppose that the health of the people can be much affected in the present generation. I can give you instances of families in one dale, especially, where their forefathers have been drinkers for generations, and where if any of the family start to drink they have *delirium tremens* almost as surely as they start; it must take generations to get it back again, to make them anything like what they ought to be, and you will find them of lesser growth, quite different from what the men are in the adjoining dale.

17,824. You think that they feel the habits of their forefathers?—"I will visit the sins of the fathers upon

the children unto the third and fourth generation." You have it there I think.

17,825. (*Chairman.*) How often are the men paid here?—Every month. I believe that one of the great advantages which we have had here, has been in making our pays monthly, formerly they used to be quarterly. When they were made once a quarter the men were over head and ears in debt, and on the pay days they would meet and they would drink for a week or a fortnight before ever they struck another bat.

17,826. Are the pays made at public houses?—No; another advantage is that all the pays now, without an exception, are made apart from public houses; I believe that the whole of them are apart from them.

17,827. (*Mr Holland.*) Is each man paid separately his full amount?—They are paid in partnerships and they divide.

17,828. Do they divide at public houses?—No.

17,829. How do they manage that?—In some places they will go to the public house but in my own case I always have sufficient change sent up to each of the mines so that the men have no occasion to go for change to any place, they can divide the money there and then.

17,830. Is there any rioting on the pay day?—No, I never see anything of the kind; there is a little extra drinking higher up I believe, but not of any great consequence.

17,831. (*Mr. Leveson Gower.*) Was there plenty of school accommodation before the building of the new schools?—Yes, very good schools; I scarcely know a child but who attends school of some sort, and I know nearly all the children in the Dale.

17,832. Are there any night schools?—I have one of my own for a lot of lads that I have in connection with a brass band which I have, about 30 of them; most of them attend the night school, I have not heard of any other night schools.

17,833. (*Mr. Holland.*) Does the brass band work well?—Yes.

17,834. Is it beneficial to the rest of the people as well as to the musicians themselves?—I think it is in this way, they are all teetotallers and I think that it induces many of the parents to give up drinking when they see their children trained in that way. Most of my band, although they are young, are members of the Wesleyan Society as well, they have become that since they entered the band.

17,835. And the band is a source of amusement to the whole village is it not?—Yes; we have five bands in this Dale; they are very musical.

17,836. (*Chairman.*) With reference to the black spit, do you think that there is anything in the shale or plate which is deleterious in itself?—I imagine that it is the sulphur as much as anything.

The witness withdrew.

Adjourned to To-morrow at Leyburn.

LEYBURN.

Wednesday, 4th March, 1863.

PRESENT:

The Right Honourable Lord KINNAIRD, K.T.	The Honourable F. LEVESON GOWER, M.P.
NICHOLAS KENDALL, Esq., M.P.	P. H. HOLLAND, Esq.
Sir PHILIP GREY EGERTON, Bart., M.P.	

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

Mr. THOMAS EDMUNDSON examined.

17,837. (*Chairman.*) You are, I believe, a medical practitioner residing here?—Yes.

17,838. Have you been here long?—I should think about 40 years.

17,839. During that time have you had much opportunity of seeing any cases of miners suffering from disease?—I believe that I have seen as much as most people. I attended the Keldheads club; I have found this morning the old agreement.

17,840. You attended that club as the medical practitioner of the Keldheads mines?—Yes.

17,841. Do you continue to do so now?—No, it was given up.

17,842. They had a club there?—Yes.

17,843. What did the men pay?—About 4*s.* 6*d.* a year, and the company gave 5*l.*

17,844. And for that did you attend them for sickness or for hurt?—Everything that required medical or surgical aid.

17,845. That went on for how long?—Four or five years. The men in the smelting department would not submit to be treated in the manner or put under the regulations which I wished. They were the first to retire, and they got a fresh overlooker and he and I did not quite agree. I have part of them yet. Then it went on and the partners withdrew the 5*l.*, and after that the men just did as they liked.

17,846. Since that time have you had miners come to you?—Yes, up to this time.

17,847. Have you observed any particular disease among miners?—I have observed the lungs being affected from breathing the bad air.

17,848. Do you think that that is from the want of circulation in the air?—It is from the want of circulation, and from the place being so close that the carbonic acid gas accumulated, and they had to breathe it over again.

17,849. Have you had any case under treatment at the beginning when a man was first affected?—Yes, numbers; but I generally wished the partners (some men will bear it a great deal better than others) to withdraw them, and put them in a more airy place. There are some who have died, and some who are now asthmatical, as they call it, and they cannot follow any employment.

17,850. Do you think that if they were put into a place with better air they would then completely recover?—Yes, if the lungs were not injured.

17,851. Is it an asthma which is peculiar to miners who are affected with it, or not?—Yes, I believe that after continuing for a length of time the lung becomes hepatised; that is to say, that it is like a piece of liver, that the air cells completely disappear, for with the stethoscope you cannot hear any circulation of air through the air cells. During the time that they are in this air and afterwards, what they expectorate is completely black, and that deposit most likely takes place in the air cells.

17,852. Have you ever observed a case when this black expectoration has continued after a man has left the mine?—Not for any length of time.

17,853. Do you think that this black expectoration arises from the dust?—No; I believe that the blood not having a quantity of oxygen becomes carbonated.

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that there is a quantity of carbon in it, and that that carbon is deposited in the air cells ; in the secretion from the blood.

17,854. You consider the black sputa a secretion from the blood ?—Yes, I believe it to be so ; and if they are breathing air which has more than its share of carbonic acid gas, it may be deposited as well the other way.

17,855. Are the mines dusty at all ?—Some of them are where they have a great deal of hewing.

17,856. Do you see it worse for dust in any particular strata than in others ?—In the grit.

17,857. That is the worst ?—That is the worst.

17,858. Is there any plate in these mines ?—Yes, there are layers of plate in most of them.

17,859. But the grit is the worst ?—I fancy that it is the worst because it is the dustiest.

17,860. Have you been under the ground yourself? —Yes, I have had too much of it; I have worked a mine in the neighbourhood.

17,861. Which mine is that ?—It is not a mine which you know much about ; it is in the Bellerby Liberty, adjoining Lord Bolton's.

17,862. Is it worked now ?—No, I have not worked it ; we are waiting till the dry weather sets in ; we had it filled with water.

17,863. Have you been in a mine where candles will not burn ?—Yes, very often. I have sat with them for hours, and a man will live for some time where a candle will not burn ; but we have to slant the candle; the air is very annoying.

17,864. Did you feel any effect yourself ?—No. When I get a bad cold I am troubled with asthma, or when I get into certain kinds of air, such as the fumes of rosin or anything of that sort ; but I can stop in a mine as long as any of them, when the air is so bad that a candle will not burn.

17,865. Do you think that the ventilation is much improved ?—I think that it is ; it is improved much in the smelting, and the managers take a great deal more pains to get their men better air than they used to do.

17,866. Have you any men now that you are attending who are suffering from this disease?—Not at present, I think.

17,867. Have you ever traced a man's illness to a particular level or a particular forehead where he has been working ? — I have known that he was working where there was not sufficient air, where the air was bad, and that it affected his lungs, and that he spat a black secretion from that. When that club was going on, the men when they ailed anything came direct because they had nothing to pay extra, and of course when they had medical assistance early it did not go for that length of time.

17,868. Then it is of importance that they should apply to the medical man at as early a date as possible when they feel affected ?—As soon as they feel it.

17,869. What are the first symptoms ?—Difficulty of breathing, and the features of the face when they come out are purple and rather swelled ; but after they have been out for two or three hours and have got a quantity of fresh air that goes off.

17,870. Is the stomach affected ?—The liver and stomach; the liver is generally gorged. When the lungs do not do their duty, and do not get fresh air, it throws a quantity of work on the liver and other parts ; indeed if the lungs cannot admit the air the liver becomes gorged with bile.

17,871. (*Mr. Holland.*) What direct evidence have you that the liver becomes gorged ?—It is enlarged.

17,872. Can you feel it enlarged ?—Yes ; and you can feel it tender, and you can see that the motions have not the proper quantity of bile in them.

17,873. Is that an early symptom in this complaint ? —It is ; the first and prominent symptom is difficulty in breathing, then flatulence of the stomach and disorder of the liver.

17,874. Is the complaint which you speak of as miners' asthma common among the miners ?—It is frequently seen.

17,875. Their complaint is generally of the digestive organs, and not of the lungs ?—Yes. If you are speaking of the smelters.

17,876. Have the smelters a disease of the lungs peculiar to themselves ?—I think not. It generally affects the bowels in the first instance ; they complain of the bowels being stopped, and they say they are "bellowed." The obstinate costiveness will last for a week or ten days, and they die if not relieved. I have recovered two cases which had been attended for eight or ten days by other medical men, by introducing the tube of a stomach pump 12 or 18 inches long up the rectum, and throwing up at the least three pints of liquid; repeating it till the bowels were relieved. Repeated attacks will end in paralysis.

17877. You are now speaking of the smelters ?—Yes.

17,878. Have the miners anything of that sort ?—The miners who do not come into the smelting house are not under the affection of the fumes of lead.

17,879. They have no colic, have they ? — They have no colic.

17,880. Have they much disturbance of the digestive organs ?—Much.

17,882. What disturbance of the digestive organs have the miners ?—Great flatulence of the stomach and torpid secretion of the liver.

17,883. Is it general dyspepsia ? — General dyspepsia.

17,884. As an early symptom ?—Yes.

17,885. That is before the lungs are affected ?—That is before the lungs are violently affected.

17,886. Do you attribute that disturbance of the digestive organs to a previous diminution of the respiratory function ?— I fancy that it throws additional work upon the liver, and that the blood which goes through the liver, which ought to have the effects of oxygen in the lungs, does not get it. I should think that the liver prepares the blood (that is Liebig's idea) for going through the lungs.

17,887. You agree in the general opinion that the deficiency of the respiratory function is a cause of indigestion ?—Yes.

17,887*a*. You spoke of their being an absence of respiratory murmur in the lungs in the miners' complaint ; is that an early symptom ?—No, that is when the asthma has set in some time.

17,888. In what part of the lungs is the respiratory murmur most absent ?—The higher part.

17,889. Do you find that the higher part of the lung is more affected than the lower ?—In some cases it is one and sometimes the other, and sometimes both.

17,890. In which is it most frequent ?—The left lung.

17,891. And the higher lobe ?—Yes.

17,892. You are well satisfied of that, are you ?—Yes.

17,893. Your supposition is that the air cells are clogged ?—Yes, with deposit.

17,894. Have you ever had a post-mortem examination ?—No.

17,895. You are well satisfied that the air cells get clogged with carbonaceous matter ?—I go from the air not circulating in them, from the difficulty of breathing, and from the sound.

17,896. As I understand you, instead of being separate in the form of carbonic acid it is separate in the form of solid carbon ?—Yes.

17,897. That is your hypothesis ?—That is my idea.

17,898. That the defective respiration prevents the separation of carbon in the form of carbonic acid, and that it is secreted in the form of solid carbon ?—Yes.

17,899. And that hence arises the black spit ?—Yes, and that the carbon is not neutralised by the oxygen in the lungs.

17,900. Is this complaint, the miners' consumption, peculiar to miners ; do you ever see it among others who do not go down mines ?—I do not. I have seen

cases where there was difficulty of breathing where there has been congestion of the lungs.

17,901. Is the disease among miners a peculiar disease, or is it only an aggravation of what is common among other people ?—It is an aggravation of what is common among other people where they breathe bad air.

17,902. Do you think that it is produced only by breathing bad air?—No, not that particular effect; you have not the black spit.

17,903. What disease which affects ordinary people does miners' consumption most closely resemble ?—Congestion of the lungs.

17,904. Not bronchitis or any inflammatory affection of the lungs?—No, it is congestion of the lungs.

17,905. Have you noticed any cases in which there has been a marked thickening of the bronchial membrane ?—No.

17,906. For instance, where there have been rough sounds of the air passing through the bronchial tube ?—Yes.

17,907. Is that a common symptom?—Yes, when they get very bad.

17,908. In most cases ?—In most cases when they get very bad.

17,909. Is it an early symptom ?—No.

17,910. When does that appear?—After the air cells get nearly clogged up.

17,911. I am speaking now of symptoms of a thickening and therefore a contraction of the bronchial tube independent of the air cells ?—You mean a thickening of the lining ?

17,912. Yes ?—That will occur with congestion.

17,913. Or with inflammation ?—Yes.

17,914. Is it a common symptom ?—Not till they get very bad, or have catarrh or violent cold along with it.

17,915. After these men get their lungs decidedly affected, and they leave their employment, do they recover again ?—Partially, but never to get cured.

17,916. Does the disease cease to advance?—It seems to stop.

17,917. Does it certainly stop?—It stops for a time; if they get cold or any inflammation, or any congestion, of course they do not feel so well as a man does with sound lungs to bear it.

17,918. Has there been any marked change in the prevalence of this disease of late years?—There has not been so much of it.

17,919. Is there a marked diminution of it ?—There is.

17,920. Do miners live now several years longer than they did 20 years ago ?—They are more healthy a good deal.

17,921. They live to a later age ?—Yes.

17,922. Do the majority of miners get this disease at some time or other ?—No, unless they are working in bad air.

17,923. Do many miners escape altogether?—Yes.

17,924. They get even to advanced life without it?—Yes.

17,925. What proportion of miners do you think get the complaint; say miners of 40 years of age ?—Some of them will go through the natural life of man without it.

18,926. Taking a number of miners at 40, what proportion of them would have the complaint ?—I do not know.

17,927. Three fourths ?—Not so many as that; not so many as one fourth would have it; it all depends upon the place that they are working in. If they have pretty good air they will go in for four or six hours, and they will come out and ail little or nothing.

17,928. (*Mr. Leveson Gower.*) Are many of the miners teetotallers?—A good many of them.

17,929. About what proportion should you say?—I do not know; they have increased very much.

17,930. Have you observed that teetotallers are equally liable to this disease as those who are not so?—I should think quite so.

17,931. It makes no difference ?—No.

17,932. (*Sir Philip Egerton.*) Is the general health in this district good; is it a healthy situation ?—It is a healthy district.

17,933. I mean exclusive of the miners?—Yes.

17,934. What are the prevalent diseases amongst the poor here?—They generally have bronchitis and disordered stomach and liver.

17,935. (*Mr. Holland.*) From catarrh?—From catarrh.

17,936. (*Sir Philip Egerton.*) Is there much consumption amongst them ?—Not a great deal.

17,937. Do you find that persons who are of a phthisical diathesis are more liable to catch asthma than strong constitutions?—I should think that they are.

17,938. In those cases is the ultimate result tuberculosis or hepatization as you have told us?—If they are scrofulous they will have tubercles.

17,939. Have you had many cases of tuberculous disease among the miners under your care?—I have; particularly those of a light complexion, and fair skinned.

17,940. You think that those are more liable to this affection than the others ?—Yes.

17,941. Can you give us any estimate of the comparative length of life between the miners and the other inhabitants of the district ?—The miners do not live so long, but it all depends upon the healthy state of the place in which they work. I think that if the air was free from dust, and they were not exposed to water dropping on them during work, they would live quite as long as any other inhabitant, barring accidents.

17,942. In your long practice do you think that you can trace any amelioration in the length of the life of the miners ?—No.

17,943. Has there been no amelioration in the ventilation in the mines, for instance ?—They have taken a great deal more pains to keep the mines ventilated by conveying air and conveying water and other things there to get a full quantity of oxygen in.

17,944. Has the result of that been an improvement in the health of the miners?—Yes. When I have attended them where the air was bad I have generally recommended them, and wished them to carry in some quicklime and spread it on a board or on a tray, and it seems to absorb the carbon and form carbonate of lime (chalk); and, of course, if it did that it left more room for other gases; and I think that it is a very good thing.

17,945. Is there much carbonic acid gas generated in the mine, or is it merely from the absorption of the oxygen ?—It is more from the men breathing, and not having a quantity of oxygen to take off the carbon.

17,946. Are there no beds which give off noxious gases in these mines ?—I do not think that there are any here.

17,947. (*Mr. Holland.*) Is there any excess of dry dust among the miners ?—No; I do not think that there is.

17,948. (*Sir Philip Egerton.*) You have told us that in cases of incipient disease, you have recommended a healthier position in the mine ?—A change of place. I have recommended the agents to let them have an outward place for a while, and then put them where there was better air than the place they had been occupying.

17,949. Have you found a disposition on the part of the agents to co-operate with you ?—They generally have done so.

17,950. (*Mr. Kendall.*) Have you ever found any difficulty ?—I have found difficulty. I have mentioned about the club being broken up. I wished the men who were smelting or working in dusty places to wear respirators, and to attend to their bowels regularly once a week with a little calomel and colocinth or something of that sort, to keep the liver in order, and there was a rebellion about that.

17,951. I refer to the fore-heads where the air was bad; did you ever know an agent refuse to change parties ?—No; the parties were changed.

17,952. On your recommendation ?—Yes.

17,953. They were always changed ?—Yes; they were all ready enough to change.

The witness withdrew.

Mr. Jonathan Coatsworth examined.

Leyburn.

Mr. J. Coatsworth.

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17,954. (*Chairman.*) You are manager of the Keldheads Mine ?—Yes.

17,955. That is under a Leeds company ?—Yes.

17,956. How many men have you altogether working underground in the different levels ?—There are about 62 working in this part of the ground (*pointing to a plan*), namely, at Keldheads, and there are 18 at Ashbank, that makes 80, and we have upwards of 20 at different places upon the Moor, and opposite side of the valley; altogether it makes somewhere near 100.

17,957. How many levels are you working on the Keldheads Mine ?—We have one at this place (*pointing to the plan*), and one below at Ashbank.

17,958. Are you working below that level ?—Yes. This (*pointing to the plan*) is what we call Keldheads bottom lime, and upon this plan (*producing another plan*) you will see the same limestone, and there are beds below.

17,959. The Ashbank level is several fathoms below the other ?—Yes, 40 fathoms below the other.

17,960. How is the water taken from the Ashbank level ?—It passes out at the level mouth.

17,961. Is there any accumulation of water between the two levels ?—Yes; in Keldheads bottom lime we work it from the high level, and we have a pump perhaps 50 yards from the surface at Keldheads.

17,962. That is worked by a water-wheel ?—Yes.

17,963. Ashbank level is very wet, is it not ?—Yes, it is a very wet level indeed.

17,964. Do you give the men any waterproof clothing ?—Yes; the company have found them with a sort of glazed jacket to screen them from the water as much as possible.

17,965. But I suppose that the men cannot help getting wet going in ?—They cannot help it.

17,966. Do you see any difference in the health of the men who work in a wet mine compared with those who work in a dry mine ?—I believe that the men working in wet places, provided they do not stay too long, enjoy better health than the others because the wet settles all the dust; if they do not stay to get cold, I believe that it does their lungs less harm than in dry places; where it is wet they do not stay long hours; as soon as they get very wet they go home, let it be when it will.

17,967. How many hours do they work ?—Six hours is the usual time for working.

17,968. But they do work less ?—Yes; at the end of three or four hours they generally leave when it is very wet.

17,968*a*. Do they change their dresses when they come out of the mine, or go home in their wet dresses ?—They generally change.

17,969. Have you a changing house ?—Yes, a sort of lodge and a fire in it at the level mouth; they leave their wet clothes there and have dry ones to put on.

17,970. The principal level on the Keldheads Mine is ventilated; by carrying on a parallel shaft is it not ?—Yes, by driving a parallel level.

17,971. Is that along the lode ?—Yes, it is all in the vein. (*The witness described the same upon the plan.*) There is one level 10 fathoms above the other, and we have a rise up into the top level. From that there is a main level continuous, and we work Ashbank on the same principle as we work the other; we have rises between the levels.

17,972. In driving a forehead, how far is the end of this air level from the point where the men are working before you communicate ?—There are eight men working here (*pointing to the plan*); they are working in the air course, and they begin at the air course.

17,973. How far is the end of the air course from the forehead where the men are working ?—It is abou 15 fathoms; and at the end of every 20 fathoms I put up a rise.

17,974. (*Mr. Kendall.*) When you get in about 19 fathoms, before you have your rise, what is the general state of the air ?—It is not bad 19 fathoms from where there is a good current; the men take no harm if it is only 19 fathoms and a good level.

17,975. You communicate at every 20 fathoms ?—Yes.

17,976. Just before you communicate is the air very bad ?—It is not.

17,977. Dou you use any artificial means to throw the air in there just before you communicate ?—At Keldheads we have a water blast driving regularly.

17,978. (*Chairman.*) But not in that level ?—Not in this level; it is a new place, and we have never yet found the necessity of having one.

17,979. You depend for the air there upon the air drift ?—Yes.

17,980. It is a narrow vein in which the men are working ?—Yes, but they take the main level four feet wide and six feet above rails; and it is not a little place.

17,981. What is the size of the air drift ?—Six feet high by about three feet wide. The vein is generally about two feet wide, and we make that drift about three.

17,982. There is not a strong current of air at that point where the air drift is brought out ?—Not very strong; it will draw your candle gently away.

17,983. In your bargain with the men, are they obliged to remove the deads ?—Yes; there is a man appointed to take the refuse away, but of course they pay for it, and it is generally taken away just as they work it.

17,984. But sometimes there is an accumulation; there is too much ?—That sometimes happens when the working is rather softer than usual, and sometimes when it is rather harder than usual, the man that that takes away the stuff can hardly get sufficient, and it is kept clear enough, When it is soft it perhaps accumulates a little. Where there are more partnerships than one they cannot all get their work away at one time.

17,985. Therefore the deads accumulate ?—Yes, during that time.

17,986. That to a certain extent injures the ventilation in the forehead ?—Yes, it injures ventilation certainly; it is a great point to work every mine clean in order to keep the air good.

17,987. In the Keldheads Mine, are the workings very often soft, or are they generally hard ?—They are what we consider in a medium way for that. I have seen both harder workings and I have seen softer.

17,988. Does it often happen that the men are working in the soft, and that there is an accumulation of deads ?—No; it very seldom happens that there is any accumulation; that is a great point of success in any mine to keep it clear of work. If the men are smothered up with work it is a loss to the company. I take good care of that on the company's account, because the men suffer by it, and they cannot prosecute their work so well when they have work in as they can when it is clear.

17,989. Will you describe the water blast ?—It is simply a column of water in iron pipes, and at the bottom of the pipe a small hole is drilled about a quarter of an inch in diameter, and it will not spread much more than the breadth of my finger as far as the window, and that drives a current of wind into a cistern. We have that cistern so constructed that the water falls out at the bottom and the air passes into the pipes at the top; the pressure will not allow the air to get back, it goes forward.

17,990. It is a very strong blast ?—Yes; the air cannot get back, it must go on. I consider the blast to be very good.

17,991. What is the size of the hole ?—About a quarter of an inch, and with 16 fathoms of pressure; a strong current of water passes through it.

17,992. (*Mr. Kendall.*) What is the size of your pipe ?—Five or six inches in diameter, and the jet is about a quarter of any inch as near as I can say.

17,993. (*Mr. Holland.*) Do you know the quantity of air which it drives in?—No, I cannot say that.

17,994. (*Chairman.*) You let the men down the sumpts by windlass, do you not?—Yes.

17,995. Is there no danger of the rope breaking?—No, not a bit, while the rope is new. It will not break till it gets rotten. After it has been in use for two, or from that to three months, we take it away from there and wear it out in some other place where nobody is working under it, and then there is no danger.

17,996. (*Sir Philip Egerton.*) Are they hempen ropes or wire ropes?—Hempen ropes for common purposes.

17,997. (*Chairman.*) What is the deepest part?—Seventeen fathoms and a half is the deepest sumpt that we have.

17,998. Have you ever had an accident there?—No, no accidents at that sumpt. This is my ninth year, and we have had two accidents, and that is all. One of them was at Bolton Gill. A man had a careless way of proceeding, and he thought fit to go into old ground to strike out some wood to put into his own place, while cart loads upon cart loads were lying at the level mouth for the men to take in, but rather than take that trouble he knocked out some old wood from an old working, and when he struck it out of course the top came in, and he fell back, and dropped into a rise. It was only a fathom or two in height, but he broke his back, and died shortly after. Then at Cobb's Car another man had drawn six hours at the sumpt; he was about to leave, and fell into the sumpt. Nobody was there but himself, and for that reason we never could account for it. We did not know whether he slipped his foot or not.

17,999. Was the rise by stemples from the sumpt; or what was the way up?—They had a rope. Men were working at the bottom of that six-fathom sumpt. They had just finished their work along a drift when he fell in the sumpt. He had been working the windlass; and nobody was with him. I went up immediately to see him, but he could not speak.

18,000. You have never had a rope break?—Never, where any men have been working under it.

18,001. Have you ever had any accidents from blasting?—No, not one since I came.

18,002. Do you take any particular precautions in blasting?—Yes.

18,003. Are there any rules laid down as to the way in which the men should blast in order to prevent accident?—The principal danger is from firing the powder. Generally if the men are boring in a dry place I get them to take care of the borings of the holes, to fill their holes with fine stuff before they put the needle in, that will not strike fire, and there is then no danger. When they strike fire, it is perhaps from putting in a bit of hard stone; it takes hold of the needle if it is too big, and drives the needle against the sides of the hole which they have drilled, and it strikes fire; but if they put in the small dust it does not take hold of the needle, and is quite safe. We have never had an accident of any sort through blasting, except that in one case some men had a powder bag carelessly lying with a bit of powder in, and they fired it, and burnt themselves a bit. That is two or three years since.

18,004. Is there any difference in the description of rock as regards danger from fire?—Yes.

18,005. Would the small dust from boring from any kind of rock answer for tamping?—Yes, in any sort of rock; it does not matter what kind of dust it is, it will do. When we are working in this black plate (*pointing to the map*) it will not give any fire at all; but either the grit or the limestone will give fire.

18,006. (*Sir Philip Egerton.*) There is a great deal of chert in the limestone?—Yes; it is of a hard texture; some of the limestone gives a good deal of fire.

18,007. (*Mr. Holland.*) You said that the men working in the wet were more healthy than those working in the dry?—So far as their lungs are concerned.

18,008. And you thought that that was because they had less dust?—Yes.

18,009. Might it not be because they work fewer hours?—There may be a little in that.

18,010. They only work about half the time, do they?—As soon as they get properly drenched with water they come out, if it is only after two hours.

18,011. Are you satisfied that the dust is a serious cause of disease?—There is no doubt that it does harm, but what does far more harm than that is the foul air, bad atmosphere; it spoils the blood, and ruins the constitution; that is the worst of anything. Dust has a pernicious influence, but bad gases are far worse than that.

18,012. I suppose that with respect to the water-blast the cost of the water is nothing?—The cost of the water is nothing.

18,013. Have you an ample quantity of water?—Yes.

18,014. And it all runs out without pumping?—Yes; it passes away to the surface again, out at the main level.

18,015. If it had to be pumped again it would be expensive?—It would; but we have not to pump it.

18,016. (*Mr. Leveson Gower.*) Are there several medical gentlemen in the district who attend the miners?—Yes; when they need medical assistance they apply for it to whom they think proper.

18,017. Are the last gentlemen who were examined viz., Mr. Edmundson and his assistants, the only medical gentlemen, or is there any other medical gentleman?—Yes, there are two medical gentlemen at Leyburn.

18,018. Mr. Edmundson told us that there is no medical club now?—There is not.

18,019. You discontinued it?—They had one when I first came here, but it was broken up soon afterwards. The workmen did not agree among themselves somehow or other about it, and it got knocked up.

18,020. You do not think it desirable to re-establish one?—I do not know whether it would be desirable or not.

18,021. Do you recommend men to call in a doctor when they are affected?—I have seen it tried in other districts, and it was generally thought that some of the doctors were not sufficiently attentive; the men were hardly satisfied with the attendance, at any rate.

18,022. You think that the men are better attended without a club than with a club?—I have a little hesitation in saying that, but I think it, at all events.

18,023. (*Sir Philip Egerton.*) How many boys have you in the workings?—I cannot say exactly, perhaps from 30 to 40.

18,024. What duties do they perform?—They dress the ore after it comes out of the mine; that is their employment.

18,025. At what age do they begin working?—From 18 to 20 they go into the mine generally.

18,026. Do you call them boys when they are 18?—They are young men then.

18,027. Have you any boys in the mine of younger age than that?—No; I am not aware that we have one under 18.

18,028. How is your ore brought up?—It is brought out by levels, but we have a lift at Keldhelds by windlass; but it comes up to the main level and passes out at the main level mouth. There is only one entrance to bring it all out.

18,029. (*Mr. Leveson Gower.*) Do not the miners take their young sons down into the mines to help them?—No, not until they are 18, as a general rule. They are employed in dressing at the surface previously to that. We consider that they are better out of a mine while they are young and growing.

18,030. (*Sir Philip Egerton.*) Are there any opportunities of schooling?—Yes.

18,031. What schools are there?—Very good schools at three places.

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18,032. To what age do the boys remain at school?—There is a great deal of difference respecting that. When they get to 12 or from that to 14 they generally leave.

18,033. How do they get their livelihood between that age and 18 when you put them into the mines?—The boys who belong to the companies workmen are generally employed in dressing the ore out of doors.

18,034. Is that done in sheds, or in the open air?—At Keldheads a part of them are under sheds, and a part of them are exposed to the weather.

18,035. How many hours a day do they work?—They commence at seven, they have an hour for dinner, and then they leave at half past five.

18,036. (*Mr. Kendall.*) Do you never permit lads to go under ground before they are 18?—They are very rare exceptions, except he goes to blow an air machine.

18,037. What are those exceptions?—When a father wants to have his own son with him perhaps a little earlier.

18,038. I understand that you have 100 men working under-ground under your charge in different places?—Yes.

18,039. Will you give as near a guess as you can how many men in the year out of the 100 who work under-ground you think suffer, even in a small degree, from bad air?—That is a complex question; I do not know how to define that.

18,040. Do you think that five men out of 100 suffer within the year and are incapacitated from working in consequence of bad air?—It is my conviction that every man who works under the surface will suffer a little.

18,041. You think that every man suffers a little?—Yes; that is my conviction.

18,042. At what time of life do you think he begins to show that suffering?—A good deal depends upon what kind of workings he has been in. In the north you may begin to see some symptoms of it in some mines frequently at 30 years of age, and you may see a great deal of it at 40.

18,043. Do you know any men who have worked under you who are at this time in this neighbourhood and who are entirely done up, as far as working goes, who are not 50 years old?—No, not one. We have a great many above 50 working, and they do not seem to be suffering very much.

18,044. Do you know any men at all who have worked with you who are now entirely laid up on account of work?—There is one at Redmire, and the only one, an old man.

18,045. How old is he?—I do not know his age exactly; he is somewhere between 60 and 70.

18,046. You only know one instance in this neighbourhood of a man entirely unable to work in consequence of the miners' asthma?—No; and I believe it is more from an asthmatic affection which he has than anything else.

18,047. Is that asthmatic affection a peculiar one to miners, or a common one?—Some farmers are troubled with asthmatic complaints; men who have never been in a mine are troubled from asthma.

18,048. Out of 100 men that you employ every year, how many do you think are suspended from working in consequence of working in bad air within the year, even for a month?—Not one that I am aware of; we only have a single man off work now out of all that number, and it is a complaint in his spine, so a doctor at Richmond says, it is not from anything else.

18,049. Though there is a marked suffering among miners, yet it is not of a very grievous nature?—No; if you have mines properly ventilated men suffer comparatively little; but if they are badly ventilated men are crushed up and die away when they are 40 or 50 years of age.

18,050. Generally speaking, are the mines in this neighbourhood badly ventilated, or not?—I do not know anything about any but my own, and I consider them well ventilated.

18,051. You said just now that if a man worked in a wet place you considered that, if he changed and did not get chilled, he was working in a better place than a man who was working in a dry place?—His lungs will suffer less, so far as that is concerned.

18,052. Most of those who work in wet places change at the mine?—Yes; when it is very wet, and they get properly drenched. I made a place, and put a stove in, for that purpose.

18,053. How far do they generally live from the mines?—A mile, and two miles, and some of them three miles from the mines.

18,054. Suppose that they are unmarried men, where do they live generally; do they lodge with the other miners, or not?—Unmarried men generally lodge with their neighbours.

18,055. With the married miners?—Yes.

18,056. What do they pay for their lodgings?—I do not know. I never inquired.

18,057. Do you ever go to their cottages?—Sometimes.

18,058. What is the state of their cottages; are they generally cleanly?—Very cleanly and nice.

18,059. Are their bedrooms small, or large?—I do not know.

18,060. You have never gone into their bedrooms to see?—No.

18,061. (*Sir Philip Egerton.*) Do they live pretty well as respects food?—Yes, I dare say they do; the men earn very fair wages, and that places good food within their reach.

18,062. Do they bring their dinners with them to the mine?—They take a little with them.

18,063. Are their cottages freehold, or are they generally leased from the landed proprietors in the neighbourhood?—At Preston and Redmire the principal part of the cottages belong to Lord Bolton, and a great many of the miners have a small portion of land, and keep a cow or two.

18,064. (*Chairman.*) Do they take milk to the mines?—Seldom. Only staying six hours they do not require much; perhaps they may require meat and bread which they put into their pocket.

18,065. (*Mr. Kendall.*) What are the average wages which you permit them to get, 3*l.* a month?—They earn more than that.

18,066. Will they average 4*l.*?—Between 3*l.* and 4*l.* a month, nearer 4*l*; the Keldheads men have done so ever since I came.

18,067. Do they drink much?—No; not very much. If a man contracts an intemperate habit and neglects his employment I turn him away, because, when a man does not come, his partners generally cannot do much, and it loses both their time.

18,068. (*Mr. Leveson Gower.*) Are there many unemployed miners in this district?—I fancy that there are a few further up the Dale; the mines further up are rather poorer than usual.

18,069. You have no difficulty in obtaining labour?—Not a bit; there is plenty of labourers in our neighbourhood.

18,070. (*Chairman.*) Is the air shaft always an up-cast shaft?—Ten or eleven months out of twelve it is; in very dry weather in summer sometimes it draws down.

18,071. And then, till the current has changed, the air is not so good?—Not quite so good for an hour or two while that change is passing.

18,072. Supposing you put a fire at that air shaft, could not you ensure its always being an up-cast?—Yes; I expect we could.

The witness withdrew

Mr. JOHN TATTERSALL examined.

18,073. (*Chairman.*) You reside in this neighbourhood?—At West Witton, four miles from here.

18,074. You have been connected, more or less with mines for some years?—Yes, about 18. I was one, along with other two, that took the Keldheads ground when it was opened.

18,075. West Burton you take a principal interest in?—Yes.

18,076. You remember Keldheads when the men first began to work?—Yes, I have reason to remember it; all the levels were broken in, and we had very rough work indeed in the commencement. It had been worked previously by a company, now working the Sedlingstone mines in the north, and it had been standing some 18 years when we took it.

18,077. While you were opening up that mine the men suffered very much?—We could not let them remain above about 2 hours, from the water pouring down upon them and bad air; but we had none who died, or anything of that sort. They suffered at the time, they were soon right; they did not get what you would call the miners' illness, such as they have on Grassington Moor, they are working there in the grit. We have very little grit work here; the grit work on Grassington Moor seems to affect them much there.

18,078. From the dust?—Yes; we are chiefly in limestone here.

18,079. You consider that the Kelsheads Mine is now well ventilated?—I think so. We took every pains during the time that I was with them to have shafts to the top, and double roads and double air ways, and trap doors, and double sumpts. With the first sumpt which we had, before we communicated with the next one, we had some trouble in driving air down with a fan and those things, but when we had once got a communication and carried a double road, we never suffered much afterward.

18,080. There is an up-cast shaft?—We always had an up-cast shaft.

18,081. Is that affected at all by the weather?—Sometimes the air will go up the shaft and sometimes it will come down it.

18,082. Would it not be advisable if you could always secure its going up the same way?—I think it would be better, but I do not know how we could manage that.

18,083. If there was any furnace at the shaft, do you think that that would do it?—Perhaps a furnace might draw the air, but when it comes down I do not see a very great deal of difference.

18,084. That is only I suppose during the time when it is changing?—When we are going to have a fit of very bad weather, sometimes the air will hang heavy in the mine, though there is a current, it seems to be a heavy atmosphere there immediately.

18,085. I believe that the West Burton Lead Mine is what you are now interested in?—Yes; I am connected with another, a great strong vein which adjoins the Swaledale Mine; it is the high end of Lord Bolton's ground, called Apedale. We are just getting up into the hill, we have only 14 miners at work, but there we are well aired. They have worked the two top beds, as they have done in all this ground, and we rise up and get air at once into the old workings.

18,086. Do you know any mine in that neighbourhood where they were working in the plate, and where they were obliged to stop working?—No; I am not aware of any.

18,087. In the Keldheads Mine is the main level arched with stone?—Some part of it, but not very much.

18,088. Does it require much timber?—A great deal of timber; they use a great deal of timber in the Keldheads Mine.

18,089. In the West Burton Mine do you use timber?—Yes.

18,090. Does it decay much?—No; there is generally water, and we use the root end of larches for the head trees; we have them peeled, and they last a long time.

18,091. Do you think that it lasts longer by being peeled?—We think so; after it has been peeled and exposed two or three months, it gets very hard, and we think lasts much longer.

18,092. There are some other mines of Lord Bolton's are there not?—Yes; there is Wetgroves, but I think they are not getting much ore there at present, it has got a great lot in its time. It is a very singular place, the beds are tumbled down there most extraordinarily.

18,093. (*Mr. Holland.*) You have said that the ordinary up-cast shaft occasionally becomes a down-cast?—Yes.

18,094. Is that in the hot weather?—I think it is generally when there is going to be a fit of wild weather.

18,095. Is it changed by the direction of the wind?—No; I think that it happens when the wind is in all parts, sometimes.

18,096. Is it changed by hot weather?—I have found it generally when it is going to be very wild weather. When I have made these observations I have generally found it so. Sometimes the wind is then driving from different quarters.

18,097. You have not discovered the immediate cause of the change?—No.

18,098. (*Mr. Leveson Gower.*) Do young boys work under ground in your mine?—Not many young ones.

18,099. At what age do they begin?—They will begin, perhaps, at 15 or 16.

18,100. Have you any medical club connected with West Burton?—Not at West Burton. The miners are in some sick societies, such as the Odd Fellows and the Foresters, and those societies, but they have no medical clubs. I think that they had at Kelheads; they had one when I was there, but it was broken up, and whether it is established again or not I do not know.

18,101. (*Mr. Kendall.*) Have you given your attention to any other mines beyond the mines in this district?—No; I do not go out of the district much, except when I am off for a pleasure trip. I am then generally amongst the mines where I go.

18,102. Do you ever go under ground so as to have a comparative idea of the ventilation in other mines, and in the mines in this district?—I have been in some of the mines in Derbyshire, and I have been on Grassington Moor many times.

18,103. In the Derbyshire mines where have you been?—I was once at the Cradge Cliff Mine; that was a very rich mine; it is not far from Matlock.

18,104. Was it worked at all by pumping machinery?—They had a very heavy engine there.

18,105. Did you go under ground there?—Yes; I think that the shaft was 70 fathoms, and the air was then very bad there.

18,106. Was that owing to a bad system of ventilation, or what?—I do not know how they got their air. I saw no appliance; I saw no pipes; they had just one pumping shaft.

18,107. Did you see the miners there?—Yes.

18,108. Did they look unhealthy?—I do not think that they looked so healthy as ours do here, but that is some years ago.

18,109. Do you think that your men here have improved in health a good deal in the last few years?—I do not see they are much different from what they were when we came.

18,110. Taking the health of the agriculturists and of your miners, do you think that there is any visible difference between the two?—Our miners do not look so rosy and healthy as the agricultural labourers.

18,111. Do you think that they live as long?—I cannot speak to that.

18,112. Your general impression is that the miner,

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though he lives in tolerably well ventilated mines here, still must suffer to some extent ?—I should think that they will not live so long as the agricultural labourers ; that is my impression.

18,113. Take Grassington ; do you think that the mines there are as well ventilated as they are here ; did you go under ground there ?—Yes, at different times, but I thought that they were not so well ventilated as we have them here, and they work in grit there, and it appears to affect the men very early. The dust appears to get on to their lungs, and their wind is bad.

18,114. Then you attribute the difference to the grit, and not to the mode of ventilation ?—I think it is the grit ; the mines are dry and very dusty in the grit ; they are generally hard veins.

18,115. Did you converse with the men at all ?—No, not on that subject.

18,116. (*Mr. Holland.*) Do the miners look older than the agricultural labourers at the same age ?—I should think that they do look older than the agricultural labourers.

The witness withdrew.

Adjourned to To-morrow at Grassington.

GRASSINGTON.

Thursday, 5th March 1863.

PRESENT:

The Right Honourable Lord KINNAIRD, K.T.	The Honourable F. LEVESON GOWER, M.P.
NICHOLAS KENDALL, Esquire, M.P.	P. H. HOLLAND, Esquire.
Sir PHILIP GREY EGERTON, Bart, M.P.	

The Right Honourable LORD KINNAIRD, K.T., in the Chair.

Mr. MATTHEW NEWBOULD examined.

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Mr. M. Newbould.

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18,118. (*Chairman.*) Will you name to the Commissioners the mines of which you have now charge ?—Sunside lead mines, Stoney Groves, and Prosperous Mine, Forest Moor Mine, and Yorkshire lead mine.

18,119. About how many men have you altogether working underground in Sunside ?—In Sunside we have about 90, and on the surface from 20 to 25, in Stoney Groves and Prosperous 15, in Forest Moor 10, and in the Yorkshire mine 6 ; there have been more but there are only 6 at present.

18,120. Do boys work underground ?—We have not one boy I think under 18 or 19.

18,121. Do they all work at the surface ?—Yes ; any boys that we have.

18,122. Do women work on the surface ?—None.

18,123. About what is the longest level in Sunside ?—A mile and a half.

18,124. Is that the lowest level ?—No ; we have one a mile and a half that lies away to the east of the general mines and we have two other levels each of which will go about a mile and a half.

18,125. Are the levels sufficient for taking off all the water or have you any machinery ?—We have no machinery excepting for below the levels ; we there pump it by a steam engine,

18,126. What are the beds generally in which most of the ore is found ?—In the limestone strata.

18,127. Do you work in the grit at all ?—Not at all in the Sunside Mine.

18,128. Have you many communications with the surface, that is to say, shafts ?—Yes, several.

18,129. Do the men go in by the level or do they go by the shaft ?—They go both ways, by inclines and some nearly perpendicular, and sometimes by the levels.

18,130. Do they go down by ladders or stemples ?—Mostly by stemples at the Sunside Mine.

18,131. Have you any ladder ways ?—None to speak of ; I think that we have not 20 yards of ladders in the whole mine.

18,132. Do you think that the men prefer stemples to ladders ?—They are more convenient for our mine than ladders would be ; we have not many deep shafts to climb up, they are more inclined.

18,133. Do you draw up any of the shafts ?—No.

18,134. Have you worked as a miner yourself ?—I worked for twelve months when I commenced with my father.

18,135. How many years have you been manager ?—45 or 46 years manager and assistant, I took the whole upon myself after my father's death in 1836.

18,136. Is the Sunside Mine a wet or a dry mine ?—It is generally dry.

18,137. In driving a forehead do you ever find a want of air on any occasion ?—Very rarely.

18,138. How do you ascertain that ?—We can tell by the burning of the candle.

18,139. Do the men report if they find it ?—We have no bad air, only sometimes it may be rather dull for want of circulation : there is no fire damp or anything of that sort. Occasionally we have a want of circulation, sometimes even a change of weather affects it.

18,140. Do the men on that occasion leave the work ?—No ; it is a very rare occurrence for the men to leave the work.

18,141. They work on as long as they can get the candle to burn ?—If the candle will burn, then of course they will work on ; perhaps it will be rather dull and they may work on as long as they can after that.

18,142. Do they then apply to you for any artificial means ?—We make air ways as quickly as we can, as soon as we see that it is really necessary.

18,143. Do you use any artificial means such as fans ?—We have fans and zinc pipes mostly for blowing.

18,144. Are those blowers supplied with air by a machine worked by hand or by water ?—Mostly by hand work.

18,145. You have no water blast ?—Not at present ; we occasionally use them in some parts of the mine, when we require them.

18,146. At present how long should you say that in any one forehead the smoke is getting away after blasting ?—It will be away in five or ten minutes. Of course, it depends upon the air, how near they are to an air way.

18,147. (*Mr. Holland.*) That is about the usual time, is it ?—It will vary a little ; it will be from five to ten minutes, some will be longer and some shorter.

18,148. (*Chairman.*) Will it ever be as much as an hour getting away ?—No ; not in getting away from the forehead.

18,149. How many men generally work in a partnership ?—Generally four.

18,150. Do you set the contracts yourself ?—Yes.

18,151. How many hours do the men work?—We require them to work six; they will perhaps work from five to six.

18,152. Are there so many men working by the bing and somany by the fathom?—Yes.

18,153. When they work by the bing are they bound to work so many hours?—We like them to stick pretty closely to the work for so many hours.

18,154. Do they work night shifts on those occasions?—It is very rare; we only work night shifts when we are lifting water from under levels.

18,155. Is that pumped by hand below?—No; we have a steam engine; it is only on one particular part of the mine in which we have it; we do not expect it to be of any long continuance.

18,156. Do the men pay for their powder and candles?—Yes.

18,157. What do they pay for their candles?—We generally charge them according to the price we give, sometimes it is lower and sometimes higher.

18,158. What is about the present price?—6*s.* 6*d.* a dozen.

18,159. Where do you get them from?—In the neighbourhood.

18,160. Do you contract for them?—Yes; we buy them every month.

18,161. (*Mr. Kendall.*) Do the men pay 6*s.* 6*d.*?—Yes.

18,162. What do you give?—6*s.*; we generally charge about a halfpenny a lb. more, just to keep them below the retail price; if we charged them only 6*s.* they might make a trade of it.

18,163. (*Chairman.*) Are they limited to a certain amount?—No; they have any quantity which they require.

18,164. What do you charge them for the powder?—We generally charge from 16*s.* to 18*s.* a quarter barrel, cost price from 50*s.* to 56*s.* per barrel 100 lbs., of course, the price of powder goes up and down; powder has been rather lower of late, but we have not reduced the price.

18,165. Do you use the large or the small powder?—The small powder.

18,166. Do you think that that is better than the large grained powder?—Yes; we like it better, we think that it does not make so much smoke for one thing.

18,167. (*Mr. Holland.*) Is the mine very dry?—Yes.

18,168. (*Chairman.*) Have you ever any accidents from blasting?—I scarcely remember but one; a man got his eye injured with it; he went back too soon before he had given the hole plenty of time to explode.

18,169. (*Mr. Holland.*) Were you well acquainted with the miners 20 years ago?—Yes.

18,170. Is their condition as regards health much different from what it was 20 years ago?—No; I see very little difference.

18,171. (*Mr. Leveson Gower.*) At what age do the boys begin working on the surface?—On the surface they begin at 12 or 14 years of age.

18,172. I suppose they leave off going to school then?—Yes, we do not keep more than about half a dozen boys altogether.

18,173. Have you schools?—There is a school adjoining the mine to which we subscribe.

18,174. Does the parent pay anything towards the school?—Some do.

18,175. (*Sir Philip Egerton.*) Have you much miners' asthma amongst the men?—No; I do not know that we have any more than there is generally in the neighbourhood among the other people who are not miners.

18,176. There is not more disease amongst your miners than amongst the agricultural population?—No, I think not.

18,177. Is there any medical club to which they belong, or do they just call in the union doctor, or any medical man?—They are generally in clubs, the Odd Fellows, and so on.

18,178. Benefit societies?—Yes; they mostly join those societies, and they have a doctor belonging to those clubs.

18,179. (*Mr. Kendall.*) What is the length of the most distant forehead which you have from good air; you have two levels a mile and a half long, take the end which is the furthest from good air?—I think not more than 100 yards; we have only one which is that distance. We have some a good deal nearer.

18,180. Have you a fan there for it?—No, we do not require it, we have a double way-gate; this is a top level. We have another rise from a horse level which makes a communication of air.

18,181. But still your end is 100 yards from that communication?—Yes.

18,182. Do you find the air bad at all there?—It is duller; it is worse when the men give up working. There are two men at a time, and they stop about five hours.

18,183. Have you any intention of ventilating it better?—Yes; we shall open a shaft from the surface.

18,184. How many fathoms is that?—About 40 fathoms from the surface.

18,185. Why have you not done that before; is it because of the expense?—No, we have not required it; but now we see that we shall have to do it.

18,186. Have you commenced as yet?—No.

18,187. How many fans are there at work in the mine?—Not more than three or four and those only occasionally.

18,188. Then if you do not use a fan here, where you do use a fan the air must be still more dull?—No; we place it where the air is very good, and take zinc pipes from thence; it is of no use blowing bad air back again.

18,189. But you do not blow any air into this forehead which is furthest off as yet?—No, we do not require it; the men can work without it.

18,190. What is the age of the boys who work these fans underground?—Sometimes they will have a boy of 12 or 14 years old.

18,191. Then you do allow them to go underground at that age?—Yes; two or three, we have not more than that; perhaps they will be 14 years of age. I think that we have only one at present.

18,192. No boy works as a miner underground; but those boys go to blow the machine?—No; the men blow themselves, or they hire a boy.

18,193. Is any person employed to mark the time when the men go down and when they come up?—No.

18,194. Then you allow them to follow their own mind on that point, in a great measure?—I let the contracts, and if I am not satisfied with the working I discharge them as I think proper; we have not anybody to watch them on our part.

18,195. How deep is your steam engine under the adit level?—20 fathoms.

18,196. What depth have you extended east and west from that?—About 40 fathoms east. We have another drift way at 10 fathoms deep, where it is about the same distance east, and about 50 fathoms west.

18,197. How do you ventilate at the 40 fathoms?—From the horse level; we have several sumpts and shafts or pits, down to the 20 fathom level.

18,198. How far is the furthest end from any good air there?—We have plenty of good air.

18,199. But how far is your end off?—40 fathoms.

18,200. You have no communication to come back to the shaft?—No, excepting with the horse level.

18,201. How far is the communication into the horse level from the very end of the 40 fathom level?—It will be within 12 fathoms.

18,202. (*Mr. Holland.*) You have said that the men work six hours each set, in two sets?—We require them to work six hours.

18,203. At what hour do they go on?—At six in morning, and come out at 12; it takes them nearly an hour going and coming.

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18,204. At what time does the second set go in ?—They follow the first.

18,205. Immediately ?—Yes; they meet on the way.

18,206. And they work till 6 ?—Yes.

18,207. Then from 6 till 6 the mine is occupied ?—Yes.

18,208. And again from 6 to 6 it is unoccupied ?—Yes, in some parts, not in all parts of the mine. We have eight or nine miles of horse level.

18,209. Is the air much fresher at 6 in the morning than it is at 6 at night ?—In the whole mine we have not above three workings which are rather dull.

18,210. The difference is not very great ?—We have plenty of ventilation in our mines.

18,211. (*Mr. Kendall.*) Do you smelt your own ore ?—Yes.

18,212. What sort of health have the smelters ?—One of them died not 12 months since, and he was about 64; and he was a smelter from nine years of age.

18,213. His health was very good ?—Yes; his father was a smelter, and he lived till he was between 70 and 80.

18,214. (*Mr. Leveson Gower.*) Is the smelting done in the open air ?—No, it is covered up.

18,215. Are the dressers covered over ?—No.

18,216. (*Chairman.*) You said that the pumping engine pit was 20 fathoms below the horse level ?—Yes.

18,217. Is it at the mouth of a level ?—No; it is up in the middle part of the mine; we go up the horse level to it.

18,218. Have you ever observed whether there is any particular draft coming to that fire of the engine ?—There is of course a very good draught to the engine.

18,219. Do you think that it is of any use in ventilating the mine ?—We should not require it at all for working the mine if it was stopped up.

18,220. Is there an excess of draught along that level where the fire is ?—There is rather more just about where the fire is, but it does not make so much difference in the other levels; if you go even 40 or 50 yards from it, it does not make much difference.

18,221. You do not think that it acts as aiding the draught in the level ?—We have plenty of air without it; quite sufficient for any purposes.

18,222. (*Mr. Kendall.*) Where is your engine placed ?—Even with the adit level.

18,223. At the surface or in the mine ?—In the mine; it is even with the horse level.

18,224. How far in ?—About three quarters of a mile; and from the surface down to where this engine is placed it is about 60 fathoms deep.

18,225. (*Chairman.*) Has there been any occasion when the men have had to leave their work from any bad air occurring in the mine ?—What we call for want of air ?

18,226. Yes.—By chance; but it is very rare that we have anything of that kind.

18,227. In which description of bed is it more difficult to ventilate ?—In the shales and grit beds; I think they require a better ventilation than even the limestone does.

18,228. (*Mr. Leveson Gower.*) Do you extract fume from the chimney ?—We have a short horizontal chimney, but it is only a short one, it is not more than 30 or 40 yards; we clean it out once a year, or something of that sort. We have one miner now working 75 years of age who has been a miner all his life, and we have several from 60 to 70.

18,229. (*Chairman.*) How often are the men paid ?—We pay them every month.

18,230. And you clear off every month ?—Yes.

18,231. (*Mr. Holland.*) Are they paid for the current month ?—For instance, we clear off about the end every month, and we pay them on the third Wednesday in every month.

18,232. For the previous month ?—Yes; for February we shall pay on the third Wednesday in March; we only keep about a week in hand.

The witness withdrew.

Mr. WILLIAM BARRON examined.

Mr. W. Barron.

18,233. (*Chairman.*) Of what mine have you charge ?—Craven Moor.

18,234. Any other ?—No.

18,235. What number of men have you working underground ?—40.

18,236. How do the men go to the work ?—They go down ladders chiefly.

18,237. They go down a shaft ?—Yes, 56 fathoms.

18,238. How many shafts have you ?—One.

18,239. Is it bratticed in the middle ?—Yes; we have one shaft divided into three; we have two drawing shafts and one climbing road for the men as well.

18,240. How many levels are you driving from the shaft ?—We are driving two at present.

18,241. How far is the forehead from the mouth of the shaft ?—About 150 fathoms west at 42 fathoms deep.

18,242. How do you get air at thatend ?—The Old Man has worked it for several years before; it is a very ancient mine, and we hole up into his workings; there are other shafts from different workings, so that we can come out very near any place, viz., Woodhouse shaft, Longthem shaft, Derby shaft, and Cockhill level.

18,243. From these levels you hole up into the Old Man's workings ?—Yes; what we call rises.

18,244. What distance do you carry a level before you think it necessary to put in a rise to the Old Man's workings ?—It depends upon the metal; if we have good batches of metal we cut it all out and get the ventilation behind us.

18,245. When you drive by the fathom, how far would you drive ?—By using good zinc pipes we can drive 100 or 200 fathoms and sometimes 300, with fans or pressure of water confined to pipes.

18,246. Do zinc pipes decay ?—No, I have not found any decay.

18,247. How are the fans driven ?—By water wheel generally. None at Craven Moor.

18,248. What do you use ?—A trap door.

18,249. What size are the zinc pipes ?—From four to six inches.

18,250. And that gives you sufficient air without having a fan ?—Yes, for the distance that we drive.

18,251. Where you put the trap door, is the air which is diverted by the trap door from the bratticed shaft or from an Old Man's working ?—From a level; we have a level which comes in from the Cockhill mines to take all the water out, a depth of 56 fathoms; and we have a thorough communication of air both into the bratticed shaft and the other way. We put a trap door in the main level, and in a change of wind we have it both ways.

18,252. Then I suppose that the up-cast is dependant upon the weather ?—Yes; sometimes it draws down the level and sometimes it comes up the level and shaft, and it acts in the same way in the pipes; it is sometimes like a pump forcing the air in, and sometimes it is drawing it out; but the furthest level at present is only 48 fathoms from the trap door of main level.

18,253. And you find the air perfectly good ?—Perfectly.

18,254. How do you ascertain that ?—By the candle.

18,255. Not in any other way ?—No; we never think of anything of the kind; if the candle will burn straight up without slanting it, we consider that quite good and safe.

18,256. Supposing you were obliged to incline the candle, what should you do ?—We should leave off for a day.

18,257. Have you ever had to do that ?—No, never at Craven Moor.

18,258. Have you worked as a miner yourself?—Yes.

18,259. In what mines?—In the county of Durham mines; and I have worked at Rookhope, at Brandon Walls mines, the Derwent mines, Healyfield, and Silvertonnge mines, and I have been at Greenside mines in Westmoreland; I was agent there for four and a half years.

18,260. How long have the Craven Moor mines been working?—I believe about eight years by the present cess. I have been here about five years.

18,261. Is a deduction made from the men for candles and powder?—We let the contracts and keep a store and find all these things, and we take it off their money, but we calculate powder and candles. Not in average of wages.

18,262. What have the men to pay for candles?—7*d.* a lb., and 7*d.* a lb. for powder.

18,263. Are there any other deductions?—We find work tools as well, and we deduct 6*d.* a pound for the wear and tear.

18,264. (*Mr Holland.*) Is there any peculiar disease among the miners?—Not in our parts at all.

18,265. Are they as healthy as other labourers?—I think that they are; we have one man 75 years of age.

18,266. But take them as a body, is there any asthma among them?—There is some, but very little.

18,267. Is there more than among agricultural labourers?—Yes, in any mine there is a little more than that; but I think that in the limestone district there is very little difference between them and the agricultural labourers, as they only work six hours per day, and all get home to their own houses.

18,268. Do they look as young as other men of their age?—Yes.

18,269. (*Sir Philip Egerton.*) I think you say that the men go to their work by ladders?—Yes.

18,270. Is it usual in this district to have ladders?—A good many of the miners in this district go in by ladders.

18,271. Which do the men prefer, ladders or stemples?—Ladders; but I do not prefer having the ladders so long, because when you put in a ladder 20 or 30 feet long you make a stage, so that when a man gets up it, it is a little bit of relief.

18,272. (*Mr. Holland.*) You make a little slope?—Yes.

18,273. (*Sir Philip Egerton.*) As to the difference of expense between ladders and stemples, which do you suppose are the most costly to put up?—I should think that ladders in a permanent shaft would be considerably cheaper.

18,274. Do you think that they are safer than stemples?—Yes, a long way; I am confident of it.

18,275. (*Mr. Kendall.*) Have you ever been in a mine where stemples had been used, and where they had been done away with and ladders introduced?—In all the permanent roads (and I have been a miner since I was seven years of age) there have been ladders; but in little temporary roads which are wanted only for a few months you merely put in a few stemples, because it is not worth while to put in ladders.

18,276. (*Sir Philip Egerton.*) You mean in the rises where you want them for access?—Yes.

18,277. (*Mr. Leveson Gower.*) Do you ever use stemples in those cases?—Yes; sometimes we put in a ladder if it is likely to be a permanent road.

18,278. (*Mr. Kendall.*) Did you ever know a case where a miner quarreled with the ladders, but where after the use of ladders he preferred them to stemples?—No, I never heard of men making any objection to a ladder.

18,279. (*Mr. Holland.*) If ladders were put too long the men perhaps would object?—I think it is dangerous.

18,280. And is it not laborious?—Yes.

18,281. It is very hard work?—Yes.

18,282. (*Mr. Kendall.*) How frequently are there rests in your ladders generally?—From 21 to 30 feet.

18,283. What is the size of the hole through which the men go down?—Two feet.

18,284. The whole of the rest is covered over?—Yes.

18,285. (*Mr. Holland.*) How long is the floor?—It depends upon the size of the shaft; our shaft is six feet, and we slant the ladder.

18,286. You have a slant of about 5 feet in every 30?—Above three feet.

18,287. That is very steep?—No; the first ten fathoms that we go down we go right down one ladder almost.

18,288. (*Sir Philip Egerton.*) In case of a man missing his hold, are your stages strong enough to prevent his falling?—Yes, quite.

18,289. (*Chairman.*) Have you any accidents from blasting in your mine?—Not here; not much in the limestone. It is a very safe thing for that.

18,290. Is it the same in other strata?—No, not in the grit stone or the blue slate rock, or anything of that sort; it is more dangerous there. I should recommend copper prickers to be compelled to be used at those places.

18,291. Would it not be equally dangerous with the jumper or the tamping rod?—No, not with the tamping rod. With a copper pricker and an iron tamping rod very few accidents occur.

18,292. (*Mr. Holland.*) What is your tamping material?—Merely shale or a little barita.

18,292*a.* Is there that in the mine?—Yes; but we generally use shale.

18,293. (*Chairman.*) Do you use fuses at all?—No, we use at straws; we only use a fuse where it is very wet; it makes too much smoke when it can be done without.

18,294. (*Sir Philip Egerton.*) Do you use small powder or large powder?—Both kinds. The small powder is generally used where it is dry work, and the other when it is very wet.

18,295. (*Chairman.*) What do you think the most injurious thing to the miners' breathing besides the bad air?—I do not think that powder smoke is a very injurious thing, but still if you have too much of it you spit a deal of black when you come out. I would recommend a squib wherever it can be used for the sake of making less smoke.

18,296. (*Mr. Holland.*) What description of match do you use?—A slow match made of paper with grease from the candle.

The witness withdrew.

Mr. BENJAMIN CALVERT examined.

18,297. (*Chairman.*) Of what mine have you charge?—The Nedderdale Mining Company.

18,298. How many workings does that comprise?—Only three at present.

18,299. Which is the most extensive of those three?—The adit level.

18,300. What length is that adit level?—Perhaps from 700 to 800 fathoms.

18,301. What number of men are working?—Six.

18,302. How many are working underground altogether?—Six in the adit, and two fours in the other workings.

18,303. Do you communicate with any of the Old Man's workings?—No, it is a new thing; it is maiden ground. We shall have to do so by and by, but it will be sometime first.

18,304. What communication have you with the surface besides the adit level?—We have two communications; we have one very recently put through

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near to the head of the adit level; we have another about 100 or 150 fathoms further back.

18,305. In driving, before you put up this last rise to the surface, was the air at all close?—Very much so at times.

18,306. How long were you getting the rise up?—From 5 to 6 months.

18,307. During that time what means of ventilation did you provide?—We had a very powerful water blast, but that water blast was not sufficient to keep the bad air clear continuously; and we had a double communication as well. We had two sets of tubes up into a rise to help us to get this rise put through to another top level; but at times, for four or five days, the air was so bad that no one living could get in.

18,308. Then the men were obliged to leave off work?—Yes, of course. A candle would not burn, and a man could not live.

18,309. Do you think that that was affected by the weather?—Yes; altogether by the weather.

18,310. How often did that happen?—I think that happened, we will say, three times in the five months.

18,311. Has the new shaft completely remedied that evil?—Yes; we have had to put up doors to quench the air; we could not keep a candle in. We could not get up and down after we got the communication complete; and so we have had small doors put in to prevent that.

18,312. Had you to pay the men higher?—Yes, occasionally; because they must have something to live on, and so we had to give them an extravagant price to get this rise put through. Since that we have reduced the prices.

18,313. The men are always willing to work if you paid them for it?—Yes; they were willing to work when they could; but when they could not it was impossible.

18,314. Do you think that the men suffered at all from working there?—There was no compulsion used. If they had been forced to go in, and to remain in as long as they really could, they would have suffered; but I do not think that they suffered materially at all. If they had continued for a length of time there is no doubt of their suffering. I know that they would have suffered.

18,315. Were they off work from suffering during that time, or were they always able to come as soon as the place would admit of it?—They were always able to come as soon as the place would admit of it; there was nothing to prevent them.

18,316. Do you think that there was any carbonic acid gas generated in the mine, or that it was from want of air?—It was from want of it; but the damp was so strong, that if you had stopped too long you would have fallen down the same as a crow being shot out of a tree.

18,317. Was it worse at the top of the level or the lower part of the level?—It was generally the worst up above; it was owing to some different beds that we had to go through.

18,318. What were the beds through which you were driving before you got the last rise?—In this place it is all shale and grit.

18,319. Do you think that that is worse for ventilation?—Yes, no doubt of it.

18,320. Why do you think that it is worse for ventilation?—It contains more sulphur.

18,321. Have you worked as a miner yourself?—I have been in the mines now for something like 48 years.

18,322. How long as a miner?—I worked for, it may be, 27 years. Since that I have been engaged as agent.

18,323. How do the men go into the mine; by the adit level?—They can take either way now. There is very good accommodation either way.

18,324. Have you ladders or stemples?—We have only stemples at present.

18,325. Have you worked in mines where there were ladders?—Yes.

18,326. Which do you prefer?—I prefer ladders.

18,327. Do you think that the men generally prefer stemples or ladders?—A good many of the men prefer stemples; I do not. As an agent I prefer ladders.

18,328. Did you begin to work with ladders or with stemples?—Stemples.

18,329. And when you had to work with ladders did you object?—I did not much like them at first.

18,330. And after a time, having tried the ladders, you preferred them to the stemples?—I prefer them decidedly.

18,331. (*Mr. Holland.*) How long was it before you got to like the ladders?—In a few weeks. They are safer.

18,332. (*Mr. Leveson Gower.*) Why do you not put up ladders yourself now?—I believe that we shall; but two parts out of three is what we call a slant rise, and there is only about 12 fathoms plum; and I think that we shall put in ladders after we have got it complete; but we have some water to take off at present. To make the thing more complete, I should recommend ladders into any place.

18,333. (*Chairman.*) Is yours a wet or a dry mine?—Some odd places are rather wet, but it is not generally wet like some places that I have been accustomed to.

18,334. Do the men get wet in working there?—No, not much.

18,335. Is there much dust in any part?—No; there is not much dust either.

18,336. Have you ever any accidents from blasting?—No; we have not had one that I can remember.

18,337. Have you ever known of an accident from blasting when you have been working in a mine?—I have only known one in our district, and that was 40 years ago.

18,338. (*Mr. Holland.*) Do you fire your blasts by means of greased paper?—They do it chiefly by straw.

18,339. Is the straw lighted by a piece of greased paper?—Yes; a greased match.

18,340. Does that burn pretty regularly?—It depends upon the making of it. If it is twisted too tight it cannot burn, when it burns very slowly.

18,341. Does it ever burn unexpectedly fast?—No, I do not know that it does; not too quick.

18,342. But sometimes too slow?—It is sometimes too slow.

18,343. Does it ever miss fire?—The straw sometimes does.

18,344. But the match does not, does it?—Sometimes it does go out.

18,345. When the straw misses fire do you hole it out again?—We generally try to get it out and put in a second one.

18,346. Can you get it out safely?—Yes, with a straw you might.

18,347. Does it ever fire when you are getting it out?—No; but if you cannot get your straw down sufficiently, and have to bore it out, there is a risk.

18,348. Do you believe that the powder in that case can be got out dry?—Very often when it does not go it is on account of the damp, and on account of getting wet, and there is no danger if it is wet in boring it out again.

18,349. You trust to that, do you?—Yes; that is trusted to, and perhaps rather too much.

18,350. Do you consider miners much more unhealthy than other workmen in this district?—I do not know; a good deal depends upon men working continually in certain sorts of works, in a close heading where they are working continuously for years and years, it does injure them a little.

18,351. Do they look considerably older than other men of the same age?—I do not see that they do.

18,352. (*Mr. Leveson Gower.*) Have you ever known of any accident from the use of stemples?—Yes, I have.

18,353. How many?—One.

18,354. Was it fatal?—No, it was not fatal.

The witness withdrew.

Mr. Joseph Broad Champion examined.

18,355. (*Chairman.*) Of what mine have you charge?—Merryfield Mine.

18,356. Have you ever worked as a miner yourself?—Yes.

18,357. For how many years?—About six years.

18,358. How long have you been agent of the Merryfield Mine?—I have been there near about three years now.

18,359. How many men have you employed underground?—18.

18,360. What is the strata in which you find the ore principally?—It is principally between shale and grit.

18,361. Is it mostly picking or blasting?—Generally blasting, I think.

18,362. How many levels have you?—Two.

18,363. Which is the longest?—The adit level is the longest.

18,364. What is the length of it?—About 900 fathoms.

18,365. Do you communicate with the Old Man's workings?—We have not opened up the Old Man's workings.

18,366. How many rises have you in the course of that level?—We have three shafts from the surface.

18,367. How far is the forehead from the last shaft?—Merryfield level is communicated with Storney Groves level, and they carry the level forward.

18,368. How far is where you are working now at the forehead from the shaft?—About 20 fathoms.

18,369. Have you any difficulty in ventilation at that point?—No, not in the least.

18,370. Do the candles burn quite well?—Yes.

18,371. How far shall you drive before you put up another rise?—About 10 fathoms further; 30 fathoms we propose.

18,372. You think that you may drive 30 fathoms safely?—We could; but I think that in grit 30 fathoms is quite sufficient for the men to have good air.

18,373. There is more difficulty in getting good air in grit and shale than in limestone?—Yes; I think that there is.

18,374. Since you have been working there, have you ever had occasion to employ any artificial means for throwing in air?—Yes; we opened out the level 600 fathoms with air pipes alone.

18,375. Had you any means of throwing air into the air pipes?—Yes; we had a 40-fathom water blast.

18,376. Did you find it quite sufficient?—Yes.

18,377. What size was the pipe?—Eight inches.

18,378. Was it zinc or wood?—Zinc.

18,379. Does the zinc decay or corrode at all?—Yes; the water did decay it. I suppose that it was sulphuric acid coming from the sulphur which decayed the pipe.

18,380. How long do you think that they would last?—They last a great number of years with care.

18,381. But if they decay at points, the air escapes without coming on to the end, does not it?—Yes; and then we lap it with flannel.

18,382. You have to try it constantly?—Yes; we tried it in fact every day.

19,383. Do the men have extra pipes to carry on to where they are working?—Yes; they keep it on as close as possible.

18,384. How far is the mouth of the pipe generally from where they are blasting?—Generally about two or three fathoms; the pipes are nine feet long.

18,385. Have you ever any accidents from blasting?—No.

18,386. Do you make a deduction from the men for candles and powder?—Yes.

18,387. What do the pay for candles?—7*d.* a lb. as a general rule.

18,388. And how much for powder?—9*d.*

18,389. Do the men all go in by the levels?—Some go in by the levels and some go down by a ladder.

18,390. Have you ladders or stemples?—Ladders.

18,391. Do the men prefer the ladders to the stemples?—Yes.

18,392. Have you no stemples in any part?—We have no stemples.

18,393. (*Mr. Holland.*) You have said that the zinc pipes frequently decay; is that at the point where they are supported?—No; it is generally where there is a drop of water coming down from an old working.

18,394. How are the zinc pipes supported, upon holdfasts?—Yes.

18,395. Iron holdfasts?—Yes.

18,396. Is there anything between the iron and the pipe?—Yes; flannel.

18,397. Does that last pretty well?—Yes; it lasts very well.

18,398. It keeps them apart for a long time?—Yes.

18,399. Do you think that flannel is as good as wood for that purpose?—Yes; I think so.

18,400. Do you think that it lasts as long?—Yes; quite as long, I think.

The witness withdrew.

Mr. Henry Daykin examined.

18,401. (*Chairman.*) You are underground agent for the Grassington mines?—Yes.

18,402. How long have you been so?—I have been connected with Grassington and Cononley mines for 50 years.

18,403. Were you originally working in the mines?—Yes; have been agent eleven years.

18,404. How many men have you working underground now in Grassington mines?—About 76, I believe.

18,405. They are scattered about very much?—Yes; very much.

18,406. Do the men mostly work by the bing or by the fathom?—By the fathom; and so much a ton when we are working in pitch ground; it is not a custom in this country to work by bing; not in Grassington mines.

18,407. In what strata is the principal ore?—Grit.

18,408. Do the men suffer at all from the dust in grit in their breathing?—I should say that they will a little.

18,409. Do they work by blasting, or is there any work by pick?—Both ways.

18,410. Are the men working by pick more subject to dust?—No; I should say not.

18,411. In Grassington mines are all the workings in connection with the Old Man's workings?—Yes. Not all; some veins have been worked, not being connected with any of the Old Man's workings. I have not been in Grassington mines all that time. I was eleven years in Cononley Mine. I was a year and a half abroad.

18,412. Have you ever had occasion to employ artificial ventilation?—Many times; we are doing that now.

18,413. What means do you use?—In general we use a machine—a fan.

18,414. A hand machine?—Yes.

18,415. Is it a part of the contract that the boy who drives the fan is to be paid by the men?—No; the master always pays him.

18,416. Do you judge when it is necessary or do the men apply to you?—We judge when it is necessary; it depends upon the air; in some places we can work longer without employing artificial air than in others; it depends a good deal upon the sort of ground which it is, whether it is hard or soft.

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18,417. Supposing that the men could not get a boy to drive the fan, would they stop their work?—Yes; they could not work without air; we always have boys, and we always get plenty of boys; we have a great many applications to employ boys, more than we can employ.

18,418. At what age do they drive?—Fourteen or fifteen, and so on.

18,419. Does it never happen that the men go on working, and the boy leaves the work?—The boys will sometimes play a bit, and the men have to get them to come back to work many times; they very soon know when the machine stops; boys are boys, and they will play a bit sometimes.

18,420. And leave the machine?—Yes.

18,421. (*Mr. Holland.*) The men find it out in an instant, do not they?—Yes.

18,422. (*Chairman.*) Supposing that the boy left the work, the men would go on working for the rest of that day, probably without him?—They would be very much inconvenienced if they did so.

18,423. But still they would probably do so if the boy had left the work?—Yes; unless it was very bad; if it was very bad they would come away.

18,424. But if not, they would continue at work?—Yes.

18,425. Had you any complaint from the men after I inspected the mine, that the boy had left?—No; I do not know that I had. The boy sometimes stops for a few minutes.

18,426. Do you use much timber in your mine?—In some places we do, and in some places we do not want any.

18,427. Do you judge when it is necessary to timber, or do the men apply for it?—The men know as well as we do.

18,428. And can they always get it?—Always; they have access to it at any time. We have plenty of timber, and the men always have it to go to when they want it; sometimes we will scold them for not taking it; sometimes they work where it ought to be put up, and it is not put up.

18,429. Do you fine the men at all for anything?—We do for bad conduct.

18,430. Supposing that a man was working where timber ought to have been put up, and where it was dangerous to work without it, and he had not applied for it, should you fine him?—No; we have never done so to my knowledge.

18,431. But you would find fault with him?—Yes.

18,432. From the fear of being found fault with is it likely that he would make an excuse that he could not get it?—I should think that he would not, seeing that it was there knowing that he could get it, because we have always plenty ready.

18,433. You always have it ready sawn?—Yes.

18,434. Then if a man stated that he could not get it, that no timber was sawn, you think that that would only be an excuse?—Yes; we have always plenty of timber on hand. I never saw a better place.

18,435. The men do suffer from working under ground I suppose?—I should say that they will.

18,436. What do you think they principally suffer from?—I should think from the grit dust, that that is the worst; that is my opinion of it.

18,437. More than from any want of air?—Yes, I think so.

18,438. Do the men enter the workings by the level, or do they go down by ladders or stemples?—By ladders, in our mines.

18,439. In some parts of the rises is it by stemples?—Underground some of the rises have stemples and some of them have ladders.

18,440. Do you go down sometimes by windlass?—Not much; perhaps we do while we are sinking, but afterwards we generally put ladders down.

18,441. Which do you think best, stemples or ladders?—I should say ladders.

18,442. (*Mr. Holland.*) Is there any doubt of that?—No, there is no doubt of it in my own mind. I have been used to both, but I should prefer ladders myself.

18,443. Why?—Both for speed and for safety too.

18,444. And ease of climbing?—You can make it easy both in climbing ladders and stemples too, it depends upon the speed.

18,445. (*Mr. Leveson Gower.*) Have you ever known any accident from the use of stemples?—I have known a leg or two broken.

18,446. You have known no fatal accident?—No, never in my life.

18,447. (*Mr. Holland.*) Have you known any accident from ladders?—Only slight ones, nothing of any importance.

18,448. No broken bones?—A broken leg, or something of that kind. I know a boy, who not long since, had his leg broken through falling from a ladder.

14,449. (*Chairman.*) At the end of each ladder is it covered over?—We have what we call a ladder soller, and a manhole through.

14,450. (*Mr. Holland.*) At what distance are your sollers generally from each other?—Perhaps four fathoms.

14,451. How long are the sollers generally?—It depends upon the width of the place.

18,452. What is it generally?—Perhaps 6 feet long by 3 feet 6 in width, something of that sort; but in the main shafts they are larger.

18,453. What is the usual length?—6 feet by 3 feet 6.

18,454. You said that you used fans for driving air in?—Yes.

18,455. Is there any doubt about the economy of using those fans?—We consider them the best of anything here, unless we can bring water to bear.

18,456. Is there any doubt that it is cheaper to drive air in than to let the men be short of air?—It must be cheaper, they could not work in bad air.

18,457. Do you use those fans before the air gets so bad as to affect the candle?—No; it depends a good deal upon the place where we are working; if it is hard ground we require a fan sooner, we cannot go far, but in ground which can be worked with a pick we should go further.

18,458. Is the fact of the candle beginning to grow dim your mark of the want of air?—Yes, generally, and the breathing.

13,459. Do you use a fan before you find it out by the candle?—No, I cannot say that we do.

18,460. Would it not be profitable to do so?—I cannot say; many men would want it when perhaps there was no occasion for it.

18,461. Cannot men do a better day's work when the air is good than when it is poor?—Yes.

18,462. What is the pay for working a fan?—We have two boys now working a machine, one of whom has 1*s.* 1*d.* and the other 1*s.*

18,463. Does one boy work as long as the men work?—Yes.

18,464. That is 1*s.* for the pair?—Yes; 1*s.* each boy per shift or day of eight hours.

18,465. Are the men of that shift able to earn more than 1*s.* because of the air?—Yes; I should say so.

18,466. There is no doubt if it is there?—Not a bit of doubt of it.

18,467. Then would it not be well to give these men who wish for more air, the air which they wish for, though it is not strictly wanted?—If they have sufficient air to work with we think that all that is necessary.

18,468. But if they could work better with more air, would it not be more profitable to let them have it?—But I do not know that they could.

18,469. You think that sometimes the men would ask for it when it was of no use at all?—Yes, many a time.

18,470. (*Sir Philip Egerton.*) What is the condition

of your working miners; are they a sober race?—They are very sober men here; there are exceptions.

18,471. Have they comfortable homes?—Very comfortable, I should say, for the most part.

18,472. What sort of distance have they to come to work?—I should say that it would be three miles from this village up to some of our places.

11,473. Do they walk three miles there and back?—Yes.

18,474. Do they take their dinners with them?—Yes.

18,475. Have you any places appointed for them to change their clothes?—We had a place on purpose, since I have been agent here, and they would not use it.

18,476. Then they walk home in the clothes in which they have been working?—Yes, they do.

18,477. It is not a very wet mine, is it?—No; it is a very dry mine.

18,478. There is not much drip from above?—No, not much. In sinking shafts or anything of that sort, there is dropping, but it is a very dry mine over head.

18,479. Do the men generally live pretty well?—Both ways I should say.

18,480. Do the single men take lodgings with the married cottagers, or have they cottages of their own?—Some do, who have not parents to live with; some live with their parents at home until they get married, and those who have no parents lodge with other people.

18,481. Have any of the miners gardens or land attached to their cottages?—Some few, but not many here.

18,482. (*Mr. Kendall.*) What is generally the size of the vein in your mine?—It varies very much.

18,483. From what to what?—We have one vein, I should say, six or seven fathoms wide; indeed, I have seen it so myself, and we have some no broader than two inches.

18,484. Where it is so very wide, is it rich?—Yes, in some places.

18,485. Where is the richest part now?—We have no rich place working at present; it is very poor now.

18,486. But you have had rich deposits?—Yes.

18,487. Where have you found those rich deposits principally?—In veins two or three feet wide, and some as far as six, and some as far as 14 have been very good.

18,488. How many tons of ore have you ever raised in one fathom?—I should say that we had one place, since I have come here, where we got 9 tons in one fathom.

18,489. What was it worth a ton, 20*l.*?—Not in ore.

18,490. Would the ore produce lead of 20*l.* a ton?—Yes, lead.

18,491. What is the produce of that ore?—75 per cent.; we sold some of it for pottery ore.

18,492. Do you find any difference in the air according to whether there is plenty of ore or not?—No, I cannot say that we do.

18,493. There is no difference whether you are working in a quantity of grit or lime, or where there is a quantity of lead?—It is better ore in lime.

18,494. But you see no practical difference as far as the air goes?—No.

18,495. (*Mr. Holland.*) Are any of your levels particularly hot?—No.

18,496. They never get above summer heat?—No; nor up to summer heat.

The witness withdrew.

Mr. WILLIAM CRAIG examined.

18,497. (*Chairman.*) Will you name the mines of which you have charge?—I have the superintendence of two or three mines in Wensleydale, and one or two in the neighbourhood of Kettlewell. I superintend mines in the higher part of Wensleydale belonging to the Wensleydale Mining Company.

18,498. What are the names of the mines?—They are called Hawes and Bainbridge. Then I am connected with another mine at Woodhall, near Askrigg in Wensleydale.

18,499. Those mines at Kettlewell are small workings?—Yes.

18,500. Which are the largest working with which you are connected?—Those in Wensleydale.

18,501. How many men have you working underground?—I can scarcely speak to that; I am only consulting engineer, and I have a brother up there. I should think that there are perhaps 100 men. I have three places which I superintend in Wensleydale, and three in Kettlewell.

18,502. Do you visit those mines occasionally?—Some I visit very frequently, and others only occasionally.

18,503. For the purpose of directing the workings?—Yes, generally.

18,504. (*Mr. Kendall.*) You do not set the work at all?—In some cases I set the work, and in others I only direct the work.

18,505. (*Chairman.*) Have you been for some time connected with mines?—I have been brought up to mines; I have been connected with mines for 45 years.

18,506. Is there more difficulty in working in one strata than in another?—Yes, occasionally.

18,507. In what respect?—We find that in the mountain limestone in this district we can drive and do with half the quantity of fresh air that we can in grit or shale; in grit or shale it requires more fresh air.

18,508. Is there any direct carbonic acid coming out of the rocks in any of those cases?—Yes; uphill we have a great deal of it, that is at Wearnside.

18,509. A good deal of carbonic acid comes out of the fissures of the rock?—Yes; particularly after we get under the millstone grit.

18,510. Does it come out so that it puts out the candle at once?—Sometimes I have seen it so that it has driven workmen out, and at other times we have sufficient air.

18,511. Is it affected by the weather?—Yes, I should say so, by the little changes which take place.

18,512. And this finds its way through fissures?—Yes, in some cases; not as a general rule.

18,513. Are the men obliged then to leave the work altogether?—In some cases I have known that they have had to do so.

18,514. What means do you use for remedying it?—If we have a deficiency of proper holes, or proper shafts, or second levels, and so on, we force the air by what we term a water blast, a pressure of water which throws it into a tank.

18,515. You think that that is the best mode?—It it is the best mode which I have tried; I do not know of any other.

18,516. When you have shafts do you observe that any shaft is more particularly an up-cast than another?—Not particularly; but when we have these changes of atmosphere our current of air changes; sometimes the shaft sucks down, as we term it, and at other times it draws up.

18,517. Would it not be an advantage to have one shaft as a permanent up-cast?—I think that it would not answer in lead mines.

18,518. Why not?—I think that we should have a pressure to contend with if we forced it one way in these changes of which we have been speaking, that if the air in the shaft was in the course of going down and you were forcing up, there would be a pressure against it—that is according to my experience. I am not aware of any benefit to be derived from it.

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Mr. W. Craig.

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18,519. In short, you could not well accomplish it?—It would make no difference whether it goes up the level or down the shaft, because we get the fresh air.

18,520. Is their no stagnation of air at times?—Not in any particular current; but we find the draughts sometimes very much stronger than at others.

18,521. When there is a change, owing to the change in the temperature of the atmosphere, are the men aware of it?—No, I do not know that they are; those are matters which they never notice particularly, except they are working at a great distance from a current of air, and then it affects them.

18,522. They would then discover that there was a change in the atmosphere?—Yes.

18,523. How would they discover it?—The air is not so clear.

18,524. Would they discover it by their own feelings or by the candles?—By the candles generally, that is generally their guide.

18,525. When it is in course of changing, the air is for a certain time stagnant, and will affect the men?—It perhaps does not work so quickly.

18,526 (*Mr. Leveson Gower.*) Dou you use stemples or ladders?—Generally ladders.

18,527. A witness from Swaledale told us that stemples were more economical to put up than ladders, because the stemples were used for supporting the side of the shaft; do you know any mines in which you think that that would be the case?—Yes; I have been in several mines where they climb by these stemples, and by the same timber which supports the shaft; but I decidedly think that it is better to have ladders.

The witness withdrew.

Mr. THOMAS WISEMAN examined.

M. T. Wiseman.

18,528. (*Chairman.*) You are the manager of the Appletree-wick Mine?—Yes.

18,529. Are you manager of any other mine?—No.

18,530. Have you ever worked in a mine yourself as a miner?—Yes.

18,531. For many years?—Yes.

18,532. In what district?—In Kettlewell.

18,533. The mines in the Kettlewell district are all small mines, are they not?—Very small mines.

18,534. Are a good many of them trial mines?—A good many of them.

18,535. Did you ever find the air bad in working these trial mines?—Yes; sometimes the air has been bad at Kettlewell, where we were trying.

18,536. How far have you ever driven a level from the surface where the air has become bad?—400 yards.

18,537. How did you find the air then to affect you?—We found it by the candles; the candles would not burn when the air was bad.

18,538. Did you see any of the men who were working with you suffer from that at all?—No, we did not.

18,539. Did you give up working there?—We would leave it for a few days, or for a week, till the air got good again, and then we would go back again.

18,540. Had you to leave it as much as a week?—I only remember once when we were a week; it was at hay time, and we were at hay, and we did not go for a week.

18,541. Had you ever to leave the work for a day and then go back again, or only for a short time?—Yes, we have had to leave for a day.

18,542. Was that quite sufficient to enable you to work?—Yes, quite sufficient.

18,543. The Appletree-wick Mine is quite a new mine, is it not?—It is.

18,544. Are you sinking?—No, we are driving a level.

18,545. What distance have you driven?—We have driven it 360 yards.

18,546. Is the air quite good there?—Quite good; we have three air shafts in that distance.

18,547. (*Mr. Holland.*) How far could you drive beyond an air shaft?—We have an air shaft close to the forehead.

18,548. (*Chairman.*) What is the distance between each of your air shafts?—80 yards.

18,549. (*Mr. Holland.*) You drove 80 yards beyond the air shaft?—Yes.

18,550. (*Chairman.*) Before you put up the last air shaft, when you were coming to the part where you put it in, was the air at all close?—No, not at all. The ore goes up to the surface and we take it out, and we keep taking it out.

18,551. (*Mr. Holland.*) It was not only an air shaft but also an exploring shaft?—Yes.

18,552. (*Chairman.*) Have you ever had to use any artificial means of ventilation?—Never.

18,553. Have you got on a good vein now?—Yes, it is a very good vein.

The witness withdrew.

Mr. THOMAS JOB examined.

Mr. T. Job.

18,554. (*Chairman.*) Of what mines have you charge in this district?—Only the Hebden Moor at present.

18,555. Have you worked as a miner yourself?—Yes, in Devonshire.

18,556. In what mine?—In Wheal Betsy, and also Wheal Friendship.

18,557. Have you worked in other mines?—Yes; I worked in Coniston mines in Lancashire, about six months 33 or 34 years ago.

18,558. Have you visited other mines?—Yes; both in Ireland and also in Derbyshire since I left there. I inspected them occasionally.

18,559. Have you been in mines where the stemples were used?—Yes, in Derbyshire.

18,560. To what depth of shafts?—I have seen stemples there 24 or 25 fathoms in depth.

18,561. Which do you think are preferable, stemples or ladders?—Ladders.

18,562. You have no doubt of it?—Not at all; they are more easy for climbing, and there is greater safety as well

18,563. What number of men have you working underground in Hebden Moor?—Nearly 50.

18,564. Are you connected with the Old Man's workings there?—It is quite a new field, there are no old workings to speak of. A level was formerly driven before we took on to it, but there were no old workings to interfere.

18,565. What is the longest level which you have driven from the day?—The longest level which goes from the day, which the former company and the present company have driven, is nearly 500 fathoms.

18,566. Are there many shafts communicating with the surface in that distance?—There are two levels from day; there is a level 20 fathoms above the lower one, and there are communications from the lower level to the upper level.

18,567. Are there shafts to the upper level?—No; we sank a shaft, but still it was of no benefit respecting the circulation of air, and it was of no advantage to us in drawing out the stuff.

18,568. So that now the ventilation is between the two levels?—Yes.

18,569. Do you find that quite sufficient?—Yes.

18,570. In what strata are you working there?—Sandstone or grit, and shale between the grit. There are two layers of grit, what we call the top grit and the bottom.

18,571. Do you find any difference in the ventilation according to the strata in which you are working ?—Yes, we do sometimes.

18,572. Which is the worst ?—When we have any great thickness of plate it is not altogether so good as it is in the grit, but there is no great thickness in general, not more than three to four fathoms between the grits.

18,573. Have you ever met with carbonic acid gas ?—We have met with foul air occasionally; it depends upon the atmosphere.

18,574. Can you describe any occasion when you have found carbonic acid gas coming out from the rock?—Yes ; we have just discovered it where there have been openings, or what we call crevices in the rock, and it will escape there occasionally; but then it will depend upon the atmosphere outside whether it has any effect or not, as to whether it is any detriment to the men, it will depend upon the point from which the wind is.

18,575. How do you discover it ?—By the candles not burning quite so well.

18,576. Have you ever heard it ?—We just hear a kind of a singing tone for a day or so sometimes before we should feel the effects of it.

18,577. (*Mr. Holland.*) Hissing out ?—Yes ; just coming out, that has been in the grit.

18,578. You hear it hissing out of the crevice, do you?—Yes, occasionally.

18,579. (*Chairman.*) Before you feel the effects of it ?—Yes.

18,580. Have the men to leave work on that occasion?—They are obliged to sometimes. We never allow them to work in a place where the candles will not burn.

18,581. You judge by the candle whether the air is bad or not ?—Yes.

18,582. What do the men pay for candles at Hebden Moor ?—About 7*d.* a pound.

18,583. How much for powder?—About 3*l.* a hundredweight.

18,584. Have you ever known any men suffer from working in mines?—No, not at Hebden Moor.

18,585. But have you in other mines ?—Yes ; I believe that in some cases they have suffered.

18,586. From your own knowledge do you know of any men who have suffered ?—Yes, from the time that I was a boy; in consequence of their working hard and in wet places, and not having been careful enough of themselves they have shortened their age.

18,587. Have they been broken winded ?—Yes ; it may have that effect sometimes. I have myself worked in places where it was very dusty, in Devonshire ; it was the gray slate strata there, and in some places it was very dry, and there it was worst; but if there was water and it was a wet place it had a tendency to prevent the dust from flying.

18,588. (*Mr. Holland.*) Are these mines as close to work in as the Devonshire mines ?—No; they are not so warm.

18,589. Do the candles burn better ?—No; I do not know that they burn better.

18,590. The difference is chiefly as to the temperature?—Yes; and they are not so deep. I have worked in 50 fathoms to 200 fathoms deep.

18,591. Have you any mines here 50 fathoms deep?—Yes, from the surface.

18,592. Did you ever work in any 50 fathoms deep from the surface in Devonshire ?—Yes.

18,593. Are the levels 50 fathoms from the surface here as hot as 50 fathoms from the surface in Devonshire ?—Yes, I think that they are.

18,594. Is the air similar ?—Yes, just the same, I think, when the same thing is laid out for ventilation.

18,595. Is the ventilation as good or as bad as it is in Devonshire ?—Just about the same.

18,596. Do you think that the miners are as healthy or more healthy here than in Devonshire ?—They are more healthy. A greater heat proceeds from a copper vein and also in the grey slate than in lime, from what I have proved from my own workings.

18,597. Do you see much effect from the carbonic acid which comes out when it is not enough to put out the candles ?—No ; but there would be an effect produced if the men worked in it for any length of time.

18,598. When it is not enough to affect the candles, do you think that it affects the men's health ?—I do not know that it does much.

18,599. When there is not enough carbonic acid to affect the candles, does it affect the men in their breathing ?—No, not much in breathing ; it affects the head a little.

18,600. Does it make the head ache ?—Yes, if the men continue to work in it many hours; but when it is like that they do not work long.

18,601. Does it ever gather so completely as to put out the candle if you put it at the bottom of the level ?—No.

18,602. Is your mine very dusty ?—Not particularly.

18,603. Do you think that the dust or the bad air affects the men most ?—Dust is very injurious, and bad air is also injurious; but I may say that they have not any bad air in Hebden Moor.

18,604. But you have dust ?—Yes, in dry places.

18,605. Does the dust make the men cough much ?—I think not.

18,606. Does it hurt them ?—It lodges upon the inside.

18,607. Do not they cough it up afterwards ?—We do not take any particular notice of that.

18,608. What particular injury do you think that it does ?—It may affect the lungs a little.

18,609. Have you noticed that it does affect the lungs ?—I judge from my own experience when I worked underground.

18,610. What effect had it upon you ?—If I worked in it I felt a tightness, a difficulty in breathing, if it was a close dry place.

18,611. How long did it last ?—A good emetic would clear it again.

18,612. But if you did not have an emetic, how long would it be before it would clear ?—Not long.

18,613. How long ?—It might take a day or two.

18,614. And during all that time you would feel a tightness ?—Yes, a little tightness.

18,615. That you think was from the dust ?—Yes.

18,616. Have you observed the same thing from poor air, not dusty ?—No.

18,617. What effect would that produce ?—You would feel a difficulty in breathing it when you were in it, but you would not feel it when you came out.

18,618. Have you felt all the strength out of you after working in bad air for some time ?—I have felt deprived of a part of my strength ; you would not feel so fresh.

18,619. (*Mr. Leveson Gower.*) Do you know any lead mines in Derbyshire ?—Yes.

18,620. Do you consider the men here to be more healthy than the men working in the lead mines in Derbyshire ?—No, I do not think that they are more healthy, because it was limestone in Derbyshire.

18,621. (*Sir Philip Egerton.*) How many levels have you ?—We have two that go in and come out at the surface, but we have three inside.

18,622. In which are you working now ?—What we call the low bottom and the middle level.

18,623. Do you find any difference in the air in the middle level and the lower level ; which is best ?—It depends upon the distance which is driven. At this time we have good air in both levels.

18,624. What distance are you working now from the air shaft ?—One level is in about 40 fathoms, and the other about 30.

18,625. Is the ventilation natural, or do you use artificial means of ventilation ?—It is natural.

18,626. And it is very good in both levels ?—It is pretty good.

18,627. Which is the best ?—At this time the middle level is best, although it is extended the farthest.

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18,628. Has the air in the middle level been heretofore bad ?—No.

18,629. Never ?—Occasionally when the damp has come out. When the gentleman came here to test the air, we could not carry a candle in the level.

18,630. What do you mean by "damp"?—The foul air coming out through the crevices.

18,631. That is your name for the foul air which you have described in your evidence ?—Yes.

18,632. (*Mr. Holland.*) Do you call it cold damp ?—No, we call it damp.

18,633. (*Sir Philip Egerton.*) But you do not feel any ill effects from that now where you are working in the middle level ?—No.

18,634. (*Mr Kendall.*) How long have you abandoned work on account of the damp ?—I think two days.

18,635. Have you ever abandoned it before on the same account ?—Yes.

18,636. How frequently ?—We have had to abandon it twice since January, for about two or three days each time.

18,637. After two or three days is the air very good ?—Yes.

18,638. After this oozing out ceases ?—Yes.

18,639. Have you worked in Cornish mines ?—I have worked in Devonshire the adjoining county.

18,640. Are you a Devonshire man ?—Yes.

18,641. Are the wages higher here than in Devonshire ?—At this time the wages are much the same as they were when I left Devonshire.

18,642. Are the miners more sober here than they are in Devonshire, or just the same?—Just the same.

18,643. Do they live better here than in Devonshire ?—I think not; their diet is different from what it is in Devonshire.

18,644. Which do you think is the best diet, you having tried both ?—In Devonshire they use fried potatoes and bacon; but here they make use of porridge made of oatmeal; it is a very good food, but I do not make much use of it myself, I eat a little oatcake.

18,645. What age are you now ?—58.

18,646. How old were you when you began working as a miner ?—12 years.

18,647. Do you find yourself strong now ?—Yes.

18,648. You are as able to do your work as another agent ?—Yes.

18,649. You can go up and down anywhere ?—I cannot go quite so well as I could ten years ago.

18,650. Can you go any depth now ?—I cannot go any depth.

18,651. How deep do you go down ?—Our mine is not very deep; we have the benefit of going in the levels.

18,652. Still you are strong and healthy ?—Yes.

18,653. (*Mr. Holland.*) Should you like to climb 200 fathoms ?—No, I found that enough before I left Devonshire; 22 years ago.

18,654. (*Sir Philip Egerton.*) Do you like ladders or stemples ?—Ladders.

The witness withdrew.

Mr. JAMES RAY EDDY examined.

Mr. J. R. Eddy.

18,655. (*Chairman.*) I believe that you are the Duke of Devonshire's mineral agent ?—Yes.

18,656. For which mines ?—For the Grassington and the Cononley mines, the Duke works, and his mineral property generally.

18,657. Have you charge of other mines in other parts ?—I have charge of the Snailbeach lead mines in Shropshire, about 12 miles south-west of Shrewsbury.

18,658. Are they large workings ?—Very large.

18,659. Have you during all your life had more or less to do with mines ?—I have been here continuously for ten years, before that I was three years with a civil engineer, and before that again I was with my father in the office.

18,660. (*Mr. Kendall.*) Your father held the same situation as you now hold ?—Yes; he was the mineral agent to the Earl of Burlington and the Duke of Devonshire before the titles became merged. I also manage the Alport mines in Derbyshire for a company, and the Burlington slate works in North Lancashire for the Duke; the Duke works the latter himself.

18,661. (*Chairman.*) You smelt the ore at Grassington ?—Yes; we smelt all the ore here, and do likewise at Cononley and at Snailbeach.

18,662. You have turned your attention particularly to the smelting ?—Yes; I paid particular attention to the smelting in the early part of my time here.

18,663. Do you think that it is very efficiently done ?—I believe that the smelting at Grassington is as perfect as it is possible to make it, indeed it is acknowledged by large smelters to be better than theirs; but it arises from the simple fact that our men here have been for so long a time accustomed to one class of minerals only that they are quite masters of the thing, whereas at other works where they buy all classes of ore, it is a continuous change.

18,664. Do you work by water power or by steam power ?—At Grassington it is all water power; at Cononley there is one steam engine for winding, crushing, and pumping.

18,665. You make extensive use of the wire rope ?—Most extensive.

18,666. For all your drawing ?—Yes.

18,667. And for drawing at all angles ?—Yes. I have brought with me specimens of different wire ropes which have done service. This rope (*producing a specimen*) has six strands of six wires, No. 12; it is one of Newall's, made in 1844, it has let down about 200,000 tons upon a self-acting incline, 60 yards short of one mile long, independently of the waggons, which would amount to about 18,000 tons besides. That rope never broke in 14 years workings. We took it off thinking that it had done enough duty. I have tried to keep within the mark in the figures which I have given, and I think that it would turn out to be more if properly gone into.

18,668. Your experience of wire rope is that it is more economical to use than chains ?—There is no comparison.

18,669. And how is it with regard to hempen ropes?—We could not work hempen ropes where we work these wire ropes on account of their dead weight. In the rope which I have produced there are six strands of six wires, No. 12, that is what we used to work formerly. The centre core is hemp, they now sometimes make them of a mixture of gutta percha and hemp, which I believe works pretty fairly.

18,670. You find no difficulty in working it with an angle ?—None. This rope (*producing another specimen*) is a six strand rope, No. 12 likewise, but there is a peculiarity about it which I do not think advisable, In two opposite strands they have inserted instead of a hempen centre, a wire centre, I do not think that is advisable. If that rope was closely examined I believe it would be found that the twist in it in the course of working would not be uniform, in other words, I think, that by placing the extra wire in it, the rope has greater rigidity in a certain position than in any other. That is the argument which I go upon; I have not examined the rope, but I think that would be the result. This (*producing another specimen*) is a new rope which has not done any work.

18,671. Which do you think more durable and safe, flat wire rope or a round rope ?—Weight for weight, decidedly a round one.

18,672. Will you state your reason for that opinion?—My reason for it is this, that taking it weight for weight, it is the faggot of sticks exemplified. In a flat rope you have so many pieces of roundish ropes stitched together, so that the whole load is never

borne uniformly upon every part of that rope. In a round rope it is always borne uniformly by every single wire; but in a flat wire rope the strands will never bear at any two different moments exactly the same load, it is tearing at one side or the other. We work a flat rope at Snailbeach, in a shaft more than 400 yards deep. The rope with the two wire cores in it has drawn at Grassington mines during nine years certainly not less than 10,000 tons, besides the dead weight of the kibble. That part of the mine is exhausted. Of the two ropes which I have produced one has been drawing perpendicularly and the other at an angle.

18,673. (*Mr. Kendall.*) Do you get these ropes all from the same manufacturer?—No; formerly we got all from Newall's. My father was perhaps the first person that ever used a wire rope in a mine.

18,674. How do you manage now?—We have changed and find a material improvement. I know that all the Cornish ropes are from Henry Morton, of Leeds, and I have no reason to complain of them, because I have never tried them. I get ropes now from Garnock and Bibby, of Liverpool, and am trying one from Edge and Son.

18,675. (*Chairman.*) If anything gave way in the wire rope, at what point would it give way?—We have had the greatest difficulty (I am speaking now of those years when we knew less about wire rope than we do at the present time) at places where we wanted to make connections on the one hand with two lots of rope, or on the other for attaching the tail chain to the rope. We put on a thimble, and the difficulty has arisen when the neck of the thimble pressed hard on the rope. If the thimble went over the pulley-head (under the above circumstances), we sometimes used to neck the rope, and it would go away from the thimble before we knew any- thing about it; but with care and observation we have been able to get over that difficulty; we have not necked one for the last five years and a half, which is a proof that the safety is comparatively certain.

18,676. With a continuous wire rope you would think that there would be no danger?—We never lost the coupling off that rope (*pointing to one of the specimens*); we once broke a piece away from this rope (*pointing to another of the specimens*) working in a shaft 57 fathoms deep, by plucking at the sheeting and dividers; but we never broke that rope anywhere but at the coupling, so that there are two ropes there which have drawn together about 240,000 tons without a break.

18,677. (*Mr. Holland.*) Will you describe the improvement of the thimble?—Our mode of putting on the thimble is this:—If we put on the thimble to this rope we should separate and open the strands of the rope. Having done so we should bend every strand back over as near right angles as possible, for a length of about 8 or 9 or 10 inches, depending upon the kind of coupling which we were going to put in. A coupling for connecting ropes is usually put in longer than one which should pass over a pit-head pulley, though we always take care if possible so to arrange the chain and the landing place that there shall be no occasion for the coupling to go over the pit-head pulley. We then wrap the whole with old hempen rope, putting the greatest covering of wrapping on to that part of the rope on which the sharp ends of the thimble would bear. The thimble is made in two wings, connected together and riveted through the rope with four or five rivets, care first having been taken to chamfer back the inside of the ends of the iron wings. The iron embraces it in two arms, and we take care to chamfer back the inside of the end of the iron, so that if there should be a bend of the rope it allows a little play before the sharp end of the iron touches it. We never dragged one; that is to say, we never tore a thimble off, which shows that the system of putting it on is sufficiently strong.

18,678. (*Chairman.*) In the angles and ends what course do you adopt to prevent the wearing of the rope?—We have small pulleys.

18,679. You find that quite sufficient?—Quite sufficient.

18,680. So that that rope would be used at any workable angle, although a curve of a small radius would render the use of a wire rope impracticable?—At any workable angle. As a proof of that, at the Burlington Slate Works upon one of the shorter inclines (not the one to which I alluded before) there are two reverse curves, and speaking without having measured them, I take it that one curve is of as small radius as 30 feet, and the other is perhaps of 45 or 50 feet radius, which is very sharp. They are self-acting inclines.

18,681. (*Mr. Kendall.*) That they bear?—Yes.

18,682. (*Mr. Holland.*) How many pullies do you want to turn that curve; three?—We put as many as are necessary; we have no rule for that. We are forced to put them to the outside of the inside rail. This is a plan of the lines of wire rope now in use at these mines (*producing the same*). It is on a scale of 40 yards to the inch. There is no other mine in the world which has used so much wire rope as this mine; and I think I can say that no other person in the world uses more wire rope than I do. We have been drawing at Grassington mines from one shaft 960 yards from the machine; that is the length of the rope on the surface in a straight line, independently of the angles, and the depth of shaft is 120 yards more. We have been drawing at another shaft 1,320 yards, and at another nearly 1300 yards, besides angles and depth of shaft.

18,683. (*Mr. Kendall.*) Did you ever work that distance with a hempen rope?—No; the furthest that we ever worked with such a rope was 640 yards. I believe that it was with a hempen rope; but it was before I remember.

18,684. (*Mr. Holland.*) Have you ever worked out the fraction of loss?—No; but my father did so very minutely, and the difference between hemp and fire rope is so great, that it does not admit of the slightest comparison. In working at the furthest shaft the men have a signal made to them twice in the morning only. A hempen rope would with the alternations of wet and dry, and with the day's work have altered in length some feet. We could not have drawn back the hempen rope on account of the weight. The small wire ropes weigh about 6 or $6\frac{1}{2}$ lbs. to the fathom; they come to us about 3 inch ropes, and the one which has been working nine years is drawn down to about $2\frac{1}{4}$ inches. In the new rope we have improved it; we find it advisable, instead of having six strands of six wires, of No. 12 wire, to increase the number of wires and reduce the strength of each wire; and we now work them with six strands of eight wires, of No. 13 gauge.

18,685. (*Chairman.*) What is the price of these wire ropes?—They are 38*s.* a cwt. at the present time.

18,686. (*Mr. Kendall.*) What does a fathom weigh?—A fathom of that rope will weigh, I think, about $7\frac{1}{4}$ or $7\frac{1}{2}$ lbs. By increasing the number of wires, it increases the weight a little; the $3\frac{1}{2}$ inch wire new will weigh $9\frac{1}{2}$ lbs. per fathom.

18,687. (*Mr. Leveson Gower.*) You are agent to mines in different counties; you have mentioned four different counties?—Yes.

18,688. With regard to the health of miners, do you see any difference in those different mines?—The most healthy miners that I know are the Shropshire and the Derbyshire miners. I think that we have the least chance in the north of England; I am omitting altogether Devonshire and Cornwall. I think that the ventilation at Grassington, and the size of the levels, and all that sort of thing, have been on a better scale than in other mines in the north; but the small mines in the valleys between here and Alston Moor have, generally speaking, been carried on by small companies who would not spend money. Thirty years ago, when my father came here, a great part of these mines were worked by small companies, Derbyshire companies, and north country companies; and a great part of the miners came here originally

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from Derbyshire and the north country. The late Duke then took all the royalties into his own hands: and we have constantly had from time to time, in going over any of the old works, to enlarge their levels. It is not seven years ago that we opened out more than 90 fathoms of one level, which at that time was not more than 3 feet 6 inches high and 2 feet wide; and a man worked in that level nearly all his time, who stood 6 feet 1 inch high.

18,689. Do you believe that those small levels still exist in this neighbourhood?—Yes, in the small mines; they do not exist in this immediate neighbourhood in the present workings, but they are existing in the old mines as old works.

18,690. Do you think that there are any mines in operation at this moment near here with such small levels as those?—There are levels which are too small; but I think that that is not so general as it was. Mr. Taylor, of London, who works the Derwent mines, is very particular about large levels; and we have mostly here made what we consider pretty good sized levels, and I think that the other mines are following that.

18,691. To what do you attribute the better health of the Shropshire and Derbyshire miners as compared with the miners of this district?—The health of the Shropshire miners is better than the health of the Derbyshire miners, from the fact that they have no shales, no argillaceous beds, or very little. For instance, in Snailbeach, in Llandeilo Flags, there are no soft argillaceous beds in the working part of the mine. In this district I do not think that there is anything to damage the men's health, save boring in the grit stone; that is the bane of this country; and I believe that what I am trying to get the men into at the present day, namely, wearing a moustache, is the only preventive, and I would say the only sure preventive for it. The gritstone causes the mines of this county to be less healthy than those of the two counties named.

18,692. (*Sir Philip Egerton.*) You encourage that in the miners?—I do; but you will not find many of them wearing it.

18,693. (*Mr. Leveson Gower.*) Are there many miners who are teetotallers?—We have not many teetotallers here; but I think that we have a less percentage of drunkenness than among any body of miners I ever knew. I am quite certain that we have less than among any body of miners I ever came in contact with.

18,694. Do you consider that there has been an improvement in that respect since you knew the district?—There has been an improvement resulting from temperance.

18,695. (*Sir Philip Egerton.*) Since you have been acquainted with this district, can you trace any improvement in the health of the miners; do you think that they are more healthy now than they were when you first came here?—I can see this very plainly, that those miners who have for the last ten years suffered the most from their working, and also those miners of the present day, who one would say are the worse for it, are men who originally worked in Arkindale and the northern country. We have in attendance here one man who has been working 57 years; all the men who are in attendance here have been working more than 30 years, and some of them are not more than 42 years of age; the youngest went underground at 7 and from that to 12 and 14, and I think that they are a very good sample; I am not at all afraid of showing them anywhere.

18,696. (*Mr. Holland.*) Are those whom you have here selected men?—No; they are those who have been longest in the mine, whose length of time of working has been my guide.

The witness withdrew.

Adjourned.

DEVON GREAT CONSOLS MINES.

Tuesday, 26th May 1863.

PRESENT:

The Right Honourable Lord KINNAIRD, K.T.
Sir PHILIP GREY EGERTON, Bart., M.P.
The Honourable E. F. LEVESON GOWER, M.P.
NICHOLAS KENDALL, Esq., M.P.
JOHN ST. AUBYN, Esq., M.P.
RICHARD DAVEY, Esq., M.P.
P. H. HOLLAND, Esq.

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

Mr. THOMAS MORRIS examined.

DEVON GREAT CONSOLS MINES.
Mr. T. Morris.
26 May 1863.

18,697. (*Chairman.*) You are resident director of these mines?—I am.

18,698. What number of men are employed under ground?—About 500.

18,699. And how many on the surface?—Boys and girls about 450, and 250 men, making 1,200 altogether.

18,700. How many shafts are there?—11, and two footways.

18,701. At which part of the mine are the principal workings?—Wheal Josiah, Wheal Anna Maria, and Wheal Emma.

18,702. Which is the deepest level?—Wheal Josiah; 212 fathoms. We are now sinking below the 212 fathoms—two or three fathoms merely.

18,703. How do the men ascend and descend?—By ladders. Our working has been very small comparatively at the 212 fathoms; in fact, we have had no ore from the 140 fathoms down to the 212 fathoms, but now we fancy that we are riding on a course of ore at the 212 fathoms, and therefore we are now resuming our operations there by sinking the shaft, driving the levels, and putting down a winze.

18,704. At the 140 fathoms, therefore, are your principal workings?—At this shaft, from the 60 to the 140 fathoms.

18,705. Is the power chiefly water power?—Yes; pumping by water power and hauling by steam; four steam engines.

18,706. In hauling do you use a wire rope?—Yes; and steel for some. We have only lately introduced it, and we find that it answers very well.

18,707. Do the men ever go down by the kibbles?—Not that we are aware of; that would be a fine.

18,708. Do you use the skip or the kibble in hauling?—Both.

18,709. Then it is by an incline?—By a railway, and guides.

18,710. Have you any levels at the lower part of the mine running out to the surface, to the water levels?—No.

18,711. Is the whole of the water pumped?—Yes; chiefly water power and one steam engine.

18,712. Are there any levels wetter than others?—Yes. We generally leave them; we have so much ground open that we can do that. Where the levels

are very wet they are left until we get below them in order to drain; that we do with great economy.

18,713. Do you know which is the wettest level at which you are working?—I should say Wheal Emma at the 130 fathoms, at the eastern part of the mine, at present.

18,714. Is there any age to which the boys are limited in going underground?—Very much depends upon their size, because some boys are as big at 10 as others would be at 12; we do not let very little boys go underground.

18,715. Do the women work under cover?—Yes.

18,716. Is there any separate refreshment house for the women to go to?—Yes.

18,717. (*Mr. Kendall.*) Are Wheal Anna Maria, Wheal Maria, Wheal Fanny, Wheal Josiah, and Wheal Emma all under the same Company?—Yes.

18,718. What is the object of giving them separate names?—Merely to give them a name; we began with that system; we might just as well have called them A and B, or 1 and 2.

18,718*a*. The same parties hold the same shares in all?—Yes. We commenced in 1844. (*See* 18,724.)

18,719. You have no man-engine in any part of the mine?—No.

18,720. Have you it under contemplation?—At the 212 fathoms it has been a query with us whether we should abandon it, till lately; but the prospects are now so good that the probability is that we shall put a man-engine down there, and a perpendicular shaft, and a steam engine.

18,721. Has the subject of having a man-engine been discussed again and again in the mine?—No, because we are not sufficiently deep for it at any other point but the 212 fathoms.

18,722. You fancy that at a certain depth you should have a man-engine?—Yes; we should put one down at the 212 fathoms immediately if we get a course of ore, otherwise it would have been abandoned.

18,723. You have given the matter a great deal of consideration; at what period, generally speaking, of a mine's depth do you think it wise to begin to use a man-engine?—I should say from the 150 fathoms to the 200 fathoms. Much depends upon the nature of the men that you employ; we want a large quantity of work done in these mines, and our men are chiefly young men; young men, of course, are more able to climb the ladders than middle-aged men would be.

18,724. Your mine has been established some time, in 1844; if you started with young men you must after a while have a fair share of aged men?—Yes, we have some old men; but if we take on any fresh men we generally contrive to have young men.

18,725. Your impression is that on the whole it would be cheaper and better to work a mine till it is 150 fathoms deep before having a man-engine?—Yes; I should not think it necessary before arriving at that depth.

18,726. You do not think that the wear and tear of the men is much before that?—No; our men are very healthy.

18,727. (*Mr. Holland.*) At what age do you consider a man young?—From 20 to 30.

18,728. What becomes of them when they get above 30?—According to circumstances, employed at surface, or shallow parts of the mine. We have some few men now who have been with us from the commencement, that is 19 years.

18,729. What becomes of the men when they become old?—Some go away; others employed at surface. We lose our men occasionally; they go abroad, or to other mines where they can get better pay.

18,730. Your mines are not deeper than mines usually are?—No.

18,731. Do they leave your mine because they must climb there?—They leave occasionally from various causes. I can scarcely tell you from what cause.

18,732. Am I to understand you that when your men get above 30 they find the climbing too hard for them?—No, I should say not; but still our work is hard; we require them to keep constantly at it, and therefore we select young men as a general rule.

18,733. (*Mr. St. Aubyn.*) Have you any data upon which you can tell the average age of the men employed underground in the mines?—Yes.

18,734. What is it?—I cannot tell you without referring.

18,735. (*Mr. Davey.*) Have you not many men working underground above 30?—Yes.

18,736. Up to 40?—Yes; some 50, and some very good men too, and more than that probably.

18,737. (*Mr. St. Aubyn.*) Can you state the percentage of sick of those men working underground?—I find that it is 3 per cent. for the last three years.

18,738. (*Mr. Leveson Gower.*) Do you consider the health of the men affected by climbing?—I should conceive not much in these mines.

18,739. You have never perceived it?—No, not much; if we did we should put them to work at a more shallow level, say down at the 30 or 40 fathoms level, or something of that sort, instead of going down double that depth, or at the surface.

18,740. Then your object in putting up a man-engine is to save time, and not with reference to health?—To save the men as well, of course, and also to get the most work out of them.

18,741. Is the engine which you propose to put up a double or a single engine?—We have not sufficiently considered that point; we should not do that unless we got a course of ore there below the present run of ore ground.

18,742. Which do you consider most desirable?—I really do not know at present. There are various descriptions of man-engines, I believe, and therefore we should try to get the best.

18,743. (*Sir Philip Egerton.*) How many hours do the men work underground here?—Eight hours.

18,744. Does that include the time of going up and down?—Yes.

18,745. How long does it take your men to come up from the 212 fathoms level?—About half an hour up, less to go down.

18,746. Say one hour in going up and down?—Yes.

18,747. Then you lose an hour's work as compared with a man-engine?—Yes, deducting the time a man-engine would occupy.

18,748. In addition to the time which you would gain, the powers of the men would be more husbanded by going down by a man-engine?—Yes; there is no question that it would save a great deal.

18,749. And your calculation is that for anything below 150 fathoms a man engine would pay?—I should think it would, but I would prefer taking the advice of practical men.

The witness withdrew.

Mr. JAMES RICHARDS examined.

18,750. (*Chairman.*) You are the managing agent of these mines?—I am.

18,751. How long has the working of the 212 fathoms level been resumed?—About 12 months.

18,752. About how many men are now working there?—Twelve; six in the shaft and six in the drivage.

18,753. They are working at eight hours' shifts?—Yes.

18,754. How long do the men take to come up from the 212 fathoms level by the ladder?—I have never timed it; perhaps half an hour.

18,755. Are the men ever paid more for working in that level than in another?—Yes.

18,756. They are working by tutwork ?—Yes.

18,757. Are they young men ?—Yes, principally young men.

18,758. What is the next deepest shaft to the 212 fathoms ?—The 175 fathoms.

18,759. How many men are working there ?—None are working below the 157 fathoms.

18,760. How many men have you working there ?—Six.

18,761. Where are the greatest number working ?—About the 60, 80, 90, 103, and 115 fathoms levels.

18,762. What is the furthest point at which you are working from any shaft or winze ?—20 fathoms, as nearly as I can remember.

18,763. At what level is that ?—103 fathoms east of the Field shaft, I think. It is not so much as 20 fathoms.

18,764. You were working at a greater distance a short time ago, were you not ?—Yes, a little more than that, not a great deal more.

18,765. And you have now holed to a winze ?—Yes.

18,766. Was the air at all poor when you were holing ?—No ; it became warm, 65°.

18,767. Did you ever take the temperature ?—Yes.

18,768. What was it ?—65°.

18,769. Did the candles burn well ?—Yes.

18,770. You have no occasion to use any artificial means for putting in air at any of the levels where you are now working ?—None ; we have applied the air pipes now and then with waterfalls.

18,771. You have none at work now ?—No, but we have had them just when we were communicating to a winze.

18,772. Do you use iron pipes or zinc pipes ?—Wooden pipes.

18,773. Have you a plentiful supply of water always, to apply the waterfall to any part of the mine when you want it ?—Always ; we take it from the lift in the shaft if we have not it otherwise.

18,774. So that you can always apply the water power ?—Always.

18,775. Are the men limited to any quantity of candles ?—Yes ; a pound and a half to each man.

18,776. What do they pay for candles ?—8*d.*

18,777. And how much for powder ?—8*d.*

18,778. What other items appear in the bal bill ?—Smith-cost, and powder cans, and the safety fuse.

18,779. Do you always use the safety fuse ?—Always.

18,780. Have you ever had any accidents from blasting ?—Yes, some.

18,781. How do you think that that arises ?—From careless tamping.

18,782. Do you supply the tamping materials ?—Yes. There is always plenty to be found in the mine.

18,783. Have the men to take it with them ?—Yes. They use the mallet instead of the hammer in some cases where accidents have happened. Since the first or second accident we have used copper for tamping bars.

18,784. Are they merely tipped or cased with copper ?—They are shod with copper ; the upper part is iron.

18,785. Is it hard enough ?—Quite ; it is not necessary to use a hard substance for tamping.

18,786. Do you think that there would be no danger of fire if merely the point was covered with copper ?—It would be quite sufficient.

18,787. Would not the rubbing of the iron part of the bar against the side be likely to cause a spark ?—It would not if the bottom part of the bar is bigger than the upper part. We have had an accident of that kind, but it had been traced to the party looking into the hole with a candle.

18,788. Have you ever had an accident while a man has been using a copper tamping rod ?—No, never.

18,789. Are there any men working by tribute ?—Not a great many, only about a score, I think.

18,790. Where the ore is rich you find it better to work by tut work ?—Yes, it is almost entirely done by tut work.

18,791. Do you find an advantage in having experienced miners or young men as miners ?—Experienced miners.

18,792. Older men are not able to climb so well ?—No, they are not.

18,793. Therefore would it not be an advantage to have the means of bringing them up from their work ?—I dare say it would be from the deep part of the mine ; but we have gone very little depth for several years until now ; the bulk of our work is all above the 115 fathoms. The old men are employed in the shallow part of the mines and in the dry-houses at surface.

18,794. And for that depth mechanical means are not required ?—No. I do not think it necessary to have a man-engine there, where the ventilation is good.

18,795. (*Mr. Holland.*) We were told in the west of Cornwall that copper tamping rods were not perfectly safe ?—We have always found them safe with us.

18,796. What is your rock ?—The clay slate, but the lode is a mixture of caples and mundic and quartz ; that is where the tamping chiefly is ; we do not do much in the country ; our lode is very large. It is my opinion that a copper tamping rod is perfectly safe with proper tamping ; if bad tamping is used I believe there is a danger in using any bar.

18,797. You said that some of your men were working in hot air ?—The highest temperature which we have in any part of the mine is 70°, that is at the very deepest point.

18,798. You have no such temperatures as 90° or 100° ?—No ; the 70° is in the drivage from the shaft, at the 212 fathoms ; in the shaft it is only about 50°.

18,799. Have you any places where the candles will not burn brightly ?—Not any.

18,800. (*Mr. Kendall.*) The 212 fathoms level is suspended for the present, is it not ?—Only for a few days longer.

18,801. In consequence of the temperature ?—No. We are changing the pit work.

18,802. Was not the temperature very high ?—It was 70°.

18,803. Have you not a winze sinking down there ?—Yes.

18,804. How far is the winze down ?—Only 2 fathoms down.

18,805. How deep have you to sink before you communicate ?—We shall sink to the next level, say about 12 fathoms. The shaft and the winze are about the same depth ; they are going together. We have an air-machine now working in the shaft to supply the winze with air ; the shaft is in the country, and the winze is going down into the lode ; we have a powerful air-machine to supply this place. The temperature is nothing like 70° now.

18,806. Is it warm at the 103 fathoms level ?—No ; it is very good air.

18,807. What is the greatest depth that you have ever driven from a winze or any air communication without the aid of a fan or a jet ?—We have driven something like 100 fathoms without any aid but the natural ventilation. There has been no pipe or anything.

18,808. The end has been 100 fathoms from a winze ?—Yes, and the air has been perfectly good.

18,809. Had you any sollers ?—Nothing at all more than the natural ventilation.

18,810. You have gone from a point where there has been a communication with the air, and you have driven 100 fathoms without any jet or fan or soller, or anything ?—Yes.

18,811. What height was your drift ?—Seven feet.

18,812. And how wide ?—Four and a half feet.

18,813. Where was it ?—It was at the 60 fathoms' level, east of Thomas's shaft.

18,814. Can you at all account for that ?—The ground is very good ; scarcely any powder is required,

and the stuff is always taken out of the drivage and put into a waggon and trammed back at once; that is done every hour.

18,815. Is it upon the course of the lode?—Yes.

18,816. The country is slate, is it not?—Yes.

18,817. Is it porous slate; is there a good deal of cleavage in it?—Not a great deal.

18,818. Are there any crevices in it?—Yes, at places.

18,819. Are those crevices connected at all with any other place where there is good air?—No, the ground is entirely new.

18,820. Is the lode rich or poor generally?—Poor.

18,821. Is there any water in the end?—Yes, but not a great quantity.

18,822. When you got to the end of the 100 fathoms, did you communicate?—We then rose something like 40 fathoms more in the same way.

18,823. As I understand you, you went in 100 fathoms?—Yes.

18,824. And at the end of the 100 fathoms you began to rise?—Yes.

18,825. And you rose 40 fathoms?—Yes.

18,826. And you holed above?—Yes.

18,827. And you used no artificial means of ventilation?—We bratticed our rise in the usual way; the two ends were always kept open.

18,828. Did the candles burn freely all that time?—Perfectly; as well as they would now in this room. We were all surprised at it.

18,829. What was the temperature when you began to drive?—I should think 45 degrees.

18,830. And by the time you got into the end at 100 fathoms, it was about what?—About 60 degrees, I think, but I never tried it.

18,831. And it was 60 degrees up to the top of the rise?—Yes.

18,832. How many men had you driving?—Generally four men in the 24 hours; two pairs.

18,833. Were you afraid that more men would consume too much air?—No; but it was not necessary to push it.

18,834. The men worked 16 hours?—Yes.

18,835. Eight hours each pair?—Yes.

18,836. Should you have had any fear, if you had wanted to push it more, in working the whole 24 hours?—Not at all.

18,837. You think that there was quite air enough?—Quite; but in other places we have not been able to go 20 fathoms without artificial means.

18,838. In this mine what distance from a shaft or a winze have you ever known the air foul?—About 20 fathoms is the furthest point that we ever worked without a winze or rise, except at the 60 fathom level east of Thomas' engine shaft.

18,839. Have you ever found the air getting poor at the end of 20 fathoms?—Not poor, but only warm; not foul at all.

18,840. In other mines have you found the air at all foul when driving within 15 fathoms of a winze?—Yes, where a large quantity of timber has been used, and stuff allowed to accumulate.

18,841. Can you give any reason for the goodness of the air in the case which you have before mentioned, which struck you as extraordinary?—Only keeping the level clear of stuff; we always find that a benefit.

18,842. Did it turn out any ore at all?—Not a pound; we have seen a little of it, and that is all; but we have saved none.

18,843. Have you seen a man-engine?—No.

18,844. (*Mr. Davey.*) Mr. Morris said that your ore ceased to exist under the 140 fathoms?—It went down as deep as about the 140 fathom level.

18,845. What was the character of the lode when it changed?—It became more sparry and with caples and a mixture of killas. In the deepest part of the mine it is precisely the same.

18,846. Was it gradual or like a floor?—It was almost suddenly like a flaw.

18,847. In sinking down to the 212 fathoms did it continue pretty much of the same character all the way till you got to the bottom?—Yes, there being less mundic.

18,848. What is the change, now that you are more promising?—There is becoming more quartz, fluor spar, a good deal of mundic, and rich ore.

18,849. Some of the deeper levels on the plan have been driven, have they not?—No, they have not been down to the deeper levels until within the last three or four months.

18,850. (*Chairman.*) At which level are most men working now?—From the 40 fathoms down to the 115; there are very few men below that.

18,851. Have you a communication between all your shafts?—Every one, except the Wheal Maria shaft; we can walk three miles underneath.

The witness withdrew.

Adjourned to To-morrow, at Tavistock.

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(*Note.—The evidence previously taken at Tavistock will be found at page* 294.)

Wednesday, 27th May 1863.

PRESENT:

The Right Honourable Lord KINNAIRD, K.T.
Sir PHILLIP GREY EGERTON, Bart., M.P.
The Honourable E. F. LEVESON GOWER, M.P.
NICHOLAS KENDALL, Esq., M.P.
JOHN ST. AUBYN, Esq., M.P.
RICHARD DAVEY, Esq., M.P.
P. H. HOLLAND, Esq., M.P.

The Right Honourable Lord KINNAIRD, K.T., in the chair.

Mr. JOSEPH MATTHEWS examined.

18,852. (*Chairman.*) Will you state the names of some of the principal mines with which you are connected?—The principal mines with which I am now connected are Wheal Friendship, Birch Tor, North Wheal Robert, and Wheal Russell.

18,853. What is the kind of ore?—From Wheal Friendship the principal produce is copper; there is a small quantity of tin. Birch Tor is tin, and North Wheal Robert is copper, and very recently tin ores.

18,854. Can you state the number of men employed on Wheal Friendship?—I cannot from memory; but I think it is about, underground men, 72; underground boys, 51; trimmers, fillers, &c., 12.

18,855. Is it fully at work now?—Yes.

18,856. Has there been any part of the mine inundated lately?—Yes.

18,857. Can you state from what cause?—The cause of the inundation has been a choke. There is

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Mr. J. Matthews.

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a communication between Wheal Friendship and a mine called Wheal Betsey. A choke in the adit level had dammed back the water in a pretty considerable quantity into Wheal Betsey, and about three weeks ago this choke gave way; the water came back through the adit, and got into the mine.

18,858. Were there any people at work in the mine at the time?—No; it happened fortunately on Sunday.

18,859. If had happened on another day, would any lives have been lost?—I do not know. I should think that there would be no danger of any loss of life. There were so many ways of escape open at the places where men were at work that this would be scarcely probable.

18,860. Is it pumped out now?—No. It happened that just about the time when the accident occurred we were putting up a water wheel which had got into a bad condition, and therefore we can do nothing in pumping until that engine is put to work.

18,861. Do you know about the number of shafts which there are?—Six principal shafts, and two inclined planes.

18,862. What is the greatest depth?—240 fathoms under the adit.

18,863. What is the deepest level which you are now working?—At the present moment about 180 fathoms.

18,864. Is the water below that?—Yes.

18,865. On which lode are the men now principally working?—The principal workings are upon what we call the main lode, and Kent's lode.

18,866. What level is it in?—The 240 fathoms is the deepest which we have been working.

18,867. What other levels do the men work in?—There are men working at several levels above the 180 fathoms level, at 150 fathoms, and 100 fathoms, and several other levels.

18,868. Is the air quite good in 150 fathoms level?—I hear of no complaint anywhere. In the 150 fathoms level we have not had very good air, and we are now putting in a machine there by which the air will be improved; but I believe that generally the mine is very well ventilated.

18,869. The machine is not in at present?—I think it is not in yet.

18,870. What distance from the shaft is the end of the level carried?—I think it may be as much as 120 or 130 fathoms; but I speak quite offhand.

18,871. What kind of machine do you propose putting in there?—I cannot tell you that.

18,872. How do the men ascend and descend?—By ladders.

18,873. Is it a perpendicular shaft or an incline?—They are underlie shafts. There are two inclined plane into the mine.

18,874. But the other shafts are underlie shafts?—Yes.

18,875. Do the men come up the inclined plane?—No, none; we forbid their going up and down by the inclined planes under penalties.

18,876. Is the inclined plane used for drawing?—Entirely.

18,877. Do you draw by kibble or skip?—By skip (both).

18,878. With guide rods?—We have no guides, but there is a rail all the way. The men are not allowed on any account to go up and down by the rail.

18,879. Do you suppose that they do?—I think not.

18,880. Have you had any accident lately?—No; I think that we have had no serious accident there for several years; I do not recollect any.

18,881. No accident from blasting?—Neither from blasting nor from any other cause.

18,882. Have you changing houses at the footways?—We have changing houses on the mine.

18,883. Near the footways?—Yes.

18,884. Do any of the men change in the boiler-house?—We have no boilers. We have no steam engines at work.

18,885. Are the men allowed a certain quantity of candles per week?—Yes; I believe as a rule about 2 lbs. per week per man.

18,886. Do you know what the men pay for candles?—Yes; we have charged 7*d.* a pound for candles.

18,887. And how much for powder?—For powder the same.

18,888. Do you know what the cost price is?—The present cost price of candles is about 5*s.* per dozen pounds.

18,889. Is a deduction made for club money—Yes.

18,890. Is it for visible hurt, or does it include sickness?—We have a sick fund to which the men contribute; in case of hur they are paid by the mine in addition.

18,891. Does the money which the men contribute go to the sick fund?—Yes.

18,892. Does a part of it go to the club fund?—No; in case of hurt it is paid entirely by the mine.

18,893. Does the attendance on the sick include their families, or only the men?—The men and their families till they go to some work.

18,894. Is there a doctor appointed to the mine?—No; we appoint no doctor, but we leave the choice of the doctor to the men themselves, so that any man may choose what doctor he pleases, and each doctor is paid in proportion to the number of men that he attends.

18,895. How often is the pay of the men?—Twice a month; we have subsist and pay.

18,896. Do you pay in notes or in change?—All in small money; we pay no notes.

18,897. (*Mr. Holland.*) Then they can divide their money without going to a public house?—Yes. We always pay in such a way, that if we pay to four men 10*l.*, we give them 2*l.* or 3*l.* of silver, so that they can divide their money without going out of the mine.

18,898. (*Mr. Kendall.*) You have generally acted as purser of a mine?—Yes.

18,899. Almost always?—Yes.

18,900. You have never taken any management?—I have never taken any underground management.

18,901. You have been purser of mines for a great number of years?—40 or 50 years.

18,902. You not only know the Devonshire mines, but you know the Cornish mines a great deal?—Yes, some mines about St. Austell.

18,903. You have been a good deal mixed up with mines in the neighbourhood of St. Austell?—Yes.

18,904. Do you know much about the condition of the miners on the surface, their mode of living, and so on? Do you visit them much?—I see them and know their gettings. The general getting is about 2*s.* 4*d.* or 2*s.* 6*d.* a day.

18,905. Is the condition of the miners better now than when you first knew them?—Very much better.

18,906. Taking them as a body of men, are they more careful than they used to be?—I think so, very much.

18,907. More temperate?—More temperate.

18,908. Are accidents so frequent as they used to be?—By no means; the number of accidents from gunpowder are, I think, reduced two thirds.

18,909. I suppose the adventurers take more care in the appliances which they use?—We do all we can to render their work as little hazardous to life as possible.

18,910. Did you ever attend any inquest?—Never.

18,911. With regard to the surface accommodation, the changing houses, and so on, has there been much improvement in that way since you recollect?—Very much. In the first place, in all our mines we have dries, where the men's clothes are always dried for them before they go underground, and where, if they take off their wet clothes, they are dry by the time they come from underground; and that, no doubt, would very much conduce to their health.

18,912. With regard to their accommodation in their own houses, do as many sleep in a house as used to do, or not?—I think that, as regards those who live in town, there is a very great improvement in that respect; but in the country, I think, most of the families have two bedrooms and a room downstairs for cooking, and so on.

18,913. Can you speak as to the lodging of miners, whether, when a man is married, several men lodge with him, and whether two men sleep in a room?—I don't think that this prevails amongst miners working at Wheal Friendship, whether they live in town or in the country.

18,914. You cannot speak as to overcrowding?—I do not think that there is anything of that kind.

18,915. In any of your mines is there any arrangement for the separation of men from women during meal times, or things of that kind?—I think at Wheal Friendship the principal part of the girls reside very near the mine, and they generally go home to their meals.

18,916. There is no particular accommodation that you know of, either for the men or for the women, at meal times?—I do not think that we have at Wheal Friendship anything of that sort, but there is ample accommodation there for any few who may not go to their own homes to their meals; dinner, indeed, is the only one. [I take this question to apply to surface labourers.]

18,917. Have you changing houses there?—Yes.

18,918. And dries for the clothes?—Yes.

18,919. (*Mr. Holland.*) Has there been any other cause for the great diminution of powder accidents, except the increased carefulness of the men?—I think that the use of the patent fuse has very much tended to diminish accidents.

18,920. Is there any objection by the miners to the use of the patent fuse?—I have never heard of any. I think it would be very difficult to get our men to return to the old modes of "firing" their holes.

18,921. Is the smoke which it makes a serious objection?—I have never heard of any, except where ventilation is bad.

18,922. (*Chairman.*) Do you go down the mine?—Never.

18,923. Therefore you cannot speak as to the temperature of any of the levels?—I cannot.

The witness withdrew.

Mr. Richard Sleman examined.

18,924. (*Chairman.*) You are a surgeon?—Yes.

18,925. Resident at Tavistock?—Yes.

18,926. Have you the special charge of any mines in the neighbourhood?—Not the special charge, because in our locality the miners choose whom they please.

18,927. Have you many miners who come to you as patients?—Yes, a great number.

18,928. Those for sickness are paid for by the club money?—Yes.

18,929. What arrangements do you make with the miners for attendance?—We attend the men and their families; they pay 9*d.* a month.

19,930. Not all those who choose to come to you?—No; all those working at the mines pay 9*d.* a month.

18,931. Do they pay you?—No.

18,932. How are you remunerated?—We receive the money from the purser, the money being deducted from each man's pay.

18,933. But you receive according to those who come to you?—No; every man working at the mine is obliged to pay 9*d.* a month, whether he is married or single; we receive that 9*d.* through the purser.

18,934. You receive from the club money according to the number of men who choose to apply to you for medical assistance?—Yes; that is the custom of our neighbourhood.

18,935. The men select the surgeon, and the surgeon is paid for the number who come to him?—Not for the number who come to him, but the number on the list for the surgeon.

18,936. Is that for the year or for any limited period that the men select?—That depends upon different mines. In Wheal Maria the selection is once in three months, but in Wheal Friendship and some other mines the men have the power of selecting when they please; for instance, if I give dissatisfaction to a man he has only to go to the purser and have my name struck off the list and another substituted.

18,937. When is the settlement with you by the mine?—There is a little irregularity; it depends very much upon the character, perhaps, of the purser. At Wheal Maria we receive once in six months; at Bedford United once in three months, and at Wheal Friendship once in six months. In small mines we are anxious to receive more frequently, because otherwise we may lose the money, and I am told that in law we cannot recover more than a month. The Stannary Court tell us so, and therefore in small mines we look a little more after it.

18,938. In case of accident, how are you remunerated?—The 9*d.* covers everything except midwifery and vaccination—every ordinary sickness.

18,939. What are the principal disorders for which the men apply to you for medical relief?—When you are speaking of the district, that depends a good deal upon the portion of the district; for instance, at Mary Tavy, in consequence of the habitations of the miners being adequate to the population, we do not get much fever. If you go to Beer Alston, where the number of houses is the same, but where the population is 2,000 as against 500, you get more fever and more disease generally, and so at Gunnislake. I believe that the disease depends more upon the habitation of the miner than anything else.

18,940. By "disease" do you mean fever?—Yes, and general disease. With regard to the children they get more severe forms of measles and scarlet fever at Gunnislake than they would at Mary Tavy, because they are living in an impure air in consequence of the houses being densely crowded.

18,941. Is fever difficult to eradicate?—It is more severe at Beer and Gunnislake in consequence of the overcrowding. Cholera is also more virulent there when they get it.

18,942. Do you know a disease peculiar to miners called "miners' disease?"—Yes; but if you take certain districts it is not very rife; at Mary Tavy it is not, although it is a deep mine; you get more at such a place as Gunnislake and Beer.

18,943. Do you think that the overcrowding of the dwellings also tends to the increase of what is called miners' disease?—Yes, I think so; very much.

18,944. You think that a man is in an unhealthy state owing to his habitation?—Yes, you have that superadded to the other drawbacks upon him; first of all he has irregular hours, then when he gets home he has a miserable place to sleep in; he may be sleeping in the same room as that in which his wife is washing in the same day.

18,945. At what age do you think that this miner's disease generally attacks a man?—At various ages; about 40 I think sometimes; but there is very little of it in Mary Tavy.

18,946. Did you ever have a post mortem examination?—No, we do not get post mortem examinations.

18,947. Do you go down any of the mines?—No, I have never been down.

18,948. (*Mr. Holland.*) About how many years have you been in Tavistock?—About 30.

18,949. You have been in practice for that time?—Yes, rather more than 30 years.

18,950. You said that you thought the disease was

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much more influenced by the dwellings than by the employment of the men ?—Yes.

18,951. Has there been much diminution in disease since the town of Tavistock has been improved ; it has been very much improved within 30 years, has it not ?—Yes. The town has been very much improved ; but then I rather doubt whether there has been that improvement in the dwellings, because although the Duke of Bedford has erected very good cottages the other parts of the town have been still overcrowded.

18,952. Has there not been a very great diminution in the overcrowding ?—There has certainly in those cottages, but not generally throughout the town.

18,953. Is there very much overcrowding still ?—A great deal.

18,954. Have you ever been at a mine where the doctor was appointed by the adventurers ?—Yes.

18,955. Which is the best system ?—The system where the men choose the doctor is by far the best ; it is best for the adventurers, it is best for the doctor, and it is best far the men.

18,956. Is there less grumbling ?—There is no grumbling at all.

18,957. The men just change their doctor as they please ?—Yes.

18,958. Is there any canvassing ?—No ; it is quite unnecessary, it is of no good ; if you have not anything like a standing, it is of no use to ask a man to employ you.

18,959. We were told in Cornwall that there was danger in this system, from the doctors and the men acting rather unfairly towards each other, the doctors canvassing for names?—That is all very well in theory. I was with Dr. Harness, under the old system ; he happened to be a nephew of Mr. John Taylor, who has just died, and it broke down under him ; he had other practice which was more remunerative, and he did not care so much about the miners, and then Mr. Taylor determined to throw it open. Wheal Friendship was the first mine in this neighbourhood where it was thrown open ; since that, you never hear anything like a row.

18,960. Does this system, in your opinion, give any unfair opening to a low class of practitioners ?—No, it cannot ; a man must be qualified. I think that as the men pay the money the other is a most unfair plan.

18,961. You think that that objection is merely fanciful ?—Yes. There are one or two mines in this neighbourhood which are not upon this system.

18,962. Do they go on as satisfactorily ?—Not at all.

18,963. I understood you to say that you thought that the miners' disease was much influenced by the dwellings ?—Yes.

18,964. By "miners' disease" you mean the particular bronchitis to which the miners are subject ?—Yes, bronchitis terminating in consumption.

18,965. Are the women of the miners' families here peculiarly liable to bronchitis or consumption ?—No.

18,966. But are they not as much influenced by the dwellings as the men, or more ?—No. The men have irregular hours, and when they come home they very frequently sleep where their wives are washing. Girls are not so ; they work by day, and come home and sleep by night. I draw the inference that the dwellings have a good deal to do with the matter, from the fact that at the deepest mine in our neighbourhood, Wheal Friendship, the miners' disease is not pravalent, and the cottages are not so filled.

18,967. Is there any other peculiarity about that mine ? Is it very well ventilated ?—I think it is just like other mines. I think that the ventilation of the mines in this district, with very few exceptions, has been attended to, because it is the interest of the adventurers to have them well ventilated ; you cannot get a man to work in a badly ventilated mine unless you pay him more.

18,968. Do a large proportion of the men work in the deep levels at Wheal Friendship ?—Yes ; it is essentially a deep mine.

18,969. They work all levels ?—Yes, but chiefly at the deep levels.

18,970. And they are not more unhealthy than other miners who work in shallow mines ?—No, certainly not.

18,971. In fact are they more healthy ?—Yes, I think so, partly owing to that ; and Mary Tavy, where Wheal Friendship mine is, is near Dartmoor, where there is pure air.

18,972. Are they younger or older men than the others ?—They are older, because at Mary Tavy as a rule the men are born and die there ; they do not migrate as a general rule to Gunnislake or Bere. At Bere and Gunnislake the miners have not been born there, but come from other districts, it being a new mining district.

18,973. Wheal Friendship is an old mining district ?—Yes. I have attended about 30 years ; it has been working, I think, about 50 years.

18,974. Has it increased much lately ?—It has rather decreased ; there are not so many men working there now as there used to be.

18,975. Have you seen much of the miners' disease ?—No, except at Gunnislake.

18,976. You have not seen it down the country?—No.

18,977. You cannot compare the prevalence of it here with it in the Cornish districts ?—No, not at all. I believe that it is influenced a little also by the strata. I believe that where the men are working in granite they get it worse than in killas ; it used to be so in old Gunnislake Mine very plentifully ; that was in granite. Perhaps the prevalence of the disease is also influenced by the miners themselves ; there is less intemperance among them.

18,978. Is it a marked disease among the miners ?—Not in Wheal Friendship ; not in Mary Tavy district.

18,979. It is so in Tavistock ?—Yes, and in Gunnislake.

18,980. A very large proportion of the men who are ill have that disease ?—Yes.

18,981. Three fourths ?—No, nothing like that. There is such a proportion as that you would notice it, but it is not so at Mary Tavy.

18,982. What are the chief causes to which you attribute it ?—There are several causes ; one frequent cause is boys going up the deep levels too rapidly, that is a predisposing cause, I think. Then another cause, I should say, is the irregularity of the hours at which the men work, the irregularity of their sleeping hours, sleeping by day and working by night, and I should also mention the dwellings. I believe it is admitted that in mines which are in granite the men suffer more than in killas. I have never heard it accounted for.

18,983. The system of using changing houses for drying their clothes has been introduced in your time, has it not ?—Yes.

18,984. Has it produced a marked improvement in their health ?—I think that that must have been the natural result.

18,985. Do you think that they suffer much from dust ?—No.

18,986. Do they suffer much from smoke ?—No.

18,987. Do they complain much of it ?—They complain of bad air ; but what they call bad air I believe is what they take at the public house ; working in bad air, I believe, has been working at the public house more than anything else.

18,988. (*Mr. Leveson Gower.*) Of the different mines with which you are connected, which, in your opinion, is the worst for miners' disease ?—I should say that the Gunnislake mines are the worst.

18,989. Those are not as deep as Wheal Friendship ?—No.

18,990. As to ventilation, are they worse ventilated than Wheal Friendship ?—The mines about Gunnislake, except Wheal Maria, are not so well ven-

tilated as the other mines ; they are newer mines, and in some instances machinery has not been put up nor shafts put down in sufficient number ; they have been obliged to use air machines.

18,991. Therefore though less deep they are worse ventilated than Wheal Friendship ?—Yes, and worse for the men to work in.

18,992. Do you apprehend that the miners are as long-lived as the agricultural labourers ?—In certain localities they are ; in other localities they are not. It hink that at Mary Tavy they are as long-lived.

18,993. But, taking the average, what is the case ?—If you take the average, you take the Gunnislake and the Beer districts ; they are not so long-lived ; they get fevers from which the others are exempt.

18,994. (*Mr. Davey.*) You said that there was a considerable improvement in the health of the miners since you had been practising ?—I think so.

18,995. To what age do they generally live now ?—I think that at Mary Tavy they live as long as the others.

18,996. And do they continue to work underground ?—Yes.

18,997. We saw yesterday that a greater part of the men underground were young men. What becomes of the old ones ?—You are, most likely, now speaking of the Devon Consols ?

18,998. Yes.—They have been very charitable at the Devon Consols ; when it started they took on a lot of men who were getting past work in other mines, and they have not had much work out of them ; perhaps they have had 10 or 15 years work out of them, and now they put them to do other things. But at Wheal Friendship they have had the men from their childhood perhaps up to 60, and they have one working at 70 at Wheal Friendship.

18,999. Then at Wheal Friendship after a man becomes of a certain age he is taken from underground and put to the surface ?—There are very old men working at Wheal Friendship now who do not like going to the surface. They work as long as they can ; there are many now working at Wheal Friendship between 60 and 70 years of age. Men and boys work together at Wheal Friendship.

19,000. Are you surgeon to the Devon Consols ?—Yes. But you must draw this difference between the Devon Consols and Wheal Friendship, that one is an old mine and the other a young mine. At Wheal Friendship you will find men who have been working there for 50 years.

19,001. Where do the old men go ?—In a place like Wheal Maria, if there are old men who have worked out their strength in the service of the mine, there are plenty of places where they can put them to dry clothes and cut up timber. A number of old men are wanted at Devon Consols, but still I know that they have employed men who were nearly past work in other mines, and then they soon become burthensome to them.

19,002. (*Sir Philip Egerton.*) From your experience in this district, how should you define shortly the symptoms and progress of what you call true miners' disease ; do you say that it commences with bronchitis ?—Yes, generally.

19,003. What are the next steps ?—It is a gradual disease ; it eventually gets into phthisis.

19,004. It becomes true tubercular disease ?—Yes.

19,005. Do you consider that to be the true miners' disease of this district ?—I do not go the length of saying that the miners are subject to that disease, and that their lives are shortened in consequence, because I have evidence to the contrary in Wheal Friendship.

19,006. I gathered from your evidence that you considered that the social habits of the population in some districts complicated this miners' disease ?—Yes.

19,007. Therefore you can scarcely call it the true miners' disease uncomplicated with other disease ?—No.

19,008. For instance, have they the black spit ?—Yes.

19,009. At what period of the disease is that ?—That is before it gets into what we call tubercular phthisis. They may have it, and it may pass off ; men work on for years after having it.

19,010. Are you quite confident that the black spit degenerates into true tubercular disease ?—Frequently it does.

19,011. In other districts we have evidence that phthisis is very rare in cases of miners' disease—that hepatization of the lung is the consequence ; do you find that to be the case in this district ?—No.

19,012. You have spoken of climbing the ladders as being a predisposing cause ; do you believe that it affects the lungs ?—Certainly ; it affects the heart and the lungs.

19,013. It proceeds to affect the heart also ?—Yes.

19,014. Then the miners' disease is complicated with heart disease ?—Yes.

19,015. I think you have stated that you have never had a post-mortem examination ?—No, there is no object to be gained in a post-mortem examination that I know of.

19,016. You could ascertain the state of the lungs by the stethoscope, I suppose ?—Yes ; or even without the stethoscope. I think you are pretty nearly certain what you are treating.

19,017. Have you ever known any cases of true miners' disease terminating in phthisis in districts otherwise healthy, where you have not had the complications of bad dwellings ?—I have had miners' disease in Mary Tavy, but it is rare.

19,018. Terminating in phthisis ?—Yes.

19,019. How do you account for the spurious melanosis, as it is called, that is to say, the black spit ?—I suppose that that is from the bronchial tubes.

19,020. Not from any dust which is inhaled ?—No, not at all.

19,021. From blood extravasated ?—Yes.

19,022. And the colouring matter of the blood causing black spit ?—Yes.

19,023. Not smoke or caroon ?—Not at all.

19,024. (*Mr. Kendall.*) How many medical men are there at Wheal Friendship ?—There are only two. I am not certain whether there may not be another medical man, but two I should say.

19,025. How many medical men are there at the Devon Great Consols ?—I can hardly say now. I think that I attend about 250. I do not trouble myself to ascertain who are attending the men. I am satisfied with the number that I have.

19,026. Have you ever conversed with any of those surgeons who have very few miners ?—No.

19,027. Therefore you do not know what their opinion is as to the present system ; you think it a good one, and the fairest to all parties ?—There is no question about it ; it does not admit of an argument.

19,028. Have you ever discussed the matter with the medical men who have very few miners ?—No ; in some mines I have very few.

19,029. You never heard any complaint of other medical men ?—You cannot have a complaint where the list is fairly kept ; there is no right to complaints.

19,030. With regard to accidents, are there fewer than there used to be ?—I do not know as to whether the number is fewer. I think that they are about the same.

19,031. Do you attend the inquest as a matter of course when there is an inquest ?—No, because that would involve the payment of a guinea. I mean that the coroner would not be justified in calling me.

19,032. If an accident occurs, and you are called to the man as the mine doctor, and he dies, is not it a matter of course that you attend the inquest ?—No ; we never attend unless the cause of death may be uncertain ; for instance, if I am called to a man, and I do not think that it is a case for amputation, and subsequently I consider that it is, and the man dies

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after the amputation, the coroner may or may not call me, because it may have been owing to improper medical treatment.

19,033. Do you think that it is on economical grounds that you are not called as a medical man generally?—Yes; I think that the coroner feels bound not to call us, because if the cause of death is apparent I do not see that we are required.

19,034. I will suppose an accident, and that the man lingers under that accident and dies?—Then we are not called as a general rule.

19,035. If you attend him in the meanwhile you are not called on the inquest?—No, not as a rule.

19,036. (*Mr. Holland.*) If a man dies after being hurt it is assumed that he dies in consequence of being hurt?—Yes, generally.

19,037. Without evidence of the fact?—Yes.

19,038. (*Chairman.*) Have you any miners who are working at Drake Wall's mine?—Drake Walls happens to be an exception to what I said just now. I did attend at Drake Wall's mine, but the purser thought proper to strike my name off the list.

19,039. The purser makes out a list of the doctors to whom the men apply?—Generally speaking he keeps a list for his own satisfaction; we seldom see it.

19,040. The men are to a certain extent limited in their choice by the list which the purser makes out?—No, they are generally allowed to choose what doctor they please.

19,041. (*Mr. Leveson Gower.*) Have you ever known a case in which your evidence could have been of use in the investigation in which you were not called on account of the expense?—No, I do not know that. The great object is for the coroner to watch whether there has been any neglect on the part of the mine, and blame attachable to them. I think that that has been the chief thing.

The witness withdrew.

Mr. James Hosking examined.

Mr. J. Hosking.

19,042. (*Chairman.*) Are you underground manager of any mine?—Yes, I am underground agent.

19,043. Of what mine?—Drake Walls.

19,044. Any other mine?—No.

19,045. Is East Gunnislake adjoining?—Yes, East Gunnislake is north of us.

19,046. What description of ore is yours?—Tin.

19,047. How many men have you working underground?—About 120 generally.

19,048. How many boys?—We have not many boys underground; not younger than about 18 or 20.

19,049. How do the men enter the mine and come out?—By ladders.

19,050. What is the greatest depth?—102 fathoms is the bottom of the mine.

19,051. Is that 102 fathoms below the adit level?—Yes.

19,052. Do you work by tut work or tribute?—The whole are on tut work.

19,053. What is the strata?—Killas or clay slate.

19,054. Is it hard or soft?—It is tolerably compact killas.

19,055. Do you blast much?—Yes.

19,056. Do you work by sinking?—Sinking and driving and stopeing.

19,057. Do you work up from a lower level, or do you work down?—Some portion of it we stope in back from the lower level, and some portion we stope under hand from the upper levels, something like quarrying; we call it underhand stopeing.

19,058. Do you use much timber?—Not a great deal, considering the extent of the mine.

19,059. How is the roof supported when you are working?—The sides generally are pretty well; we fill up some portion of it from the refuse.

19,060. You have accidents sometimes?—Very rarely.

19,061. When was the last time you had an accident there?—We have not had one for a good while. I can hardly say when the last was.

19,062. Was not one there last year?—I don't think that we have had any death for two years or moer than that. I think it is between two and three years since we had any death from an accident.

19,063. Do the men excavate the whole of the level below? Do they work by winzes?—We sink shafts first and we stope underhand and sometimes in the back.

19,064. Do you take out the whole?—Yes, with the exception of a few arches, small portions to support the sides here and there; in some places it is generally very firm.

19,065. There are a number of open workings to the surface?—Yes, it is very open. We have one down-cast shaft and two up-cast shafts. These are the degrees of heat, which I took myself.

The Witness handed in the following paper—

Drake Walls Mine.

May 22, 1863.

Trials of Thermometer.

	Degrees.
At surface, in the shade	52
In the office	54

Underground.

	Degrees.
102 fathom level	61
92 „ „	56
70 „ „	59
50 „ „	64
40 „ „	62

Stopes.

	Degrees.
Back of 40 fathom level	60
Up-cast shaft	56

1862.	Brentons. lbs.
Candles consumed in the mine and at surface	15,388
Powder consumed	31,000

(*Witness.*) I think that ours is the most open mine in the county, because almost all the ground is beaten away; it is not closely confined as some mines are.

19,066. Are your men young men chiefly or old men?—Middle aged men; some from 19 to 20 up to 50.

19,067. Where do they reside?—Some of them near the mine, and some of them perhaps two or three miles off.

19,068. Is there plenty of house accommodation in the neighbourhood of the mine?—Yes.

19,069. Do the men change much or do they stay by you?—We have some men in the mine who have been there I believe 14 or 15 years, others 7 or 8 years, and others come for a few months and then leave.

19,070. Do they come from other mines in this neighbourhood or from a distance?—Some come from the westward, and some from other mines; some are constantly changing.

19,071. Have you any men who are at all affected in their breathing, who have come to you from other mines?—I do not know that we have now.

19,072. You do not think that men come to seek work there on account of its being a more open mine than others?—Some have done so, I believe; some have left other mines to come there, and they find that they are much hardier after they come there to work. They generally accustom themselves to carry a bit of food with them, and when they are in other mines they have no appetite to eat it, but in our mine

they can eat it and are glad to have it ; they are heartier.

19,073. From the system of working the men are not at all afraid of working there ?—No, I never heard them complain.

19,074. You do not think that there is any danger in the mode of working your mine ?—No ; I have been in the mine between eight and nine years, and we have not more accidents there than in other places, I believe.

19,075. Is there an allowance of candles to the men ?—Six men have 10lbs. of candles in a week ; it is hardly 2 lbs. each.

19,076. What are they charged for the candles ?—8*d.* a pound.

19,077. And for powder ?—8*d.*

19,078. Have you any doctors attached to the mine ?—Yes.

19,079. How are the doctors paid ?—Every man subscribes 15*d.* a month for doctor and club.

19,080. Is the club merely for visible hurt or for sickness ?—For hurt, not for sickness.

19,081. How much does the doctor get out of the 15*d.* ?—9*d.*

19,082. And the rest is for the men in case of injury ?—Yes, in case of an accident.

19,083. Do those doctors attend other mines besides yours ?—Yes ; Dr. Brown from Callington has perhaps about 30 of the men, and there are Dr. Sellers from Gunnislake, and Dr. Northey ; those two gentlemen have the greatest part of them. They live at Gunnislake, about a quarter of mile from the mine.

19,084. Then the men choose either of those two doctors ?—Yes.

19,085. But two are appointed by the adventurers ?—Yes.

19,086. How often are the wages paid ?—Once a month.

19,087. Is a month kept in hand ?—Yes.

19,088. Do you allow subsist ?—They have subsist one month and pay the other. We set a contract for two months generally.

19,089. Have you any women working at the mine ?—Yes, women and girls, a great many.

19,090. Do they work under cover ?—Yes.

19,091. Have they any separate place for getting their meals in ?—Yes, they have a house, if they choose to go in ; but they do not go in there in this this weather, in winter time they do.

19,092. Where do the men change on coming up from the mine ?—In the dry. We have a tube, about five feet in diameter, from the engine house, always warm. The smoke which comes off from our two boilers passes through this tube, and it always causes it to be warm, so that sometimes a man cannot suffer his hand on it. They dry their clothes, and there is a man to attend to that.

19,093. That is where the men change ?—Yes.

19,094. (*Mr. Leveson Gower.*) Have you many boys at work underground ?—No.

19,095. Have you any ?—None less than about 18 or 19.

19,096. Are any of the women whom you employ married women ?—We have two or three widows there, the husbands having been killed in the mine. One was killed in the mine about six or seven years since, and we have the widow.

19,097. But you have no married women ?—No, not with husbands.

19,098. (*Mr. St. Aubyn.*) Are there more accidents in your mine than in others in the neighbourhood ?—No, I do not think that there are.

19,099. Have you found that there are more complaints by the men than usual as to the condition of the mine ?—No, I never heard any of them complain of the condition of the mine, as regards being afraid to work.

19,100. Are the footways and so on in good working condition ?—Yes, ladders with iron staves and wooden sides, with an underlie of perhaps 16 or 18 inches in a fathom.

19,101. Have you had many accidents from the falling away of the country ?—No, I do not know that we have had any accidents from the falling away of the country for years.

19,102. (*Mr. Davey.*) What is the size of the lode in this mine ?—It is branches chiefly, varying from 9 to 15 or 16 feet in breadth.

19,103. What is the character of the ground ?—It is clay slate.

19,104. You are obliged to take the whole of it to the surface ?—Yes.

19,105. You could not select any to remain behind for support ?—We have an arch which we have to support the sides. Perhaps every 10 fathoms there is an arch two or three feet thick.

19,106. Where you find it very soft at the sides, are you obliged to bring down the stuff from the surface again for support ?—It is not very soft, it is all open, but yet stands firm.

19,107. I understood you to say that you were sometimes obliged to bring the stuff down from the surface ?—Yes, because the burrow is so far off, and it is handier for tipping.

19,108. You could not select enough rubbish out of the mineral underground to fill up that space ?—The same space would not hold the same stuff again.

19,109. If you are working underhand or stopeing at the back, cannot you select sufficient refuse from the back of that level to fill up the space again ?—We cannot work in that way ; we cannot work as in a good many mines in Cornwall, taking away the side ; we are obliged to take away the whole of the branches up to the surface ; the branches sometimes are as thick as my finger, and sometimes they are two or three feet apart. We are obliged to take away the whole ; sometimes it is 15 or 16 feet wide, and sometimes wider than that.

19,110. (*Mr. Kendall.*) Does your timber cost very much ?—We have Norway timber chiefly.

19,111. Do you use a good deal of timber ?—We have only one timber man and an assistant in the mine ; it is not a costly mine for timber.

19,112. (*Mr. St. Aubyn.*) Can you state how many men have been killed in the eight or nine years that you have been in the mine from the falling away of the country ?—No, I am not prepared to answer that question, but I think it is three.

19,113. Not more than three ?—Not above three, and one of them was killed by blasting the powder, one was killed by an accident in timbering ; he fell away from the stage, and another fell away through a hole.

19,114. But there has not been a single accident from the ground falling on the men ?—No.

19,115. How many years was the mine worked before you came ?—I believe that the mine has been working this time about 18 or 19 years ; I cannot tell to 12 months.

19,116. Did you ever hear of any man being killed from the falling away of ground on him in the mine before you came there ?—No, I do not recollect that there ever was such a case.

19,117. (*Mr. Kendall.*) You have been on the mine nine years ?—Between eight and nine years.

19,118. And there has been no accident during those eight or nine years from the falling in of the ground ?—No.

19,119. You do not consider the ground dangerous ?—No.

19,120. The men are not afraid to go there on account of danger ?—No ; I never heard one of them say so.

19,121. (*Mr. Davey.*) Did you ever hear of any accident occurring whilst the mine was part open to the surface ?—No, it was before I came there that it was part open to the surface. It is a mine of old standing ; no person can tell the commencement of it, and it used to be worked quite open.

19,122. Were you in the neighbourhood longer than the nine years ; what part of the country did

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you come from?—I have been in the neighbourhood of Callington a great many years past.

19,123. Are you a Cornish man?—I was born in Callington; I was reared chiefly in Fowey Consols; I worked there for a great many years; I had all my rearing there till I was 21 or 22.

19,124. How long have you known Drake Walls?—I was never well acquainted with the mine before the last 9 or 10 years.

19,125. (*Mr. St. Aubyn.*) If it had been a common thing for men to be killed in Drake Walls nine years before you went there, you would probably have heard of it?—I should, no doubt, have heard of it; it would generally have been cried up as a dangerous mine, if it had been so.

19,126. And, in your opinion, it never has been considered as a dangerous mine?—No.

19,127. (*Mr. Kendall.*) At what depth did you work in the Fowey Consols Mine?—125 fathoms was the deepest level I ever worked in.

19,128. How was the air at the 125 fathoms as compared with the Drake Walls Mine?—Fowey Consols was a very hot mine.

19,129. You consider your mine much healthier than Fowey Consols?—Yes, nothing to be compared to it.

19,130. Did you work in the Fowey Consols as a tributer or as a tut-work man?—As a tut-work man generally. Some of the ends in Fowey Consols were very warm.

The witness withdrew.

Mr. William Gard examined.

Mr. W. Gard.

19,131. (*Chairman.*) Of what mine have you charge?—I am the manager of East Gunnislake and South Bedford and Old Gunnislake.

19,132. What is the description of ore in those mines?—Copper.

19,133. How many men have you working underground?—At present we have about 30 at East Gunnislake; we have only 6 at present at the Old Gunnislake Mine; we have generally about 100, but we have taken off a portion of the men now.

19,134. What is the deepest level at which you are now working?—36 fathoms under adit; about 75 fathoms from the surface.

19,135. The men go down by ladders?—Yes.

19,136. How far is any level driven from any shaft or winze where the men are now working?—We are now driving for the purpose of ventilation; we are in 170 fathoms from the engine shaft.

19,137. How is ventilation provided there in the meantime?—Artificially, by pneumatic pump.

19,138. How is the pump driven?—It is worked from the main rod of the engine.

19,139. It is not water ventilation?—No, it is air forced in.

19,140. Has that answered completely in the meantime?—It serves for the purpose of the number of men that we have now in the end; but we have a large quantity of ore laid open, and we have tried to take it away; we first tried artificial ventilation by driving a 46 fathom level and sinking a winze inside, and then driving a second level hoping that we should so get a current of air; that the smoke would come away from the end and come back to the part of the mine where there is a winze up again to another level, and so away off the shaft; but it failed, inasmuch as the current was backward and not the way we wished. We have tried every way to get a current of air, by doors and one thing and another, but have failed, and consequently we abandoned taking away the ore until the present shaft which we are now sinking and this level are communicated.

19,141. You did not try the application of fire?—No, it would be impossible to do so. We have about nine fathoms more to drive to reach the shaft; the shaft is not down yet; 20 fathoms sinking of the shaft will bring it down to the 36.

19,142. And in the meantime you must depend solely upon the air which is driven in?—Upon the air driven in by this machine.

19,143. How long is the smoke now getting away from where the men are working?—It goes away freely; there is very good air indeed there now.

19,144. Do the candles burn freely?—Yes.

19,145. How is the air taken in?—By 4-inch zinc pipes a part of the way and 6-inch zinc pipes.

19,146. The machine is constantly at work being attached to the engine?—Yes; the same power keeps the water as well as the air.

19,147. You think that that sized pipe would not admit of more men working than there are?—No, certainly not; it would be against our own interest to put on more men.

19,148. How have you ascertained that?—We ascertained it practically by the amount of work.

19,149. Have you taken any means to ascertain the number of men who can work with the power of the air machine which you now have on?—We have an end to drive, and the ore to be taken away is behind that narrow ventilation; the consequence would be that if the men behind were making a great quantity of powder smoke, you never could bring your air pipe close into the end for fear of its being broken by blasting. I dare say there is quite enough for 12 or more men there.

19,150. How many corps do they work?—Three of eight hours each.

19,151. Do they work for the whole 24 hours?—Yes, they work day and night, and they relieve in place; they mostly relieve at the sumpt house where they change. We make them relieve in place because it ensures regularity. If a man is not down to the time his colleagues grumble. The men keep a check on each other.

19,152. You think that that is the best way?—Undoubtedly, because the men who have been down eight hours, if the next pair of men are not down at the proper time, take care that it shall be reported.

19,153. Would that answer if the mine was deeper?—Decidedly.

19,154. Then the men would work longer hours?—It would come nearly to the same thing, because if the men were underground eight hours the others would come down and relieve them at the time.

19,155. Whose business is it to remove the deads? Is it in the contract?—No; all the hauling and tramming is done separately.

19,156. Is yours water power entirely?—Yes.

19,157. What amount of candles are the men allowed?—We allow them about 2 lbs. a week each man.

19,158. What is the price charged for them?—We charge the men 8*d.*

19,159. And for powder how much?—6*d.*; but practically the adventurer pays for all that.

19,160. What do the candles cost you?—About 5½*d.* to 6*d.*, and very often they cost us 6½*d.*

19,161. Is there any difference in the management of either of your mines?—Not at all.

19,162. How are the doctors appointed?—I appoint the doctor.

19,163. The men have not a choice in the doctor?—No; I have never in any mine, where I have had the management, allowed them to choose the doctor.

19,164. What is the deduction for the doctor?—9*d.*; we charge 1*s.* 6*d.* We do not allow any sick pay, for this reason, that very often in a mine old men come in whose constitutions are broken before they come there; they get laid up, and there is so much taken away from the fund which would otherwise go towards the man who is hurt, and who then requires everything that you can give him, therefore we prefer accumulating a large fund for a man who is hurt; and they all of them have their own sick clubs. I take it that if we allowed sick pay, in fair-

ness to the men, we ought to have every man medically examined before coming into the mine; a young man would have to pay to the support of an old man. If you have a given number of men there must be a given sum subscribed.

19,165. They have sick clubs among themselves?—Invariably. As a general rule I think that there is no miner but who pays to a club besides his mine club. I think that at all events 75 per cent. pay to clubs besides their mine clubs.

19,166. The men have never objected to the doctor?—No.

19,167. How often do you pay the wages?—Once a month.

19,168. And do you keep a month in hand?—Yes.

19,169. Do you allow subsist?—Yes, occasionally.

19,170. Do you pay in notes?—I pay in gold and silver always.

19,171. Do many oldish men come to work?—Yes, we have several men who have been in our mine for eight or nine years.

19,172. Have you any men who are affected in their breathing?—We had one who died very recently, and died almost suddenly; he had been complaining of an uneasiness on his chest, and he reported himself sick, and the next day he died; he burst a blood vessel, and he was dead in about five minutes.

19,173. Are there any men working there now whom you know to be affected in their breathing?—None that I know of.

19,174. (*Mr. Holland.*) How long had that man whom you have mentioned been ill?—We did not know that he had been ill, nor I believe did he know himself; his comrades said that he had been complaining for about a week before.

19,175. Did he find the climbing very hard?—No. From my own experience I do not think that the climbing, if you take sufficient time at it, is any more than rowing a boat.

19,176. How much air does the engine send in?—I can hardly tell; the air pump is about 2 feet square and 6 feet stroke.

19,177. How many strokes are there in a minute?—About $3\frac{1}{2}$.

19,178. For how many men?—For six men.

19,179. That is about 112 feet a minute?—Yes. It is quite sufficient.

19,180. Does it pay the adventurers well to supply it?—Of course; we could no work at all without it.

19,181. Does the extra work which you get from the men pay for the engine very well?—Undoubtedly: it will at all times pay to ventilate a mine well; it does not matter to what expense you go, provided you have a paying mine. I consider that good ventilation is the best outlaid money that you can possibly have in a mine.

19,182. There is no doubt about it?—There is no doubt in the world about it. The system in all mines throughout Devonshire and Cornwall is this: you set an end, we will say, that is worth 10*l.* a fathom to drive; you give the men a price which will give them the average rate of wages of the district; our men will earn about 3*l.* 5*s.* a month, and the captain uses his judgment, so that the men will get about that sum. Every mine captain will set so that the men shall get that, whether there is good air or not; if a mine is badly ventilated he finds by and by that the men instead of driving two fathoms drive one, and he still pays for that one the same price as for two.

19,183. (*Mr. Kendall.*) As you are such an advocate for ventilation, I will ask you why you drove 170 fathoms before you sank a shaft in order to communicate and have ventilation?—Our engine shaft is upon the boundary of two sets, and before I had the management of the mine they had been working entirely westward; they had got down to about 70 fathoms, and had driven about 150 fathoms, and had driven 16, 24, 36, 49, 60, and 72 fathom levels, and it had always been a coaxing mine,—too much ore to abandon it, and not enough to pay. When I took the management we were in granite. I saw that the dip of the granite was very near the engine shaft, and I thought that by driving an exploring level into the clay slate from there I should very likely find a deposit of ore. We were just at the very junction. I saw that it was very quartzose ground and not likely to be productive, and I thought that if we could get from that into the clay slate, very likely we might obtain ore. Therefore we drove an exploring level, one single level, and we very soon cut ore. As soon as we had done that we went away to a considerable distance and commenced the engine shaft for the very purpose of ventilating it, and we are sinking that shaft for the purpose of ventilation.

19,184. (*Mr. Holland.*) Why did you put that engine and shaft there?—The engine shaft was for working westward; we have two shafts westward which give perfect ventilation, but when we changed the direction of the mine altogether, and began to work in unexplored ground, we drove a single level, an exploring level, and that into a rising hill; it was necessary to go off a fair distance to sink this shaft to make it pay; we are now paying 20*l.* a fathom for sinking that shaft.

19,185. (*Mr. Leveson Gower.*) Do the men complain about the ventilation?—They did, when we had so many men in there.

19,186. Do you rely upon the captains for knowing when the ventilation is bad, or upon the men?—We depend upon ourselves. I go underground myself as often as I think necessary; about once a week or once a fortnight.

19,187. Have you had any accidents lately?—None, except one man who went in to see whether the fuse had taken fire, and it very satisfactorily showed that it had, for he arrived there just as the hole went off, and hurt his hand; that was all. I think the mercy was that he had not been blown to the winds. We have had no fatal accident there for seven or eight years. We had a man who had his legs crushed in the water wheel, but we have had no fatal accident underground. In fact, we have but one man on hurt pay, and that is the unfortunate man who lost his leg in the water wheel.

19,188. (*Mr. St. Aubyn.*) What was the temperature at the end at the 170 fathoms?—64°, I think when a gentleman took it the other day.

19,189. You were driving an exploring level?—Yes.

19,190. And you did not sink a shaft from the surface until after you had cut the ore?—No; we were then in about 60 fathoms, and there we had plenty of air; the moment we cut ore we commenced sinking a shaft.

19,191. Supposing that you had not cut ore, then how far should you have considered yourself justified in going, without additional ventilation, before you sank a shaft?—We should have had artificial ventilation the moment we thought that we required it, if the air became hot or impure.

19,192. Before sinking a shaft for the purpose of natural ventilation, how much longer should you have gone on?—We have been sending in artificial ventilation now for a considerable time; I think, ever since we got to the 80 or 90 fathoms.

19,193. How far would you have driven your exploring level before sinking a shaft to make natural ventilation?—I can hardly answer the question; it would depend entirely upon the nature of the ground; upon whether I thought that the ground was likely to prove productive. I should judge entirely from the nature of the stratum. It is quite possible that we should have abandoned it altogether; if we had driven into the clay slate, and had found from its nature that it was not likely to be productive, we should not have followed it; we drove through the granite and found it wholly unproductive, but the moment we passed through that into the clay slate, we found the ore.

19,194. (*Mr. Davey.*) What is the distance between the two shafts?—Nearly 170 fathoms.

TAVISTOCK.

Mr. W. Gard.

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19,195. Do you consider it economical to drive on such a great distance?—Yes, decidedly.

19,196. Would you not have got ore much sooner if you had taken 150 or 100 fathoms between the shafts?—No. There are cross courses between the two, which would have rendered it impolitic to have sunk a shaft at a nearer spot than that. The moment that this communication is through, we can make ventilation to every level throughout the mine, to whatever depth we go, in reason.

19,197. Your going such a great distance is a special case?—It is. We are about in the course of the summer to begin another shaft; we shall go with it about 100 fathoms.

19,198. But you would be able to work the intermediate ground between the two shafts much easier, would you not?—We have about 70 fathoms of barren ground. Under no circumstances should we have sunk a shaft nearer than 100 fathoms.

19,199. What is the depth of the adit at the shaft?—We have two adits; it is 39 fathoms to the deep adit.

19,200. So that your bottom level down to the 36 fathoms would be only 75 fathoms to sink?—Yes, from the surface.

19,201. Having that short distance to sink, do you not consider that it would have been more economical to have had the shafts nearer each other?—No, decidedly not, in any case.

19,202. (*Sir Philip Egerton.*) Where do you get your ore out, by the adit level?—No, through the 36 fathom level, and up the main engine shaft.

19,203. How do the men get to their work? By which shaft?—Down the main engine shaft.

19,204. Have they sollers?—Yes.

19,205. Have you a dry?—Yes.

19,206. Do the men live in the immediate neighbourhood?—All in the immediate neighbourhood, with the exception of one who lives at Tavistock.

19,207. They live within a mile?—Within five minutes walk.

19,208. Do they find it worth their while to change in the dry before going so short a distance?—Invariably; they leave their working clothes there.

19,209. Is the mine a wet mine?—No; we have a 9-inch pump, working $3\frac{1}{2}$ strokes in a minute. It is by no means wet.

19,210. Are the hands whom you employ principally married men?—Principally, I should say.

19,211. Have they cottages?—They have cottages in the village.

19,212. Freehold or leasehold?—They mostly rent them by the week or the month.

19,213. Do they take lodgers?—Yes, unfortunately there is too much of that.

19,214. They are too much crowded?—They are very much overcrowded, and the sanitary condition of the village is very bad. I believe that there is nothing which tends so much to the deterioration of the miners' health as the state in which all these little dirty villages are.

19,215. What is the name of the medical man who attends?—There are two, Mr. Sleman and Mr. Wood; they are partners.

19,216. Are the families of children large in your neighbourhood or not?—I should say large, generally.

19,217. What provisions have you for education? Are there any National Schools?—There are a Church school and a Wesleyan school, but the Wesleyan school is only a Sunday school, taught by girls who are as ignorant as their scholars, as a general rule.

19,218. Do the owners of the mine do anything in assisting in the education of the children?—No.

19,219. (*Mr. Kendall.*) As I understand the 170 fathoms at the 36 was driven on the course of the lode?—Yes.

19,220. And then you were off the engine shaft about 60 fathoms before you found any ore?—About 60 or 70 fathoms.

19,221. How long did that ore continue?—It has continued more or less up to the present time.

19,222. What will it average per fathom?—About 3 tons.

19,223. What is the maximum?—Six.

19,224. When you found that there were 6 tons of ore did you find the air worse than when the ore was poorer?—No, I do not find any difference in working, whether there is more or less ore. We never had the ore continue yielding 6 tons for any length of time. From $2\frac{1}{2}$ to 4 tons would be the quantity.

19,225. How long before there is ventilation shall you go on?—We shall make a communication in November, and we shall raise no ore there until the communication is made.

19,226. For a while you have eight men working in the end?—We have twenty, besides the six men in the end; we have twenty-six men in all.

19,227. How many had you driving the end?—Never more than six, two at each relief. Some have eight, but then they work six hours; that is very exceptional. We have never tried eight, but have thought of doing so.

19,228. In addition to driving on this end you tried to stope?—Yes, we tried it for two months but ceased that, as we found that we could not do so.

19,229. (*Chairman.*) You have stated that the condition of some of these mining villages is very injurious to health?—Deplorably so.

19,230. Has the Sanitary Act ever been put in force?—Yes. I was chairman of the committee for two years, and took a great deal of interest in trying to have it carried out, but was beaten by the owners of cottages; they found that I was making them drain. In the committee which was working there, of which I was chairman, I had farmers for my team; they were very difficult to drive at first, but at last I got them to work the Act, and when the owners found that they were compelled to drain and remove pigsties, and put up water-closets, those who owned these miners' cottages immediately set to work and we were all turned out together. There were two medical men, Dr. Sellors was one, and Mr. Wood the other. We were all sacked at once, and a set of men were put in purposely not to carry the Act out. The law has lately been altered, so that if the Act is not carried out by a committee it is put in the hands of the guardians, which is only going from bad to worse, and making it very certain that it shall not be carried out, because the guardians, beyond the parish, have no interest at all in your parish, and those who are within your parish, if they wished to carry it out, would carry it out under the Nuisances Removal Act by a committee; but they have done nothing of the sort; they have obstinately prevented it. I wrote to the Board of Health, and they sent a medical officer down there. He went about and said that it was very horrible, and that he had never seen anything worse in all the inspections which he had made. I said, "Is there no remedy?" He said, "It would not do to "let all the world know it, but we cannot enforce it "if the Nuisance Removal Committee do not choose "to act, and if the householders choose to combine."

19,231. (*Mr. Holland.*) Why do you not indict yourselves?—I do not know who is to go to the expense. We have 8,000 inhabitants in our parish; the bulk of them are labouring men. Those who own cottages have a direct interest in giving the least amount of accommodation.

19,232. Can you suggest any remedy?—My remedy is that the General Board of Health should be empowered to carry out the Nuisance Removal Act.

The witness withdrew.

Mr. Alexander Henry Wylie examined.

Tavistock.

Mr. A. H. Wylie.

27 May 1863.

19,233. (*Chairman.*) You reside in Edinburgh?—I do.

19,234. At my request you went down to Cornwall to inquire into the circumstances connected with certain accidents which had taken place?—I did.

19,235. Including the Botallack mine?—Yes.

19,236. During your stay there another accident occurred?—Yes, that was in the neighbourhood of Camborne.

19,237. You were present at the inquest?—I attended the inquest.

19,238. Will you name the mine?—The mine was called the Buller and Basset United, about four miles from Camborne.

19,239. You made some inquiries concerning it?—I did.

19,240. Have you a list of the accidents which occurred, to which I drew your attention before you went?—I have a list of the accidents, including the one at the Buller and Basset United Mine. (*The witness delivered in the same, which is as follows:*)

(*See Table in next column.*)

(*Witness.*) My attention was given to the above summary of accidents. The first six occurred before I arrived in Cornwall, and my attention was directed to them by your Lordship, and my knowledge of the circumstances connected with them is derived from an attentive perusal of various reports of Mr. Twite respecting them, and the short-hand writer's notes of the proceedings of the various inquests. No. 7 occurred when I was in the immediate locality, and having personally attended the inquests, and having visited the mine, I am enabled to speak more directly to this special case; but my remarks on this and the previous cases will be contained in a report which the Chairman has specially desired me to hand in to the Commission, and which I will present with various reports, proceedings at inquests, &c. &c. The substance of these remarks I will now allude to informally with the intention of presenting them more fully in a few days.

No.	Date.	Mine.	Name.	Cause.
1	March 4	Dolcoath - -	Thomas Kessel-	Falling down the shaft 13 fathoms to avoid a fall of earth.
2	„ 24	West Fowey Consols -	James Sampson	Explosion while tamping.
3	April 15	Trevenen -	Thomas Wedlake	Falling away of ground.
4	„ 18	Tolvadden -	Charles Vincent	Falling through a trap door.
5	„ 21	S. Just United -	Emanuel Trembath	Falling through a trap door.
6	„ 21	Botallack -	Nine individuals	Breaking of the skip chain.
7	May 13	Buller and Basset United	Frederick Uren George Teague	Blowing out of boiler.

The witness withdrew.

[*Questions Nos.* 19,241 *to* 19,256 *omitted.*]

Adjourned to To-morrow at Ashburton.

ASHBURTON.

Thursday, 28th May 1863.

The Right Honourable Lord Kinnaird, K.T.
Sir Phillip Grey Egerton, Bart., M.P.
The Honourable E. F. Leveson Gower, M.P.
Nicholas Kendall Esq., M.P.
P. H. Holland, Esq.,

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

Mr. William Hosking examined.

Ashburton.

Mr. W. Hosking.

28 May 1863.

19,257. (*Chairman.*) Of what mine have you charge?—West Beam.

19,258. How many men are employed there?—About 160 are employed underground and on the surface.

19,259. About how many underground?—I should think about 110.

19,260. Is it copper or tin?—It is copper and tin both, but principally tin. What we are returning now is tin. There are copper lodes in the set, in the property.

19,261. What is the deepest level at which you are working?—The deepest level from the surface, from the engine shaft, is about 90 fathoms.

19,262. What is it from the adit?—78.

19,263. How many levels are there working?—We are working at present seven levels.

19,264. How many shafts are there?—A great many shafts. We have seven or eight shafts altogether.

19,265. Are any of these shafts upcast and others downcast in the draught?—Some are up and some are down. You will find the draught playing up in some of the shafts and in some down.

19,266. Are they constantly upcast or do they change according to the weather?—They change sometimes. It depends upon the way of the wind.

19,267. How do the men go down and up?—By ladders.

19,268. Are the footways in the drawing shaft or are they separate?—The principal footways are in the drawing shaft.

19,269. Are they bratticed off?—Yes, we have put in a new footway all the way from the surface to the bottom in one shaft very recently. We have new timbered the shaft all the way from the surface and we have got in a new footway all the way.

19,270. Have the ladders 12 inch or 10 inch staves?—Principally 10-inch staves; they are much easier for climbing than 12-inch.

19,271. How many shifts work in the 24 hours?—Three.

19,272. What quantity of candles are the men allowed?—Each man is allowed 2 lbs. a week.

19,273. What is the charge for candles?—8*d.* per lb.

19,274. How much for powder?—The same.

19,275. What is the cost price of candles?—It costs me about 7*d.* We pay a higher price for our materials here than they do in Cornwall. For timber and iron and everything, it costs us 25 per cent. more to work our mines than in Cornwall; the prices are different. The land carriage beats us here.

19,276. How far are you from a railway?—West Beam is about eight miles from a railway, and the road is rough.

19,277. Is the stuff carted?—Yes, the mines further back in the granite towards the moor are nine or ten miles from a railway.

19,278. Are the men young or old men chiefly?—The majority of them are what we should term middle-aged men. The men, roughly speaking, I should think, would average something like 25 or 26.

ASHBURTON.

Mr. W. Hosking.

28 May 1863.

19,279. Have you many boys?—No, not a great many underground.

19,280. Are the women employed at the surface?—Yes, what we term framing the tin.

19,281. Do they work under cover?—Yes, all under cover.

19,282. Is there a changing house for the men when they come up?—No, they change in the boiler-house principally.

19,283. Have you had any accidents on the mine lately?—No.

19,284. Have you had any from blasting?—No, never one.

19,285. Do you use the safety fuse?—Yes.

19,286. Have you any particular kind of tamping rod?—The usual iron rod.

19,287. What tamping do you use?—The men select the safety fuse which they think best for the tamping; they select it underground from the different kinds of stone; we never have an accident from tamping, not from any blasting whatever. We generally give the best price for the best material of fuse, we find that answer best; we generally try to get the best material, so that the men shall have less accidents.

19,288. (*Mr. Holland.*) Do you ever use copper tamping rods?—No.

19,289. You think that an iron tamping rod is quite safe, with proper tamping?—We prove it so.

19,290. You say that the men are of middle age?—Taking the average of the men, I should say that they would average about 25 or 26; I should say so, but I don't speak positively upon the point; we have no old men in our mine.

19,291. Your men are much younger than workmen generally?—Much younger than the men in a great many mines in Cornwall.

19,292. They are a great deal younger than the men in other employments?—I do not know that, I cannot say as to that.

19,293. At what age do you consider a miner to be an old miner?—They vary a great deal in that respect, I see some old miners eighty years of age.

19,294. At what age should you consider a man to be an old miner?—At 70.

19,295. Is not a man of 50 an old miner?—No, I am 50 years of age, and I have worked in a great deal of poor air and powder smoke in my days, and I think that I could go underground now to my labour as well as any.

19,296. Of course, your miners are much like other miners; are they decidedly less healthy, than above-ground labourers?—They are very unhealthy men. You must bear in mind, that our mines are generally shallow compared with those in Cornwall.

19,297. Have you any close ends?—No, it is a well ventilated mine.

19,298. Have you any place where the candle will not burn well?—No.

19,299. What is the depth?—The deepest part of our mine is about 90 fathoms from the surface.

19,300. And many of the men work at a less depth than that, of course?—Yes, a great many; there are not many men working at the bottom of the mine.

19,301. (*Mr. Leveson Gower.*) I understand you to say that you have no boys working underground?—Not very many.

19,302. What is the youngest age?—I cannot say exactly; I should think that the youngest is something like 16 or 17, what we call a boy; there are but three or four, I believe, that we call young lads, and I should think that the youngest of them is something like 16.

19,303. If a miner wished to take his son who was much younger than that, would you object?—No, not at all, if it was a well ventilated place.

19,304. But they do not wish to take them younger?—They would not wish to take their sons into foul air; they do not wish to take them very young; if they did we should not allow it. The boys go first on the surface to work, generally on the floors washing the tin, and when they come to be about 14 or 15 their fathers feel inclined to take them underground, and of course we don't object to that, because it is then time that young lads of that age should go underground.

19,305. You say that you have not suffered from working in a mine?—No.

19,306. In what mines have you worked?—In some 35 in my day, I suppose.

19,307. Were they all well ventilated?—No, some were very bad indeed.

19,308. And yet you did not suffer?—There is no doubt that it did not do me any good; but I am 50 years of age now, and I enjoy very good health.

19,309. How long have you been a captain?—I have been a manager of a mine now for the last 14 years, and I went to a mine to work first when I was 11 years of age.

19,310. Is there any medical man attached to your mine?—There is.

19,311. What is his name?—Mr. Bean.

19,312. How is he remunerated?—By the men subscribing so much per man per month.

19,313. Is that for sickness as well as accident?—Yes; every man who works in the mine pays 1*s.* a month, and then the medical man attends them in sickness and accident, and also their families, their wives and their children, for that money.

19,314. If they wish to see any other medical man, have they the option?—Yes, they have.

19,315. Do they make use of that option?—No, I do not know that they do. They are very well satisfied with the medical man that we have. He is considered a very skilful man, and attends to the men very well.

19,316. Does the fund only go to the one medical man?—The fund only goes to the one medical man.

19,317. If they went to another man, they would have to pay him?—Some of them may live five miles out, and if they wish to have a medical man close at hand, they can have him, and he is paid by the fund as well as the others.

19,318. (*Mr. Kendall.*) You are about 50, and you began mining at 11?—Yes.

19,319. Out of the 40 years that you have been engaged in mining, you have been agent how many years?—14.

19,320. At what time did you begin to go underground?—I went underground at 13.

19,321. What depth mine did you ever work in in bad air?—In Tresavean, in hot weather, where the men worked almost naked.

19,322. What depth was it?—I think I worked at the 270 fathoms.

19,323. Where the large course of ore was?—Yes; I worked there in Captain John Martin's time. It was before the man-engine was put in. I was not there when the engine was erected.

19,324. How long did it take you coming up?—I cannot say now. I forget.

19,325. Were you very much exhausted when you came up?—Yes; and very much exhausted when we came out of the levels to take the ladder.

19,326. It was so very hot?—Yes. I have seen the candles in the clay turn down double from the heat of the ground.

19,327. Did you suffer in health then?—Of course I did not have such good health as I have now.

19,328. Have you enjoyed better health as an agent than you did as a miner?—I enjoyed very good health then, but I do not know that I was quite as well as I am now. I am in fresher air now. I am always in good air, and there is not so much powder smoke.

19,329. As I understand, the principal part of your work now is in the workings resumed by you, which were abandoned some time ago?—There was a party working this property previously to our Company taking it.

19,330. Was there any intervening time between your taking it and their giving it up?—No: the engine never ceased working.

19,331. What was the condition of the ventilation when you took the mine?—It was not bad; the levels and some of the shafts were in a very bad state of repair, but there was a communication from one to the other.

19,332. There was a good draught and good ventilation?—A capital ventilation.

19,333. How long has this been a mining district?—That I cannot tell you; for ages past.

19,334. Do the miners dwell in cottages of their own or in lodgings?—Some of them rent cottages and some of them lodge just the same as in other districts.

19,335. Do those who rent cottages let out to lodgers a great deal?—No, very few.

19,336. Did you ever have occasion to visit the dwellings of the miners here at all?—If a man has a fever, or is dangerously ill, or anything of that sort, we generally go to see him.

19,337. Then you are able to judge of the size of the rooms in which they sleep?—They have plenty of rooms here.

19,338. You have been in Cornwall a good deal; there, I suppose, you may have seen them rather thick?—They are rather cramped up in Cornwall compared with what they are here. Miners are not so plentiful here as in Cornwall.

19,339. What is their average pay?—Tutwork men will average about 3*l.* 10*s.* a month.

19,340. What do the women get?—One shilling a day.

19,341. Do your miners here live as well as the agriculturists or not?—They live better.

19,342. On the whole they live well?—Yes.

19,343. Taking them as a body are they a careful body of men?—Yes; taking them as a body we have a very good staff of men indeed in our mine.

19,344. Do you work principally on tribute or on stopes?—Principally on tribute.

19,345. (*Chairman.*) You say that you do not allow boys to go down when the air is bad; are there any places where at times the air is bad?—Not in our mines.

19,346. Not where you are driving?—No. We have, say, two levels, one over the other, with ten fathoms between; after we have extended the level so many fathoms, if there are any symptoms of the place being close, we put up a rise or sink a winze to ventilate those two levels.

19,347. Till that is put in is the air never close?—No; we don't allow it to go that distance to become foul.

19,348. You have been near Penzance and near Helston?—Yes.

19,349. Have you been farther east in Cornwall than that?—Yes; I worked in Tresavean mine; that is about Redruth.

19,350. Have you been anywhere near St. Anstell? I worked, at one time, a little while in Charlestown United Mines.

19,351. You have been in all parts of Cornwall?—I have been about a good bit.

19,352. Have you been in any other parts of Devon than this?—Yes, on the Moor in Dartmoor; I worked at the Birch Tor mine six years.

19,353. Then you have been in the exposed part of Devon and in the sheltered part of Devon?—Yes; the Birch Tor mine was the worst mine I ever worked in in my life.

19,354. What from?—From cold damp and poor air.

19,355. What do you call cold damp?—That is a damp arising from the rock. It settles in the level.

19,356. Can you breathe in that cold damp?—Of course.

19,357. Will a light burn in that cold damp?—Where it is very bad it will not.

19,358. When you have been in that cold damp, have you ever been down close to the rock?—Yes.

19,359. Could you breathe then?—Yes. I worked in that mine about twenty-seven years ago; it was a very rich mine when I worked there, and they had but one shaft, and in the summer time the air was very bad. I have seen the time when we could not carry in a light below the six fathoms from the surface in some parts of the season, and I being in an end I have seen my comrade in that end working, and I have gone back and have sat down, and I could see the shadow of the man but not the man; that was caused by the cold damp; and if a man put some tobacco in his pipe and took the candle to smoke, directly he took away the candle from the tobacco he could not draw any more smoke, the pipe would go out.

19,360. Is that mine at work now?—Yes. I do not wish to speak of Birch Tor mine now for I do not know anything about it.

19,361. (*Mr. Kendall.*) Have they two shafts there now?—I believe so. I have never been down the mine since I left it in those days.

19,362. Seeing that you have had much experience in various parts of Cornwall and in various parts of Devon, in the high lands and in the low lands, have you in all those districts observed any marked difference between the health of the agriculturists and the health of the miners?—The health of the miners about Ashburton, I should say, is equally as good as that of the agriculturists.

19,363. At Birch Tor, where there was that bad air, do you recollect how the miners were?—It killed scores of miners.

19,364. Take the Tresavean, and all those deep mines and the shallower mines in some parts of Cornwall; was there, in your opinion, a marked difference there between the agriculturists and the miners?—Yes, I should say so, owing to the miners climbing the ladders, the mines being so very deep.

19,365. From your experience, what do you think, is the most injurious part of the miner's occupation; is it climbing, is it smoke, or is it chill when they come up?—Climbing deep and bad air; a man has n business to be chill when he comes up, he should take it leisurely and change directly.

19,366. But they do not do that?—But that is their own fault. I think that climbing very deep is very injurious to the constitution.

19,367. (*Sir Philip Egerton.*) How are the children of the miners educated in your district; have you any national school?—We have a great many free schools. I do not think that there is a better place in the county.

19,368. Are they connected with the Wesleyans or with the Church of England?—Some with the Wesleyans and some with the Church of England.

19,369. How are the schools supported?—By people giving at their decease the rents of estates for the benefit of free schools. Ashburton is a capital place for that.

19,370. And the miners take advantage of it?—Yes.

19,371. At what age do the children begin upon your works?—It varies.

19,372. At about what age?—I should say about nine or ten.

19,373. How many hours do these children of nine or ten work?—They go to work at seven in the morning and leave work at five, and they stop for one hour in the middle of the day for dinner.

19,374. After they come upon your works those children have not much time for education, I presume?—No.

19,375. Do they attend evening schools?—Some of them do; they work in our mine the same as in all mines in the two counties.

19,376. Do you find that the children in your mines can read and write?—They all of them can read, but they cannot all write.

19,377. Do you find that the miners themselves are pretty well educated?—Some of them are pretty well educated, and some are rather plain; you could

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not prevail on some of them to learn to write if you were to do whatever you possibly could do.

19,378. Your mine is not worked on Sunday ?—No.

19,379. What distance are your miners from a place of worship, generally speaking ?—The principal part of them live in Ashburton.

19,380. Do they attend service either at church or at chapel ?—The principal part of them at chapel.

19,381. But they attend ?—Yes, very well indeed; they are a very steady lot of men, very good men.

19,382. (*Mr. Kendall.*) Are they Wesleyans ?—They are principally Wesleyans.

19,383. There are two sets of Wesleyans.—Yes.

19,384. Are they the old sect or the new ?—The old sect are here and what are called the Independents.

19, 385. Of which are there the most?—The Wesleyans, I think.

19,386. (*Chairman.*) What proportion, do you think, cannot sign their name, out of the number which you have ?—I do not know; there are some who cannot.

19,387. (*Mr. Holland.*) You said that miners suffered from climbing and from bad air ?—In very deep mines.

19,388. What other causes do they suffer from ?—I do not know. I should think that a medical man would be able to state that.

19,389. What do they complain of much besides that ?—When men have been working in very deep mines for many years and in very foul air, you will see them go away in consumption.

The witness withdrew.

Mr. John Sparham examined.

Mr. J. Sparham.

19,390. (*Chairman.*) Are you the medical officer to the union ?—I am the medical officer to the district.

19,391. How long have you been in this district ?—About 18 months.

19,392. Are you attached to any mine ?—The Devon New Consols. That is closed temporarily.

19,393. Have you miners employed at other mines who come to you ?—Constantly.

19,394. Do they pay for themselves, or are they paid for from the club of the mine ?—Some pay for themselves, and some from the club of the mine, and some fall on the parish. I get them in three ways.

19,395. Have you any men affected differently from other labourers ?—Yes ; there are different forms of disease with them.

19,396. Have you ever been down a mine ?—No.

19,397. Have you ever had a post mortem examination ?—No, fortunately not, since I have been here.

19,398. How should you say that the miner was affected ?—I think from a want of proper ventilation of the mine the miner's lungs become affected.

19,399. In what way does that show itself ?—Generally in the form of pneumonia.

19,400. Have you had an opportunity of seeing them in different stages ?—Yes.

19,401. In the early stage, how does a man suffer ?—He complains of a tight pain in the chest, and a slight cough, and it runs through his form : a rusty expectoration sets in, which in a few days changes to white, and they recover in two or three weeks.

19,402. Have they a cold ?—They complain of cold, but I am aware that it is pneumonia.

19,403. Can you at once tell ?—I at once treat them for it.

19,404. Do you see any difference on account of the particular mine in which they have been working ?—I think that from the Druid, as we call it, that is to say, the Devon New Consols, I get more than from any other on account of the depth ; it is an immense depth, and there is only one shaft to it. I get more men with pneumonia from that mine than from any of the others.

19,405. Should you say that it was increased from the want of ventilation, or from the climbing ?—That I cannot say. I have not had sufficient experience to say, but I have had more of it from that mine than from anywhere else.

19,406. When you find a man affected in that way do you advise him to give up work ?—Directly.

19,407. Have you known cases where they could resume their work with impunity afterwards ?—I have hardly been here long enough to answer that question.

19,408. Do they generally give up ?—They give up directly I order them.

19,409. Had you ever seen similar cases of men affected by working in mines before you came here ?—No. The coal pits do not produce that sort of thing.

19,410. What is the eldest man that you have had as a patient affected in this way ?—A man about 50. The men generally run about 25 to 30 here, I should think.

19,411. Have you any men now under treatment ?—Not at this moment.

19,412. Do you keep any record of cases ?—No ; I have no time for that.

19,413. Have you had any cases of accident since you have been here ?—A good many.

19,414. From what ?—Principally from falls, either men falling in the shafts, or pieces of rock falling upon them ; most of them have been scalp accidents.

19,415. Have you had fatal ones ?—No.

19,416. In what mines especially should you say that those accidents have occurred. Have they taken place in any one in particular ?—Not in any one in particular. When I first came here I had to attend them nearly all; one medical man, and the other being out of the way, I attended for the other medical men.

19,417. Do you know how many men are working in the Devon New Consols ?—When they were at work, about 40 or 50 men.

19,418. Why is it stopped ?—From some pecuniary reasons, I believe. I do not know precisely.

19,419. How long has it been stopped working ?—Not above a month or six weeks at most. I have had men on all the time ; there are some on now. Of course, the shaftman and some others are on now.

19,420. Are there any men now whom we could see who have been treated ?—No, not that I am aware of. They are all dispersed.

19,421. But before the mine was stopped, you had men ?—Yes, constantly coming to me with slight pneumonia and bronchitic attacks, which I attributed to their being in the foul air more than anything else. They complained that after they had been in this foul air for some time, they had a pain in the chest, and this went on for some days, and then they came to me with pneumonia evidently. How far the ladders might conduce to that by their having to climb up 600 or 700 feet, I cannot say.

19,422. How did they describe the first feeling of the symptoms ?—An oppression in the chest.

19,423. Was the head affected at all ?—Not much. They did not complain so much of that.

19,424. What is the food of the miners ?—I think they live pretty well.

19,424*a*. Do they get much butcher's meat ?—Yes, plenty of butcher's meat. They are rather a dissolute set here ; we get an inferior class of men, *i.e.* of the Cornish miners.

19,425. (*Mr. Holland.*) Is this disease very slow in its progress ?—No ; it is about two or three days before it gets to its climax, when treated at the commencement of the attack.

19,426. What is the end of it ?—The end of it is that resolution sets in, and they have a little rusty expectoration, and they get about again.

19,427. Do they have it again ?—Yes ; I have had one or two with a return of it.

19,428. Are they very liable to relapse?—That I can hardly say. I have not been here long enough to say. I have had one or two relapses. It seems to me that deficient ventilation is the cause which does so much mischief to the men.

19,429. (*Sir Philip Egerton.*) What opinion have you formed of the general health of the district, exclusive of the miners themselves ; of the families of the miners, for instance ?—My opinion is that we are excessively subject to disease of the lungs here ; that is to say, the general population, men, women, and children.

19,430. Is there a good deal of consumption ?—A great deal of consumption ; in fact, I have seen more consumption in the 18 months that I have been here than I saw for 12 years in Staffordshire. I was halfway between Wolverhampton and Stafford, north of Wolverhampton.

19,431. Is there much low fever?—I have seen none.

19,432. Are you inclined to attribute the prevalence of consumption and lung diseases to the air of the district, or to the overcrowding of the habitations ?—I think it is to be ascribed to the air of the district—the constant changes of temperature that we are subject to.

19,433. From the visits that you have made to the cottages of the miners, does it strike you that they are overcrowded ?—They are overcrowded in this town ; very much so.

19,434. But how is it in the country districts round about ?—In the country districts they are much about as they usually are.

19,435. Do you find much difference in the hygiene of the town and of the country districts ?—They are more unhealthy in the town.

The witness withdrew.

Mr. Joseph Phillips Nicholls examined.

19,436. (*Chairman.*) Of what mine have you the charge ?—Frank Mills and South Exmouth mines.

19,437. What is the character of the ore ?—Both the mines are lead mines.

19,438. About what number of men are employed underground at South Exmouth ?—About 70 in all.

19,439. And how many at Frank Mills ?—From 70 to 80.

19,440. Do those men work night corps ?—In some of the most important places, but not in all.

19,441. Are the men mostly tributers or tut-work men ?—There are tributers and tut-work men in one mine, but no tributers in the other. Frank Mills occupies 22 tributers, and the rest are tut-work men ; at South Exmouth there are no tributers.

19,442. Why are there no tributers there ?—Because it is a new mine, only just started.

19,443. Frank Mills is the older mine of the two ?—Yes ; and is opened to a greater extent.

19,444. What is the deepest level at Frank Mills ?—One hundred fathoms.

19,445. What number of levels are you working at present ?—40, 60, 70, 84, and 100 fathoms.

19,446. How many shafts are there ?—Three.

19,447. What is the greatest distance from any shaft or winze that you are now working ?—About 28 fathoms.

19,448. What are you driving ; are you driving on the lode ?—We are driving on the lode and cross-cuts. Our general drivings are on the lode.

19,449. How far can you drive on the level away from a shaft or winze ?—That would depend entirely on the nature of the lode ; if the lode is small and poor we can drive to a considerable distance, and the air will continue good, but in some places where the lode is large and rich we can scarcely go any distance without conveying air by some means either by pipes or otherwise ; where the lode is small and poor, you can, comparatively speaking, go as far as you like.

19,450. Is it a rich lode where you are now driving ?—The lode is rich within a few fathoms of the end, but not in the end, that is in the sixty fathom level.

19,451. In these three shafts is there one upcast, and are the others downcast ?—There is one upcast, and there are two downcast.

19,452. Is it always upcast ?—It has been so the last two or three years, and it is also against the laws of nature ; the lowest shaft is the upcast; it is a thing seldom seen.

19,453. That does not shift with the weather ?—It has not shifted in the last five years; just when it was first completed it shifted a few times, but it has since taken a regular draught and continued so.

19,454. Do you adopt doors or any other means ?—Yes, in some cases we adopt doors.

19,455. You take measures in order to continue the upcast ?—Yes, to continue it right to the end of the mine.

19,456. What artificial means do you use when the air gets bad ?—Sometimes doors and pipes, or a machine to blow air.

19,457. What sort of a machine ?—A fan machine, worked by hand.

19,458. Have you any water blast ?—Occasionally where there is a chance we throw a waterfall.

19,459. Have you any means of doing that ?—We have sometimes, we do not want it at present. We can do it in the bottom levels, but not in the upper, there being no water.

19,460. Is there no place at present where the air requires a fan ?—The worst place that I know of is in the 60 fathom North, and that is not bad.

19,461. (*Mr. Kendall.*) How far is the 60 fatho North off last winze ?—About 28 fathoms.

19,462. (*Chairman.*) Are you going to communicate with another level there ?—Directly, without going any further ; we are searching for the same part of the lode, in the 70 fathoms, to rise and sink and form a communication. We are not in the same part of the lode ; if we were, we should drain the water ; we only want to drain the water, and put a winze through.

19,463. In this place do the men work three corps ?—They do so in some important places ; we work as few by night as possible ; there are none working by night in that particular place.

19,464. How long is the end free from any men ?—From ten at night till six in the morning.

19,465. Do you find the air worst at night, or in the morning ?—It is worst at night, it freshens while the men are absent.

19,466. Have you any cold damp or carbonic acid gas in that mine ?—There is carbonic acid gas which comes out of the lode, but there is no cold damp.

19,467. What quantity of candles are the men allowed in Franks Mill's mine ?—2 lbs. each.

19,468. Is there much blasting ?—Very little.

19,469. Is it chiefly worked by the pick ?—Chiefly by the pick.

19,470. Is there much dust ?—No. The ground is chiefly damp, not wet, but a little damp.

19,471. Have you a pumping engine there ?—Yes.

19,472. A steam pumping engine ?—Yes.

19,473. Do the men ascend by ladders ?—Yes.

19,474. Is there any place for them to change when they come to the surface ?—Yes ; a very convenient dry.

19,475. Near the footways ?—Yes.

19,476. Are the footways in the drawing shaft ?—The principal part of the men come through the engine shaft and drawing shaft, but they are divided.

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19,477. They are bratticed off?—Yes. There are three shafts, and in case of accident they could come through any one.

19,478. The South Exmouth mine has not been working so long as the other?—It has been working two years.

19,479. Was it an old working before that?—There was very little done; the shaft was sunk about 16 fathoms.

19,480. How long have you been manager of either of those two mines?—Of the South Exmouth from the commencement, and of Frank Mill's from six months after it commenced; I have been between nine and ten years at Frank Mill's.

19,481. What is the greatest depth at South Exmouth?—The 60 fathom level.

19,482. What is the adit?—There is no adit in the district, the depths are given from the surface.

19,483. Are there more shafts than one?—There are three shafts.

19,484. How is the air generally?—The air is very good in general, but our shafts there do not work so regularly as in the other mine.

19,485. You have not a regular upcast and downcast?—No; the shafts stand nearly in a level, hence in a sudden change of wind they stop the wind current. We have raised one shaft 30 feet, and that has made the ventilation better.

19,486. Has that made it an upcast?—Generally, but not for certain. We have plenty of air. We have three shafts in the mine, and it is only open to a certain extent. Sometimes there is so much air that you can hardly carry a candle.

19,487. What length of workings is there?—The greatest extent of South Exmouth is 170 fathoms; the entire length.

19,488. Are the three shafts along the level?—No, the one air shaft is just against the engine shaft, against the cross cut.

19,489. Do they communicate with that long level?—They all communicate.

19,490. How far are you now working from any winze or shaft?— Not more than, I should say, 25 fathoms at the furthest place.

19,491. Have the men there ever complained of the air at the end?—Never.

19,492. Have you ever found that the candles would not burn there?—Yes, occasionally, and then of course the men must not stay there; they leave, if the air is even so bad that the candle will not burn; the men have no business there any longer.

19,493. Then do you put them to other work?—Yes, if it continues for any time; of course we should not keep the men idle. I have seen places where the lode has been large and rich, that you would merely strike into a cavity and you must leave directly, but in six hours there is as good air there as is here; if you let the gas escape the air will clear itself again directly and mix with the other.

19,494. Does it extinguish the light at once in in that case?—Yes, if you put it near it.

19,495. (*Mr. Kendall.*) It will not flame?—No.

19,495*a*. But it puts out the light?—Yes.

19,496. (*Chairman.*) Do you think that the men have ever suffered from working too long in it?—I do not know that they have. There is one class of our men that do not stand long, that is the men brought up to agricultural labour until they come perhaps to years of maturity; those men are the men who fall off quickly; but we have some men who have worked from boys who are very old; one was buried a few weeks since who worked in the mine till he was 75. There is another working on the mine, strong and healthy, 76. There is another regular miner in the neighbourhood, past 80, not working in our mine, but a regular miner.

19,497. Have you any boys?—Yes; some of the fathers are bringing their boys up.

19,498. Do those boys suffer at all?—They do not appear to suffer in any way.

19,499. Are the greatest number of the men working there young men?—We have some of all ages.

19,500. Have you women working on the surface?—Yes.

19,501. Do they work under cover?—All the women are under cover.

19,502. Have you a doctor attached to your mine?—We have a regular doctor.

19,503. Do the men pay club money and doctor?—Yes, the miners; but the surface men do not pay club, but only doctor.

19,504. How much do the men pay?—9*d*. a month for doctor and 9*d*. for club. The boys and girls pay 3*d*.

19,505. Is the club money for visible hurt, or sickness?—For visible hurt. A great many of the men are in the parish clubs, and if they are sick and receiving pay from both clubs they get more than if they are working. We are continually giving; in any case which we think deserving we help them.

19,506. Is there a separate account kept of the club money?—Yes. We give them gratuities; at the last pay day we paid £6 to the men that were sick; but they cannot claim it. The boys and girls have nothing to do with the club; the 3*d*. is for the doctor. The doctor attends them for everything and also the underground men.

19,507. By whom is the doctor appointed?—By the purser, and the men have a voice in it. When the present doctor was appointed it was left to the men whether they would like him or not. There has never been a complaint against him.

19,508. If the men were to go to another doctor, could the money be applied to him?—No. If they entered any just complaint against the doctor, he would be changed.

19,509. Have you a boiler?—We have two boilers at Frank Mills, and one at South Exmouth.

19,510. Are those boilers provided with any index?—One is, the others are not.

19,511. In the others, is it ascertained merely by the cocks?—By the cocks and the safety-valve.

19,512. Is there more than one safety-valve?—There is one to each boiler, and either one would apply to the other boiler, because they are connected.

19,513. (*Mr. Leveson Gower.*) Have you ever had any fatal accidents in your mine?—Yes; but not many. We have had fatal accidents in Frank Mills, but not in South Exmouth.

19,514. How many have you had?—Four.

19,515. Since when?—That is in all the working, I suppose, within the last nine years. Our accidents are very scarce.

19,516. When was the last?—In the beginning of January or the latter end of December.

19,517. What was the cause of that accident?—A scale of ground.

19,518. Did you work yourself in a mine when you were young?—Yes, from a boy of 12 years old.

19,519. Till when?—I have not worked much the last 20 years. I worked in Cornish mines until I was 24, and then I went to Mexico, and stayed there nine years. Since that I have been in Devonshire managing mines the greater part of the time.

19,520. Was your health at all affected from having worked in mines?—Never. I believe that up to February I enjoyed as good health as any person living; since then I have had congestion of the lungs. I caught a cold, and had congestion of the lungs.

19,521. (*Mr. Kendall.*) Did you catch cold underground?—No; I got wet above ground.

19,522. Wholly unconnected with mining?—Yes. My health is as good as any person's.

19,523. Have you worked in the deep mines in Cornwall at all?—Yes.

19,524. In what mines?—In the Great Consols; I have worked as deep as the 240 fathoms.

19,525. Did you go down by a man-engine or by ladder?—A ladder.

19,526. How long did it take you to go down?—About 20 minutes to go down.

19,527. And how long to come up?—Three quarters of an hour to an hour.

19,528. You had no man-engine in those days?—No.

19,529. How many hours used you to work underground clear?—It was called eight hours, but then we made the up and down in the eight hours.

19,530. You did not relieve in place?—Not except at the latter end of the month, or anything of that sort.

19,531. How long did you work in that deep level?—About six months; then I afterwards worked upon tribute for two or three years.

19,532. At the end of the six months did you find your health fail or not?—Not a bit.

19,533. What age are you now?—Forty-eight the 23d of next July.

19,534. Up to the time of your having this cold you were as strong as ever?—As strong as ever I was in my life, and I am now fast recovering.

19,535. Have you experienced the effects both of carbonic acid gas and of cold damp?—I have.

19,536. What is the difference between the two in the feeling?—In cold damp you would begin to get sleepy directly, and feel your legs to tremble, but the carbonic acid will put out your candle; the cold damp would have an effect upon you as quickly as it would put out the candle, or rather sooner; but in the other, before you feel the effects of it your light is gone, and hence you retire.

19,537. (*Mr. Holland.*) Does the light go out at the bottom of the level?—The air is very good there.

19,538. (*Mr. Kendall.*) Can you see cold damp?—You would see it as a mist before your eyes, and your candle would be blue.

19,539. (*Mr. Holland.*) Is it a peculiar-looking mist?—Yes; and you feel a curious sensation too as soon as you get into cold damp.

19,540. (*Chairman.*) Does the ground require much timbering at South Exmouth?—Yes, we use a good deal of timber in some places.

The witness withdrew.

Adjourned.

NATHANIEL JOHN HAYDON, M.D. and L.R.C.P., examined.

19,541. (*Chairman.*) Are you the medical attendant at any mines?—Yes; I have two mines under my medical superintendence. Yarner Mine in Bovey Tracey, and Atlas Mine in Ilsington.

19,542. How many men are employed at each of these mines?—Between 40 and 50 at each of them.

19,543. How long has the Yarner Mine been worked?—Between 6 and 7 years.

19,544. What is the ore raised from it?—Copper.

19,545. What is the deepest level?—40 fathoms; they are now sinking on the 50.

19,546. Is the mine a wet mine?—It was formerly a very wet mine, the water coming in on the men from the upper part of the workings; this arose from the nature of the ground. It is now very much improved; a steam pumping engine has been lately put up.

19,547. Did the men suffer at that time?—Yes, they were very sickly.

19,548. Are they improved in health?—Yes; but they are still sickly.

19,549. What do they principally suffer from?—Pectoral disease, such as bronchitis, inflammation of the lungs, and rheumatism.

19,550. What, in your opinion, is the principal cause of this?—The want of a good changing-house and proper "dry," so that the men have often to change while their clothes are still wet.

19,551. Do the men not change in the boiler house?—No; they are allowed to dry their clothes there, but not to change.

19,552. Why?—Because the captain considers it dangerous; the steam engine does not work regularly, but only at certain parts of the year when water power is scarce.

19,553. Have you many men at one time under your care?—Yes; particularly in wet weather. I have had as many as six or seven out of the 45 at work there.

19,554. From what disease?—From colds and from the diseases I before mentioned.

19,555. Do the men complain?—Yes, they complain of the want of a good "dry" and "change." Most of them have to walk from Bovey to the mine, just 2 miles, over an exposed road; they frequently get wet through; they then go underground for 8 hours, come up fatigued and freely perspiring, and have to put on their wet and cold clothes.

19,556. This, then, would be likely to induce sickness?—Certainly; for a man exhausted by 8 hours' work underground would be more liable to feel the ill effect of cold and wet than a man not exhausted; he would, therefore, be so much the more liable to "catch cold."

19,557. How is the mine ventilated?—I have never been below, but I produce a section of the mine. There are three shafts; the old engine shaft, a new air shaft, and the new engine shaft is now being sunk; there are numerous "winzes," and the captain and the men quite agree that the mine is well ventilated.

19,558. How many men did you say there were at Atlas Mine?—From 40 to 50.

19,559. What description of ore is raised there?—Tin.

19,560. Is the mine well ventilated?—I have never been below, but I produce a section of the mine. She is said to be very well ventilated.

19,561. Are the men healthy?—Yes very healthy.

19,562. What do you attribute this to?—To a good changing house and "dry" near the shaft.

19,563. How long have you had the medical superintendence of these mines?—About four years.

19,564. Have you ever had opportunities of investigating the diseases of miners except in those mines?—Yes. I formerly resided for four years in Cornwall, where I had frequent and continual opportunities of seeing and studying the diseases of miners; and some years since I had the medical care of a mine (lead mine) in Hennock.

19,565. Have you known any cases of miners' asthma?—Yes; I have seen many who have suffered from it; I have one case under my care at present.

19,566. How does it begin?—With slight difficulty of breathing and cough, depending on bronchial irritation; the amount of difficulty of breathing and cough necessarily differs in different individuals; in some cases the cough is nearly always present, dry and harsh.

19,567. (*Mr. Holland.*) How does it proceed; and what are the sounds on percussion and auscultation?—The circulation becomes affected, and you have increased frequency of pulse with more or less palpitation of the heart; a very harassing cough. You have a loud respiratory sound, but a dulness on percussion; this after a time is followed by a state of extreme exhaustion; the sufferer appears to waste away; his pulse becomes much slower; and in this state of sinking, or almost living death, he may and often does go on for several years.

19,568. Is there any black spit?—Yes; black spit is a frequent symptom of the second stage of the disease; it is called by some authorities carbonaceous bronchitis or black phthisis.

19,569. Have you formed any opinion how black spit is produced?—I imagine it to be a carbonaceous deposit from the blood, produced in the lung, mainly

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dependent on a long continued breathing of bad air in imperfectly ventilated mines.

19,570. Is it your opinion that a free and perfect ventilation of mines is necessary to prevent miners asthma and black spit?—I believe a free ventilation of the mines, conjoined with a good "change" and "dry," are the essentials for preserving the health of miners.

19,571. Is black spit never produced by other causes than by bad air?—I have seen black spit in a gentleman now a patient of mine, who was never in a mine in his life. He suffered for some time from a troublesome bronchitis, and for the last two years has shown "black spit." It has been examined microscopically by some eminent London men; and we came to a perfect conclusion, that in this case he had a carbonaceous deposit, and not a malignant disease. I do not know what produced it. It is a very common thing to find black matter in the lungs and bronchial glands.

19,572. Are you aware that some high authorities consider "black spit" to be a melanotic deposit?—I know there are a variety of opinions in this matter. The peculiar characteristic is the black matter. Messieurs Foy and Thenard from their analysis affirm it to be a highly carbonized insoluble matter, supposed to be altered colouring matter of the blood. Dr. Fyfe is of the same opinion. Dr. Cassell calls the black appearances spurious melanosis. Professor C. J. B. Williams says the production of black matter may coexist with various modifications of the nutritive process, * * * * as in the peculiar combination of black with opaque caseous matter, not unfrequently found in the lungs and bronchial glands; but, agreeing with Andral, he hesitates to class simple melanosis with malignant growth. I have not seen Professor Virchow's work; but I am informed he considers the deposit to be melanosis, and that Professor Goodsir coincides in that view. But without doubt two of the best papers on this subject are to be found in the Edinburgh Monthly Journal of Medical Science, 1846, by Dr. Makellar; and in the Edinburgh Medical and Surgical Journal, 13 vol., by Mr. Graham. It is here shown to depend essentially on the smoke from the lamps suspended from the miner's head while at work; to the inhalation in confined mines both of the carbonic acid generated in the pit, and of that expired by the labourers themselves; and also the inspiration of heated air after the explosion of gunpowder required in the works in which float carbon and carburetted gases.

The "black spit," which is after all one of the most serious complications of disease to which miners are liable, inasmuch as it is a symptom of a grave, intractable, and incurable pulmonary affection, has been long known. Haller relates it, so does Bayle and Laennec (Herbert's edition. 1846, p. 355, 71), under the name of Melanosis; but M. Andral, in his notes to Laennec (op. cit. p. 822, 23), very distinctly combats this view, especially in the case of miners, and he relates instances of miners who had been killed by violence, and who through life had exhibited no signs of pulmonary disease, had on post mortem examination been found with extensive black deposit in the lungs.

In Copeland's Dictionary of Medicine, vol. 2, p. 787, this disease is well treated of under the title of Spurious Melanosis.

In the Cyclopædia of Practical Medicine, vol. 3, pp. 97, 98, 99, 100, there is a most valuable paper from the pen of Dr. Carswell, "Spurious Melanosis," *from the introduction of carbonaceous matter.* He relates the cases of two miners: The first of whom was a patient in the Royal Infirmary, Eding, and died there; he relates the P.M. appearances, and the analysis made by Professor Christison of the black matter. 1. Concentrated nitric acid boiled on it did not alter the colour. 2. Immersion in a strong solution of chlorine had no effect. 3. A strong solution of caustic potass boiled on it took up some animal matter and filtrated very slowly. 4. He subjected a small portion of the black powder left after the action of the boiling nitric acid, well washed and dried, and introduced into a glass tube with a ball to the action of a low red heat a considerable quantity of gas which had the odour of coal gas, and on the approach of a light took fire and burnt with a dense white flame. In the tube a dark yellow fluid likewise condensed, which had exactly the odour of impure coal tar naphtha, and became a soft mass on cooling of the consistence of lard. This, when compressed between layers of filtering paper, yielded an oily stain to the paper, and left a white matter, which dissolved in boiling alcohol, but appeared again on cooling in the form of minute obscure crystals. Dr. Christison remarks on this, "It is scarcely possible not to recognise the ordinary products of the distillation of coal;" and Dr. Carswell said, "The result of this analysis does not permit a doubt as to the origin and nature of the black discoloration in the case;" but Dr. Carswell suggests that while there can be no doubt that these black masses are due to the inhalation of carbonaceous matter, "*is it not more probable that the accumulation is determined by a morbid state of the lungs themselves?*"

It is impossible not to be struck with this question of Dr. Carswell. The almost habitual breathing of bad air necessitates the fact that the blood is never properly decarbonized, from a want of a proper or sufficient quantity of oxygen; carbon can only combine with a given proportion of oxygen; carbonic acid is carbon in combination with the largest proportion of oxygen which it is capable of combining with. But the action of oxygen does not simply stop when it has combined to form this carbonic acid; another proportion of oxygen is required to cause the removal of the carbonic acid itself. In a deep mine or badly ventilated mine you not only have not sufficient supply of oxygen for these purposes of healthy life, but you are continually consuming oxygen by the lights which are necessary, and so continually adding to the quantity of carbon and carbonic acid; the lung is in a state of almost habitual congestion, and soon acquires that morbid state suggested by Dr. Carswell. It is well known to practical miners that "tribute men" who work in what is comparatively good air are freer from disease and longer lived than "tutt men" who work in bad air. A very excellent paper on the influence of respiration on the blood is to be found in "Stevens on the blood," pp. 1 to 162.

19,573. What practical conclusion would you deduce from these facts?—That no mine can be worked with a proper regard to the health of the miner that is not most freely ventilated; that in all mines, in addition to air shafts, there ought in all cases to be a series of winzes sunk, not as now for the purpose of profit to the mine, but for the purpose of ventilation, and so of health and life to the men.

19,574. Have you had any cases of miners with tubercular phthisis under your care?—Yes, and I found it aggravated by working at the mines; one man in particular was a labourer who took to mining after he was 30 years old, and he soon knocked up. I have seen many agricultural labourers take to mine work, but they cannot stand it long without illness.

19,575. As a rule do you consider that tubercle is produced by that condition described as miners' asthma?—On the contrary, while miners' asthma is frequent, tubercle is a rare disease amongst miners; it certainly may co-exist with the asthma, but is not produced by it. There is too a curious but very important distinction, for in the advanced stages of the asthma you get a very slow pulse, in tubercular phthisis you get a very fast one.

19,576. Have you made any post mortem examinations?—No.

19,577. How have you formed your opinions of miners' disease?—From a careful watching of numerous cases during the last 23 years, and by noticing the physical signs of disease, and by comparing my own experience with the best authorities who have written on the subject.

19,578. Have you seen any other form of disease amongst miners?—Yes. Many years since, in 1845, I

attended a man, Wm. Wilmot, working at a lead mine near Hennock, who was completely paralysed in his lower extremities from lead palsy.

19,579. Do you think he drank the water?—No, I do not. I made particular inquiry at the time, and I found he had been standing in the water of the mine. He was 26 years old.

19,580. Are the lead mines less healthy than the copper and tin mines?—I cannot say.

19,581. Have there been any accidents at the Yarner or Atlas Mines?—Very few and very trifling ones at Yarner; a man indeed fell down the shaft, but was scarcely injured. At Atlas there have been several bad accidents, including compound fractures of the legs, fractured skulls with depression, dislocation of shoulder, and some lesser casualties.

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19,582. Have you noticed any particular disease amongst the families of miners?—No; they generally live in the same way and are subject to the same influences as the agricultural labourers' families and are liable to the same classes of disease.

LONDON.

Wednesday, 17th June 1863.

Present:

The Right Hon. Lord Kinnaird, K.T.	John St. Aubyn, Esq., M.P.
Sir P. Grey Egerton, Bart., M.P.	Richard Davey, Esq., M.P.
The Honourable E. F. Leveson Gower, M.P.	Edward Headlam Greenhow, Esq., M.D.
Nicholas Kendall, Esq., M.P.	P. H. Holland, Esq.

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

Robert Angus Smith, Esq., Ph.D., F.R.S., examined.

London.

R. A. Smith, Esq., Ph. D., F.R.S.

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19,583. (*Chairman.*) You reside at Manchester?—Yes.

19,584. You are a professional chemist?—Yes.

19,585. And a Fellow of the Royal Society?—Yes.

19,586. You have made, I believe, the examination of air your special study?—I have.

19,587. I believe that at my request you visited Cornwall?—I did.

19,588. And you went underground in different mines?—I did.

19,589. Did you when underground make any experiments as to the state of the air?—I made some experiments upon the air with permanganate of potash, and ascertained that great impurities were to be found in the air. This examination on the spot, however, was only intended to enable me to understand the usual conditions of a mine, and to give me an idea of the nature of the investigation which I was about to undertake.

19,590. Did you take with you underground any peculiar means of bottling the air?—I brought away a number of specimens of air—I collected the specimens in this manner. I took tubes of this shape (*producing a tube*). These were filled with air—that is to say, air was drawn through them, and when they were completely filled with the atmosphere of the place they were sealed by means of a blow pipe, and were retained in that state until they were wanted for analysis. I used a bellows-pump to draw out the air. I have not brought it with me. When the tube was sealed it was in this condition (*producing another tube*).

19,591. (*Mr. Holland.*) It was sealed at the moment?—Yes, on the spot.

19,592. (*Chairman.*) You also had a good many tubes sent to you?—Somewhere above 200—perhaps about 250 have been sent to me.

19,593. These tubes have been sent since September?—Yes.

19,594. Do you know the levels or the mines where the air in those tubes was taken?—In very few cases indeed; in fact I may say in no case whatever, except in those which I took myself.

19,595. The tubes are all numbered, are they not?—They are.

19,596. After you had got the tubes at your laboratory will you describe the process which you adopted in order to ascertain the quality of the air which was contained in the tubes?—I thought it most important to ascertain first the exact amount of oxygen and carbonic acid, to see how far the air was deteriorated from the want of oxygen. In order that I may be more concise in my language I may, perhaps, be allowed to read what I have written, simply as a very short abridgment of my investigation, because it would require almost a volume of itself if I gave it fully, as it has been extended over many months. I did not confine my examination of the air to one method, but I considered it needful first of all to obtain an exact knowledge of the composition of the specimens, as far as oxygen was concerned, and along with it carbonic acid and nitrogen. As this can be given in figures obtained by very exact methods, all vague expressions and all uncertainty of opinion are removed. We may not be certain that air is wholesome, even when it contains the normal amount of oxygen, according to analysis, but we are quite certain that it is unwholesome when it does not contain that amount, the removal being made by breathing or combustion, and the products remaining. To obtain the amount of oxygen I used hydrogen, and exploded the two gases. I consider this the cleanest method. The number of specimens hitherto examined for oxygen and carbonic acid amounts to 120; there are, however, many others on hand for analysis, and some of the specimens have been examined for organic matter and other substances. Pure atmospheric air contains 21 per cent. of oxygen, or at least from 20·9 to 21. There are different opinions upon that subject, but 20.9 may be taken as the lowest. Any amount equal to or above 20·9 I shall call normal. Any amount below proves the air to be inferior. When the amount is as low as 20·6 the atmosphere is certainly very bad in the sense in which we find air to be bad in crowded rooms, still supposing the products of oxidation to remain. Air containing oxygen to an amount varying from 20·6 to 20·9 must therefore be called impure air. It is air in which no one can thrive, and into which if we suddenly come we feel great discomfort, whilst to some persons it is not tolerable even for a few minutes. Air having less than 20·6 of oxygen may be called extremely dangerous, such as we seldom are called on to breathe, and such as occurs only in exceptional cases, as in mines, and in similarly close spaces. Allowing these three kinds of air to exist, of good, bad, and extremely dangerous, the 120 specimens divide themselves thus: 25 specimens or 20·8 per cent. are normal; 30 specimens, or 25 per cent. are decidedly impure; and 65 specimens, or 54 per cent., belong to the extremely dangerous class. There are varieties in each of these three, but especially in the very impure and dangerous, for example, some speci-

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mens have an amount of oxygen nearly as low as 18 per cent., so that about 12 or more per cent. is removed; now, as even a candle goes out when 24 per cent. is removed, and in some conditions such as in the absence of currents, even in less impure air, we can readily understand that we have arrived at a very deleterious atmosphere. I have not, however, obtained such extreme results as those which have been obtained by Mr. Moyle. Some of the specimens which I obtained contained little more than 18 per cent. of oxygen. Mr. Moyle, who examined the air of the Cornwall mines some years ago, found as little as 14 per cent. I am told, however, that many of those specimens which I have now in my possession for analysis are very inferior to those which I have already examined, and it may happen that I shall find Mr. Moyle's results corroborated. However, as the specimens appear, they have not sunk so low as Mr. Moyle's. I may say that in my experiments I found that at 16 per cent. an ordinary tallow candle was extinguished, and became perfectly black; at 14 per cent. paraffin oil burnt; and I think at 12 per cent. alcohol went out. More volatile oils of course burn longer.

19,597. (*Mr. Holland.*) Do you mean a paraffin oil lamp with a glass?—Yes, but in this case the chimney evidently assisted the combustion by causing a draught. What I have stated relates to the amount of oxygen. I have the details in these note-books, which are rather voluminous, and I did not expect to give them to day. The carbonic acid may be taken as the difference between the amount of oxygen actually contained in the gas and 21 per cent.

19,598. (*Dr. Greenhow.*) That is to say, that where there is only 18 per cent. of oxygen there will be 3 per cent. of carbonic acid?—Yes.

19,599. Do you find that this relation is always preserved, namely, that the increase of carbonic acid is exactly equal to the deficiency of oxygen?—I find it a little different. I believe that the relation would be exact if the carbonic acid were caused by breathing, or by the combustion of a candle; but as sometimes the carbonic acid is introduced by explosions and external methods, the relation is not exactly preserved.

19,600. (*Mr. Holland.*) The combustion may not be perfect; there may be carbonic oxide, and therefore there would not be an exact correspondence?—That would also be the case. Besides the carbonic acid there are other substances. I will first give the substances which are actually introduced into the atmosphere by the explosion of gunpowder and by combustion. These are carbonic oxide, hydrogen, and sulphuretted hydrogen; these three as gases. Then there are sulphate of potash, carbonate of potash, hyposulphite of potash, sulphide of potassium, sulpho-cyanide of potassium, nitrate of potash, carbon, sulphur, carbonate of ammonia, sulphide of ammonium, organic matter, sand, and in some cases a little arsenious acid. These are introduced into the air.

19,601. (*Dr. Greenhow.*) Which of these arise from the combustion of gunpowder; arsenious acid, for instance, will arise from a different source?—Yes; arsenious acid arises chiefly, as far as I know, from striking the arsenious ores; there is a strong smell of arsenic a moment after striking; some of the ores give it out in very decided quantities, and some of them give it only in very small quantities, but there is a very large amount in some of the ores.

19,602. Will you specify exactly which of the salts end gases you have named are given off in consequence of the combustion of gunpowder, distinguishing them from those given off in the working of the mine?—All of those last specified, with the exception of organic matters, sand, and arsenious acid, come from combustion. We know that these gases exist in the mines, and that these solid substances which I have spoken of occur along with them, because they are given out by the operations which take place in the mines.

A very important question relates to the amount of solid substances. This amount is great enough to render these materials visible even when there are only a few inches depth of air containing them. They issue from the mines with the appearance of dust and smoke. An important part, as I consider, of my investigation relates to the capture of the minute particles of which this smoke is composed, and their retention in a permanent as well as in a visible condition. All, or nearly all, the 150 tubes have been examined through the microscope, and in most cases I have marked down the relative amount of crystals formed in the tube. I thought it right to pay more attention to the crystalline forms than to the shapeless dust, as it is more interesting as well as more capable of proving the origin of both. I have obtained very correct drawings of the crystals in about 20 of these tubes, which show considerable variations in the forms; although sulphate and nitrate of potash are the principal crystals, sulphate of potash greatly predominating. Much of this begins as sulphide of potassium, and must act in a manner similar to sulphuretted hydrogen, if not more violently, at least I suppose so; it is, however, soon converted into sulphate of potash. I will show some of these substances.

(*The witness produced the same.*)

19,603. (*Chairman.*) I suppose that these are magnified?—Yes.

19,604. (*Mr. Holland.*) About how much?—About 60 diameters.

19,605. (*Chairman.*) Are you able to ascertain from the form of these crystals the composition of them?—As regards at least two substances I think I can, distinctly; these are sulphate of potash and nitrate of potash; there is a little unburnt saltpetre after the combustion of the gunpowder.

19,606. (*Sir P. Grey Egerton.*) Did you analyze them?—I have also analyzed them. I washed out a considerable number of these tubes and analyzed the result, and proved that these crystals do exist, chiefly sulphate of potash. It would be scarcely possible to obtain the result from one tube, but by having several tubes it is very easy.

19,607. (*Dr. Greenhow.*) I observe that you have marked upon some of these drawings that the samples of air were taken immediately after an explosion; are you aware whether that was the case with the whole of them?—In some of them it was a considerable time before explosion.

19,608. That is to say, at a time when there would probably be a smaller amount of these impurities in the air than would be the case at most other times?—Yes; I requested Captain Rowe to give me a few specimens immediately after explosion that I might see the difference.

19,609. (*Chairman.*) But the others were taken from the tubes as sent to you?—Yes.

19,610. There were only a few which were taken at your own special request immediately after explosion?—I think only two; I have, in most cases, marked down the relative amount of crystals formed. I have spoken of salts of potash. I obtained the potash by direct analysis; it existed in considerable quantities. Ammonia was found in the tubes to a considerable extent. Some of this ammonia would no doubt arise from the organic matter, but the greater amount must be supposed to come from the gunpowder. This prevents us from using the ammonia as a mode of estimating organic matter. I have somewhere the exact amount which I got in a cubic yard of air. The organic matter was found in very decided amounts by more than one method. It was obtained in the common way by boiling down the solution, that is, after washing the tubes with water and drying them. It was readily perceived by a blackening or by leaving charcoal when treated with sulphuric acid. It was also obtained by the use of permanganate of potash, which was a ready mode of observing it.

A very curious mode of examining the air came out which appears very trifling, and which at first seemed to me ridiculous, but which I think promises very valuable results, and to me is quite as certain as the more exact chemical method, but the objection to it is that it gives no figures ; this is, by the use of the sense of smell. By simply opening a tube of impure air and smelling it when we ourselves stand in a pure atmosphere, the result is so decided that practically analysis becomes unnecessary, at least when the impurities are of such a kind as are found in these tubes and in many unwholesome places. The examination of air for practical purposes will, in many cases, be performed by a man unskilled in science, if taught to examine it in this manner. I have been able, by the mere sense of smell, to distinguish in these tubes, tallow, tobacco, perspiration, and that closeness which has no name, but which we believe arises from carbonic acid and organic matter mixed. When we enter this region, namely, of smell, the fancy is apt to lead us astray, but in this case the results were beyond all my expectation, and such as I should have held to be quite impossible. They were confirmed also by others in my laboratory ; in fact they were too gross to allow of any mistake being made.

The following are the general conclusions which I draw: I believe that the inquiry shows without the shadow of a doubt the nature of the impurities of the air in gross, and proves also that they may be considered as the principal causes in operation affecting the health of miners. I believe also that the results show that something more than ventilation may be expected, and experiments are wanted to show how far a substitute for ventilation in some cases and to some extent will be effective.

19,611. Having proceeded so far in this inquiry, do you think that in order to complete it fully, and to enable you to give a complete report as to the state of the air in different mines according to the samples which have been submitted to you, further inquiries are necessary ?—I believe so. I should be sorry to leave it in this condition, although the part which I have done, I believe, leaves no doubt in itself. All the experiments are clear and distinct, but the experiments which have been made lead to others which I think would be not only of practical value but of scientific value also.

19,612. Can you state some few of the points which you think should be more specially inquired into ?—I should think it well to inquire into the exact relation of carbonic acid to the impurity of the air, that is to say, whether it is actively or passively injurious. For example, thus far to find the smallest amount perceptible to the senses, if the pure gas is mixed with the air, or to find how much is hurtful or perceptible if the gas is mixed with organic matter, such as animal exhalations. These questions are, I believe, practically important, and have never been decided by any one ; and I believe the work could be done without great difficulty.

19,613. Are there any means by which you could make those tests, such as a hermetically sealed room or otherwise ?—I have been promised the use of a hermetically sealed room for the purpose, and I would employ it in this manner :—I would pour pure carbonic acid into the room until I found it uncomfortable ; it would be a room sufficiently large for two or three people to sit in. I should also make another experiment using no carbonic acid, but simply sitting in a room until the breath caused the atmosphere to be offensive. Experiments of that kind I think would lead to the conclusions which are desired.

19,614. (*Dr. Greenhow.*) What conclusions do you expect from those experiments ?—I wish to know whether it is the carbonic acid which is actively injurious in a crowded room or the organic matter. My own observation leads me to believe that it is not the carbonic acid ; that is to say, that the carbonic acid is not so hurtful as the organic matter.

19,615. By what process would you arrive at the conclusion ; would it be merely by your own senses ?—I think that the senses must be the only guide in all this, because it is by the sense that we know when a room is unpleasant. I might also use some animals for the same purpose. They have perhaps less prejudice, but I should rather use the human being as the test than any other animal.

19,616. Would not such experiments constitute an investigation interesting in a scientific point of view rather than practically applicable to the atmosphere of mines ?—I have thought not. My intention was to apply it to the mines. It has seemed to me that in many cases the air would be rendered pure, or almost pure, by simply washing it when there was a difficulty of ventilation. If the atmosphere in some of the dark corners of these mines were washed with lime water all the dust would be taken down, all the crystals would be removed, all the carbon would be removed, and the carbonic acid itself would be removed ; and, in fact, out of the long list of substances which are found in the air there would remain perhaps not above one or two, and these existing in small quantities ; the one or two are hydrogen and carbonic oxide. That air would then be nearly pure, but there would be a deficiency of oxygen to an extent varying up to three per cent. It is possible that when the deficiency of oxygen was very small the removal of these substances would render the air perfectly wholesome. This experiment would show whether it would render it perfectly wholesome or or not. Supposing that the air were washed in this manner the diffusion would occur much more rapidly, and I believe that the normal amount of oxygen would be much more rapidly obtained after that, so that I think that the experiments would lead to distinct practical results in the mode of purifying the air. My idea was, that in the working space in one of the levels a fine spray of lime water, like a Scotch mist, should be used to wash the air. The operation of washing the air in this manner is seen better perhaps than anywhere else exactly under us. Mr. Goldsworthy Gurney uses it for cooling the air which is brought into the House of Lords. He uses pure water. The amount of water required is very small, and the operation is very simple. I think there can be no doubt of the great benefit which would result from that mode of operation ; and I think also that it would render a difficult and expensive mechanical ventilation less necessary in many places, at least, it would make it a lighter matter if it did not entirely do away with it.

19,617. You appear to be mixing up two things,—my questions have reference only to the experiments you propose to institute relative to carbonic acid gas ; and the point which I wish to ascertain from you is their direct bearing upon the purposes our inquiry ; I wish to have that clearly made out ?—I believe that if the carbonic acid were the chief ingredient which rendered the air injurious, as has been popularly the view for so many years, the washing of the air would be less available ; but if the organic matter and these other substances are more powerful than carbonic acid, we should be able to separate the results of the two, and to see how much is due to the one and how much is due to the other, and we should also be able to arrive at how much is due to the absence of oxygen. We should then have three inquiries, namely, how much is due to the absence of oxygen, how much is due to the existence of carbonic acid, and how much is due to the existence of animal and other exhalations. I wish to separate those three distinct conditions from each other. They have never been separated, and I think that the method of purifying the mines cannot be settled until those conditions are distinctly separated.

19,618. (*Mr. Holland.*) Are you aware of any evidence which proves that a small deficiency of oxygen alone is injurious, say a deficiency of one-half per cent. or one per cent. ?—I am not aware of any evidence upon that point, supposing the air to be otherwise pure.

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R. A. Smith, Esq., Ph. D., F.R.S.

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19,619. Are you aware of anything which proves that the mere presence of carbonic acid in small quantities is injurious?—I am not aware of anything sufficient. I have been making some experiments myself on that point. I went into a room in a brew-house where the carbonic acid amounted to ·27, rather more than a quarter per cent., and the atmosphere was very pleasant to breathe, nobody could object to it.

19,620. It was ·27 of the whole air?—Yes; it was by no means unpleasant.

19,621. What was the apparent effect of it?—It seemed to have a fresh and rather a pleasant effect than otherwise; whereas if you enter a room which has ·27 per cent. of carbonic acid in it caused by respiration, the effect is extremely oppressive, and it would be equal to one of our very badly aired public assemblies.

19,622. Is not the fair inference from that that the oppressiveness is not produced by the carbonic acid but by something else?—The inference is that the carbonic acid has only partly to do with the result, but a great point is to know how much it has to do with it, and I think that that inquiry must be made before any conclusion can be arrived at.

19,623. And not only for this investigation, but for all investigations concerning the action of air upon life?—Yes, for all similar investigations. Probably a very different result would have occurred if I had gone up to ½ per cent.; it might then have been too irritating; there was a certain roughness, but still it was pleasant. I do not know how it would have been if I had lived there a whole day.

19,624. What was the effect of such air as that in the brewhouse upon the men who were working permanently there?—There were no men permanently in that room; it was pleasant air although it was easily perceived that it was not normal air.

19,625. If I understand you rightly, you mean that we know nothing at all about the effect upon comfort of the mere absence of a small quantity of oxygen, and the mere presence of a small quantity of carbonic acid?—Our information is not sufficient; the two conditions are mixed in all our experiments.

19,626. They are mixed with other circumstances, which may produce the effect that you have attributed to the absence of oxygen and to the presence of carbonic acid?—The carbonic acid and the organic matter are generally spoken of confusedly; there can be no question about the other substances, the solids.

19,627. I understand that you intend to try experiments in an air-tight room?—Yes.

19,628. Might there not be in that air-tight room a very near imitation of a close end of a mine?—I intended to make it so.

19 629. You might explode gunpowder in it if you wished, and imitate it very closely?—That might be done, although the imitation would never be exactly the same as the original. I believe that if the impurities and the exhalations from the body remain long, they become more offensive, and probably putrefactive; the condition would never be exactly the same.

19,630. (*Chairman.*) The test which is used by miners when the air is very bad is that of the lights going out; what do you think is the occasion of the lights going out?—I wish to make experiments upon that subject also. The lights do go out in air such as I have tried, containing 16 per cent. of oxygen, but that depends a good deal upon the motion of the air; if a current is carefully produced, even a tallow candle may be induced to stay in longer than that, and may burn until there is a little more than 15 per cent. Then again it seems to me from accounts which I have received from miners, and partially from observations in mines, that the candle is inclined to diminish in light, and also appears inclined to go out a considerable time before 16 per cent. is reached. I am not quite sure of the cause, but I think that it is partly owing to the solid matter floating in the air. I have found from experiments upon the combustion of oil that extremely minute particles of solid matter completely prevent the combustion of oil, that is to say, they completely prevent a wick from acting as a proper conductor for oil.

19,631. (*Mr. Holland.*) What is the effect of using a chimney glass to a lamp?—It causes a greater current, and causes the light to remain longer.

19,632. It will burn with a smaller proportion of oxygen?—Yes.

19,633. Because of the extra draught?—Yes.

19,634. (*Chairman.*) What other experiments do you think it desirable to make in order to institute the full inquiry?—I wish to ascertain the effect of the absence of oxygen separately from the effect of carbonic acid. Supposing that this air were washed in the mode which I have proposed, there would then be an absence of oxygen, but there would not be the presence of those deleterious substances which have been mentioned. It would be important to know of what value this air, after being washed with lime water, would be for breathing and for burning. I think that this experiment has never been tried, and I think that it would be valuable; perhaps it has been tried by some one unknown to me. I have been making some experiments upon the mode in which the air is supplied to the depth of very long levels. I have some results of these, but not the whole results; and I should like to finish them. It is quite clear that after a time the very remote recesses of long levels become supplied with air very nearly normal, and even at very great depths, even in mines at a depth of 190 fathoms. I have thought it interesting, and perhaps practically of importance to know how the air enters. I have, therefore, obtained specimens of air from the floor of the level and air from the roof of the level, in order to watch the progress of the air to see whether there is a current below and a current above. My object in doing that would be to see how much could be expected from the action of diffusion of gases, and how much from the ordinary mode of ventilation by current. If the diffusion of gases will make up the air which I have supposed to be withdrawn, then, of course, we have a very great gain; we shall get pure air below without so much ventilation, or perhaps without any. To answer that question I think would be very important, and I think that the results would, practically speaking, be very valuable. There are some other experiments which would be necessary, in order to make the investigation complete; but I think they would not be of practical importance, although they would certainly be of scientific importance. I have, for example, been unable to obtain the amount of carbonic oxide and hydrogen in the air by experiment as I have hitherto used small specimens.

19,635. Will you explain the difference between the diffusion of gases and a current?—Ordinary ventilation is made by currents, that is to say, the warmer air rises and the cooler air enters below; but if any two gases, or any two atmospheres, are in juxtaposition, there is a natural tendency in the atoms of the gases themselves towards motion; and these move into each other or become diffused until an equilibrium is obtained; this is entirely independent of temperature.

19,636. (*Dr. Greenhow.*) Does not it depend in a certain measure upon the density of the gases, and will not gases of different densities mix more rapidly than gases of the same density?—The rapidity of diffusion is inversely as the square root of the density of the gases; a lighter gas, hydrogen, for example, will diffuse very rapidly, carbonic acid will diffuse very slowly.

19,637. (*Chairman.*) Is there any other essential point of inquiry?—I should think that it would be important to make experiments on the simplest mode of trying the air, so as to be useful for overseers and others.

19,638. You think that it would be of very great importance to agents and others engaged in mines to have a simple mode of testing the air other than by the candle?—Yes.

19,639. (*Mr. Holland.*) Are you hopeful of suc-

ceeding in that?—There are four or five methods, all of which promise something, and I should like to try them for some time, and to give them comparative value.

19,640. (*Dr. Greenhow.*) These last experiments on the simplest mode of testing impure air might be tried in your laboratory, might they not; without necessarily going down a mine for the purpose?—I could collect impure air anywhere, but I should prefer to take such impure air as had been produced by manufacturing operations in some way or other, such as really existed, rather than to form artificially impure air. In the next place I think that there should be some experiments made upon a mode of purifying the air somewhat in the way which I have suggested, or in other ways. Then it is necessary, I think, to continue the examination of the numerous specimens of air now on hand.

19,641. (*Mr. Holland.*) When you speak of purifying the air, do you mean the purifying the air without removing it?—Yes.

19,642. (*Sir P. J. Egerton.*) Have you tested any of these samples for ozone?—I have not. I never expected to find any ozone in them.

19,643. (*Mr. Leveson Gower.*) Would not the simplest way of trying the effect of washing the air be to try in a mine in which bad air exists?—I think that would be the best way; specimens would require to be taken before and after; the operation is not extremely simple, because at present all the passages of the mines are filled with air more or less impure; the impure air is making its way to the shaft upwards, and therefore it fills every space as it goes on with part of itself; and in making the experiments a good deal of this impure air would rush back; it would be well, therefore, to obtain a mine where the passages were very pure, in order to see how the depth of the level would fill with normal atmosphere. It is not in every mine that such a choice could be obtained.

19,644. (*Mr. Holland.*) Could not you try the experiment with a hydrant without much expense?—I think so; the chief difficulty would be in finding a good mine.

19,645. (*Mr. Davey.*) Would there not be difficulty in introducing the water?—I think not. I think it might be done by something like a garden syringe, and the assistance of a similar apparatus to that which is used for cooling the air in the House of Lords.

19,646. Would it not require pure water?—I propose lime water; the water of the mine would be sufficient in all cases for dissolving the lime.

19,647. (*Mr. St. Aubyn.*) Have you ever made any experiment, or can you form any idea of the comparative quantity of water which would be required to make this experiment on a certain number of cubic feet of air?—I have not a very good idea of that; it is just one of the points to be settled, but it seems to me, on thinking it over, that it would be a great convenience if the men would throw something like a gallon or two in the working space around them.

19,648. How many cubic feet of air would a gallon of lime water purify?—I have no idea, as a good deal would fall ineffective; but in examining that subject it seemed to me that it was a very frequent case that a level proceeded forward at a distance from a winze extending somewhere about 50 feet, and I have made a number of calculations upon the supposition that there is a space 50 feet long, 6 feet high, and 4 feet broad, in which the men are working. It seems to me that taking that space a few gallons might purify 1,200 cubic feet of air.

19,649. (*Sir P. Grey Egerton.*) Then in that case one of the hydro-pults or garden engines would be sufficient?—Something like that; but I would use the water much more economically than they do, as the spray would be exceedingly fine. If the Commissioners were to observe the mode in which the ventilation of the House of Lords is conducted, or rather in which the water is cooled for it, I think it would be at once seen that an exceedingly minute quantity of water does for a very large portion of air.

19,650. (*Mr. St. Aubyn.*) Is it necessary that the water should be very pure?—I think not; I think that the water of the mine is sufficiently pure; there is a little copper in it sometimes and a little iron, but these would be thrown down by the lime, and in fact nothing but lime water and a little sulphate of lime would remain.

19,651. In an ordinary mine would the common mine water be sufficient for that purpose?—I expect so.

19,652. (*Mr. Leveson Gower.*) Apart from this experiment, is visiting any more mines desirable for the purposes of your inquiry, or could you pursue that inquiry by having the air sent to you?—Except to perform certain experiments I do not propose to visit more mines, but to have the air sent to me from many others. It is a great pity I think not to make an inquiry perfect when it is begun; I should be sorry to see any part of the kingdom left out.

19,653. Then you consider that it is requisite, in order that your inquiry may be perfect, that you should visit some more mines?—I should prefer writing a complete report to writing an imperfect one, and I think it would be better for the purposes of the Commission.

19,654. (*Chairman.*) Do you think that it would be desirable to investigate the air of foreign mines?—It seems to me that if the Commissioners reported, without knowing the opinions of foreign scientific men upon the subject, there might be a danger of being behind in some parts instead of being before, as I think they might expect otherwise to be. I was especially desirous of visiting some of the mines of Germany, and indeed I shall probably do it for my own satisfaction. Those mines are worked with, perhaps, more scientific care than any mines in the world; there are professors, in Saxony especially, of every branch of mining, who are continually studying the subject, and I think that, considering the character of the German professors, we may be perfectly sure that they have made many observations that will be valuable to the Commission, and I should be sorry to write a report without knowing their opinions. On a subject like this reading is not sufficient.

19,655. (*Mr. Leveson Gower.*) Are you acquainted with the work of Monsieur De Combe upon mines?—No; I know that it is one of the largest and most complete works upon the subject; but I asked a friend, a mining engineer in France, to give me some information about it, and he said that it did not contain any analysis of the air of mines, so that I did not obtain it.

19,656. Is air in which the burning of a candle is perfectly unaffected ever objectionable air for men to work in?—I think that it may be very objectionable, even though a candle will burn in it.

19,657. (*Mr. Kendall.*) You think that a candle may burn well and still that the air may be injurious to health?—Yes.

19,658. Will you give an instance of that?—I believe that a candle will burn till there is about 15 per cent. of oxygen, and I believe that a man will feel very uncomfortable when there is even 20½ per cent., if there be carbonic acid and the usual exhalations from the human body. When I say 20½ per cent. I am keeping rather low, because I might say 20·7 for example, without being considered to err.

19,659. (*Mr. Holland.*) You mention an ordinary room?—Yes.

19,660. (*Mr. Leveson Gower.*) When there is no perceptible influence on the burning of the candle may the air be bad for the men to work in?—I do not think that the influence is perceptible in a room with 20 per cent. of oxygen, which is a very badly ventilated room indeed.

19,661. Probably you have not quite made up your mind upon the point; you have never turned your

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attention to it?—I have not made sufficient experiments yet, but I have thought a little upon the subject; for example, in a room badly ventilated, containing probably 20·6 per cent. of oxygen, I have never seen that there was any perceptible difference in the candles burning.

19,662. (*Mr. Kendall.*) As I understand you, you think it is very possible that a candle may be burning well and you may not perceive any deficiency of oxygen, as far as the candle goes; there may be enough for the candle and still not enough for the men?—That is quite certain. Although what I am about to state does not perhaps apply to mines, yet if sulphuretted hydrogen for example were in the air to the extent of ·01 per cent., I believe that none of us could exist long; and even the Manchester air and the air of the manufacturing districts, which is perceived to be inferior by those who enter it, is made impure by an amount represented by a decimal with either four or five cyphers after the decimal point; whether there are four cyphers or five I cannot say at this moment, although I made the experiment myself. That impurity is sulphurous acid, but with sulphuretted hydrogen I believe that a still smaller quantity is injurious.

19,663. (*Mr. St. Aubyn.*) It would have no effect on the candle?—Not the slightest; in other cases, too, a candle has a peculiar power of burning in air in which it is very difficult to breathe, and I will give an instance. When Dr. Frankland was at the top of Mont Blanc he tried the combustion of a candle there, and he found that it burnt exactly the same amount of tallow up there as it did down in the plains. It adapts itself to different conditions of the air in a very remarkable manner. The flame in the rare atmosphere elongated itself in order to have a greater space from which the ignited gases might obtain oxygen, but still it burnt the same amount of tallow, and did not go out.

The witness withdrew.

ALBERT J. BERNAYS, Esq., Ph.D., examined.

A. J. Bernays, Esq., Ph. D.

19,664. (*Chairman.*) I believe that you are a professional chemist?—Yes.

19,665. You are at present engaged at St. Thomas's Hospital?—I am professor of chemistry to St. Thomas's Hospital Medical College, and physiological chemist to the hospital.

19,666. You have, I believe made the subject of air to some extent your study?—Yes; to a very considerable extent.

19,667. You have lately made some experiments with regard to air with especial reference to the future site of St. Thomas's Hospital?—Yes.

19,668. I believe that at my request you made some experiments with regard to some bottles of air which I sent up to you from different places?—Yes.

19,669. Did those bottles describe the mine or the level where the air which was in them was taken, or were they numbered?—The greater part of them were only numbered and lettered. I had but scanty information as to where they came from.

19,670. Will you describe what the bottle was?—I had a number of wine bottles sent to me, the greater part of them holding about 46 cubic inches. I could see from the remains that they had been filled in the mine by taking them down full of dry sand; the sand of course was emptied below, and the bottles were filled with the air of the mine, and they were properly sealed. I found in two cases where the bottles had been cracked that the air was normal air, but in the other cases the majority contained a very impure air as far as regards carbonic acid.

19,671. (*Dr. Greenhow.*) They were hermetically sealed I conclude?—They were sealed as completely as could well be done; they were thoroughly well corked and waxed.

19,672. (*Chairman.*) Can you state shortly the result?—I can give you briefly a few facts with reference to them.

19,673. How many specimens were there?—About 40. I should say that I have not made the absolute corrections which are necessary for pressure and temperature, comparing the mine with the time when I made the analysis, but my own experiments were with the barometer at 30″, and the thermometer at the ordinary temperature of 60°. I do not know how I can make the matter simple except by stating, that, with only two or three exceptions, there is not a single air out of the 40 specimens which I have examined which does not contain one-fifth of one per cent. of carbonic acid, while they go up as high as 2·2 per cent. of carbonic acid.

19,674. You did this by an agreement with me at a very moderate charge, and you did not go so fully into the matter as you otherwise would have done?—Having ascertained the process to be an accurate one I made the weighings as accurately as they could possibly be done, and every one of them has been corrected; various of them have been done twice over with almost precisely the same result. Whenever I found that the quantity was very abnormal, I took a small quantity of the air and shook it with lime water; and as a proof of the general accuracy of the methods which I adopted, I may state, that in the one case which your Lordship has mentioned to me of a mine which was said to be properly ventilated, I was absolutely not able to weigh the carbonic acid, whereas in all the other cases the weight is on the average never less than 2 in the 1,000; and reaching in one case to 22 in the 1,000; in 17 cases to 11 in the 1,000 and 12 in the 1,000, and in very many cases to 4 in the 1,000. That I think will explain the general facts with reference to the 40 atmospheres.

19,675. As far as you have gone you are quite satisfied that the experiments are correct as to the amount of carbonic acid?—Yes, I have no doubt whatever about it, and that as a comparative result they are as accurate as anything can well be. They have all been done by the same method, which I had proved by experiment to be correct.

19,676. (*Mr. Holland.*) The best of these airs had more than double the usual quantity of carbonic acid?—Far more; we generally calculate I think about 0·4 in the 1,000, or from 0·035 to 0·04 in the 100.

19,677. You are speaking of country air?—Yes; in towns it may rise somewhat.

19,678. (*Dr. Greenhow.*) That is to say that the smallest of these specimens would have five times the normal amount of carbonic acid gas?—Yes; quite that; it is far above it if you take the average of the 40 specimens, but of course that is not a fair way to take them.

19,679. (*Chairman.*) I suppose that you have had no opportunity of making experiments as to other impurities in the air?—The only impurity which I ever carefully sought for was sulphuretted hydrogen, and that was never present; there was no form of sulphur which could be discovered in the air.

19,680. Have you ever tried an experiment with regard to candles; what state of the air would put a candle out?—I have never made a careful experiment, and I do not think that there is any accurate information with reference to the point. I feel perfectly confident from the analysis which I have made of these airs, that not one of them would put out a candle. That is my idea at least.

19,681. Should you say that it would affect it in any way?—The high figures would affect the candle in lengthening the flame and dimming it.

19,682. (*Dr. Greenhow.*) Can you tell the condition of these specimens of air as regards the amount of oxygen?—I cannot. Lord Kinnaird only asked me to determine the amount of carbonic acid.

19,683. (*Chairman.*) From the inquiries which

you have made, do you consider that the character of the mines calls for further inquiry?—With reference to the quantity of carbonic acid, it seems to me that the inquiries which ought to be made, if they have not been made by my friend Dr. Smith, are with reference to ascertaining whether these conditions are normal or accidental; in fact, to what extent these are constant quantities. It would have been very advisable if the air could have been taken two or three days running at different times of the day; I should myself have been much more satisfied as to the information.

19,684. Have you been down any coal mine?—I have never been down, but I have been a great deal into the neighbourhood of coal mines. I know a great deal about the men who work in coal mines, from a long residence in Derbyshire.

19,685. (*Mr. Holland.*) Have you analyzed the air of any coal mine?—Never, unless some of these airs are from coal mines, which I really do not know.

19,686. (*Chairman.*) Do you believe that it would be possible to employ a chemical agent with any effect for purifying the air of a mine?—That is a question which I certainly have thought about, but I am not aware to what extent at present it could be done, and I certainly should not like to hazard an opinion without an experiment, but my idea is that it would be possible. Of course, if we are to take the experiments which have been made with reference to pure air and foul air, there is not a doubt that the impurity of these airs is something extraordinary; it is far greater than what I believed to have been possible.

19,687. Do you mean possible for men to work in without injury to their health?—Yes; in my own experience miners always carry the foul air with them. They are not only satisfied to work in the foul air in the mines, but when they go home they stop up every possible crevice in their houses. I have been in miners' houses, and I could scarcely breathe; I had to go out of the house almost stifled. In Derbyshire it is a common thing for them to shut themselves up and not move out of the house if they have nothing to do, and to keep the temperature as high as it can be made.

19,688. That would affect the other inmates of the house as well as those who were working?—Yes, I believe so.

The witness withdrew.

[*For Questions Nos.* 19,689 to 19,757, *see Appendix B. p.* 154.]

Thomas Bevill Peacock, Esq., M.D., examined.

19,758. (*Chairman.*) You are a Fellow of the College of Physicians?—Yes.

19,759. You are senior physician of the Consumptive Hospital at Victoria Park?—Yes.

19,760. And physician to St. Thomas's Hospital?—Yes.

19,761. I believe that you have had great experience in diseases of the chest?—I have devoted myself perhaps more especially to that department of medicine for a good many years.

19,762. I believe that at my request you kindly undertook to visit Cornwall in the autumn of 1862, in order to examine into the state of health of several miners?—I did.

19,763. You went underground, I believe?—I went underground at Dolcoath.

19,764. You examined a great number of miners at work and above ground?—I examined upwards of 600 of the men who were at work, and 83 men who were ill, taking full notes of the cases of 63.

19,765. Did you examine also the men on coming up to the surface by the ladder?—Yes; I saw a considerable number.

19,766. And men coming up by the man-engine?—Yes.

19,767. And at their own houses?—Yes, I examined many of the miners at their own houses, but more particularly those who were sick.

19,768. You visited also some of the cottages?—Yes, I went into a good many of the cottages.

19,769. In short, you made a very thorough examination of the condition of the miners, and of what is called the miners' disease?—I think that I did so.

19,770. Did you have any opportunity of post mortem examination?—Yes, in one case.

19,771. You are, I believe, prepared to give the Commissioners a report?—Yes, this is my report (*delivering in the same*).

19,772. This report contains a full account of all the cases which you examined?—It contains, in the first place, a statement of all the cases of disease which I examined—63 of them being fully reported, and 20 others of less importance. There is next an account of the state of upwards of 600 men, more cursorily described, who were regularly at work in different mines; and, lastly, there is a general report founded upon those observations.

19,773. I suppose that you have no doubt of what is the actual disease called miners' disease?—I think that under the popular term "miners' disease" different affections are included. As a general remark miners' disease seems to be chronic bronchitis and pneumonia, but the precise form which the disease may take depends to a considerable extent probably upon whether the miner is originally of sound constitution or otherwise. If he be pre-disposed to consumption he suffers from a form of consumption, but if on the contrary he is not so pre-disposed, he becomes subject to chronic bronchitis and emphysema with consolidation of the lungs. The case which I examined was of the last description—there were no tubercles in the lungs at all; but there was chronic bronchitis, considerable consolidation, and several cavities.

19,774. What was the age in that case?—It was 55.

19,775. Have you prepared tables showing the condition of the men when you examined them?—There will be found a table including 464 examinations of men who were at work.

19,776. These tables will give very much the history which the men gave you of their life?—Fully so.

19,777. And also of the symptoms of any disease which you discovered?—Yes.

19,778. (*Mr. St. Aubyn.*) Were the miners you examined all from one district?—No; I visited the Par Consols Mine near St. Austell, the Dolcoath and United Mines in Cambourne and Gwennap, the Wendron Consols and the St. Ives Consols, and Botallack, Levant, and Wheal Owles, in the St. Just district. The men I examined were chiefly from the districts of Cambourne and St. Just; but I saw several at Liskeard, both who were sick and others still at work.

19,779. In fact they were taken generally?—Yes, throughout Cornwall.

19,780. (*Dr. Greenhow.*) This may be taken, therefore, as a fair representation of the state of the miners employed in Cornwall generally?—Yes. My object in going to Liskeard was to compare what I had seen in West Cornwall with the condition of things there. My observations at Liskeard entirely confirm those made in the other districts, although I had not the same opportunity of examining patients at Liskeard as in the western districts.

19,781. (*Chairman.*) I believe that you also examined several of the schools and children?—Yes; I visited some of the schools, and I particularly paid attention to the women and children that I saw at work at the mines.

The witness withdrew.

[*For Questions Nos.* 19,872 to 19,846, *see Appendix B. p.* 180.]

WREXHAM.

Wednesday, 15th July 1863.

PRESENT :

The Right Hon. Lord Kinnaird, K.T.	Nicholas Kendall, Esq., M.P.
Sir P. Grey Egerton, Bart., M.P.	John St. Aubyn, Esq., M.P.
The Hon. E. F. Leveson Gower, M.P.	P. H. Holland, Esq.

The Right Hon. Lord KINNAIRD, K.T., in the Chair.

Captain John Darlington, of Minera Mine, Wrexham, examined.

Wrexham. — *Capt. J. Darlington.* — 15 July 1863.

19,847. (*Chairman.*) What is the produce of the Minera mine, lead or copper?—Lead and blend; black jack, as they call it.

19,848. You have charge of the Minera mine?—Yes.

19,849. How many years have you had charge of that mine?—Twelve years.

19,850. Have you charge of any other mine in the neighbourhood?—I have not.

19,851. About how many men have you underground?—I think 355 working underground.

19,852. Are there any boys working underground?—No.

18,953. How do the men enter the mine?—By ladders, generally speaking.

19,854. What is the greatest depth at which you are now working?—220 yards.

19,855. Are there many shafts to the surface?—There are. I cannot say exactly how many; but I should think that you may safely say 25.

19,856. Do you use any artificial means of ventilation?—No there is no mine in the world which is better ventilated, I should think.

19,857. So that you do not require any artificial means of ventilation?—We do not.

19,858. How far do you think you could drive an end from any winze or shaft?—We have driven as much as 160 yards; but generally speaking I should not think more than from 80 to 90 yards.

19,859. When you were driving 160 yards how long did the powder smoke hang there?—I should think that it might be two hours.

19,860. Did you use any artificial means of ventilation when you were driving the 160 yards?—We had a fan.

19,861. How was it worked?—By what they call in Cornwall a duck machine. It is two boxes; one box working in water.

19,862. (*Mr. Holland*). You mean Taylor's duck machine?—Yes.

19,863. (*Mr. Kendall*). Are you a Cornishman?—Yes.

19,864. (*Chairman*). Was it attached to the engine?—No, it was worked by manual labour; a boy worked it.

19,865. In what kind of pipes was the air taken?—Our pipes were about 5½ inches. We have had wooden pipes, but we now use zinc pipes; there does not appear to be so much friction in the zinc pipes. There is perhaps no mine in the kingdom in a stratified district which is freer from the carbonic acid gas than this mine is.

19,866. Do the men go in immediately after firing?—Perhaps in about a quarter of an hour.

19,867. What is the longest distance which you are now driving from any winze?—90 yards.

19,868. Have you any artificial means of ventilation there?—No. I am very much surprised to find how it is. I can hardly account for it.

19,869. Do you know how long the smoke hangs there?—I should think that it is about the same time.

19,870. Do the candles burn well there?—Capitally.

19,871. Have you never any complaints?—Never.

19,872. Do you think that there any crevices in the rock or any swallows?—In some of the caverns, which you will find in the limestone district throughout the kingdom and throughout the world, there is generally contained some carbonic acid gas, and as soon as it is let free, of course it is heavier than the common atmosphere, but at the same time we get rid of it almost immediately. We have an immense current of air through our mines.

19,873. Is the mine wet?—Yes, in some places.

19,874. Where you are working now, at 90 yards, is it wet?—No, it is very dry indeed.

19,875. Is it dusty?—No.

19,876. Is it worked by the pick at all?—Very little; most of it is blasting.

19,877. In bargaining with the tributers and tut workmen, do they get rid of the deads or do you draw the deads?—They get rid of them; they are bound to pay all expenses.

19,878. And to remove the deads themselves?—Yes.

19,879. Have you ever to fine them if they do not do so?—We very often are obliged to threaten to do so, but I believe that they behave very well in general.

19,880. So that they generally remove the deads?—Always.

19,881. Have you any accidents from blasting?—We have had two.

19,882. (*Mr. Kendall.*) In what time?—One of them was five years ago last month and the other was somewhere about six months since.

19,883 (*Chairman.*) Were they fatal accidents?—One of them was fatal, but I think I can easily account for how that man was killed. I always caution the men very carefully indeed, and urge them to put in something, a small quantity of moss or grass upon the powder, so as to keep it down, but this man took some paper out of his pocket, as I understood, and in that paper, I think, there was the end of one of the lucifer matches, and as soon as he commenced the operation, it exploded; it killed the man; he did not die immediately.

19,884. (*Mr. Kendall.*) That is merely your own idea?—Yes.

19,885. (*Chairman.*) What material do they tamp with?—Shale. I fine a man very severely indeed, if I know him to tamp with anything of a silicious substance; anything like spar, or anything of that sort which has fire in it.

19,886. Have they always shale at hand?—Always.

19,887. Is there much shale in the mine?—There is not an immense quantity, but there is plenty for that purpose everywhere.

19,888. Do you work the machinery with steam boilers or with water power?—It is all steam; we have thrown aside the hydraulic engine since we brought up the great level.

19,889. The mine was an old mine?—It was.

19,890. Do you make use of the old workings?—Yes, we have unbottomed the old workings about nine months, but all our riches have been new discoveries.

19,891. Do the men when they come to the surface, change in the boiler house?—I very unfortunately made an oversight the other day when your lordship was there in not showing you the place where they shift their clothes; we have a very nice place—indeed we have nice places.

19,892. Is it large enough for all the men?—Yes; we have 355 men, and I think that you would never see better accommodation for shifting.

19,893. Do they all go from the different parts of the mine to that place ?—No.

19,894. They do not all make use of it ?—No.

19,895. You have smaller ones ?—Yes.

19,896. There are, I believe, no women working on the surface ?—Not one.

19,897. How many hours do the men work ?—Eight hours ; the time for which we wish them to stop, but they do not work more than six ; I could not say six and a half.

19,898. Your bargain is eight hours ?—Yes.

19,899. Have the men any small ventures of their own ?—No.

19,900. They do not work at their ventures ?—No, we do not allow that.

19,901. What allowance of candles have the men ?—Two lbs. a head.

19,902. What do the men pay for candles ?—About 6*d.*

19,903. And for powder the same ?—Hardly that ; the men pay exactly the cost price ; the powder is 45*s.* a cwt.

19,904. Is there any club attached to the mine ?—They have a sort of club amongst themselves, but the sick clubs about are numerous.

19,905. Is there a doctor attached to the mine ?—We have a doctor ; indeed we have three, I think ; the men make choice of their doctor ; every man makes choice of his own doctor.

19,906. Is the sum which they pay to the doctor a fixed sum ?—I think it is 2*d.* a head per month. I am not exactly sure; it used to be that.

19,907. But there is no account kept between you and the doctor ?—No.

19,908. How often do you pay the men ?—Every calendar month.

19,909. Is a month kept in hand ?—There are about nine or ten days in hand.

19,910. Do you pay in notes or in small change ?—All in gold and silver and in pence ; we never pay anything like a note.

19,911. (*Mr. St. Aubyn.*) Are you a Cornishman ?—I am.

19,912. Are you acquainted with the working of mines in Cornwall ?—Yes.

19,913. In what district ?—I have been in the Gwennap Consols and the United Mines, and in Skirby a good deal.

19,914. Have you been in the mines about Camborne ?—Never about Camborne ; but I spent a great deal of my time in St. Austell district, in East Crinnis and Pembroke, and that neighbourhood.

19,915. You say that the mines here which you are engaged in are remarkably healthy ?— They are indeed.

19,916. There is, as you know, a great difference in that respect between these mines and the Cornish mines ?—Yes.

19,917. Can you tell us, in a few words, to what you ascribe that difference ?—I imagine that there is an immense quantity of a foul kind of air which is always hanging about the killas in Cornwall, a sort of carbonic acid gas which is always hanging about it, and the miner inhales that, and consequently it brings on what they call a decline in Cornwall, but you never find that here. I most positively declare before you that I think that the average life of every miner in this country is above 55 years of age.

19,918. Then you ascribe the difference to natural causes ?—Yes.

19,919. And not to any difference in the mode of working the mines ?—I do not know a man who has died from anything like bad air that he received in the mine.

19,920. Are the mines, generally speaking, as deep here as in the Cornish mines ?—No, there are none in this country like the Cornish mines.

19,921. They are all descended by means of footways ?—Yes, they are just now ; the men go down by ladders.

19,922. You have no such thing as a man engine or a skip ?—We have a skip.

19,923. But the men do not use it ?—No.

19,924. Have you any places more than 100 fathoms deep ?—No, the deepest place is 220 yards.

19,925. (*Mr. Kendall.*) You attribute the difference in the health of the men almost entirely to the difference between the strata here and in Cornwall ?—Yes.

19,926. Is there any difference in the habits of the men ?—I think their habits here are good. I do not know what they have been in Cornwall for the last 25 years.

19,927. Did you work as a common miner in Cornwall ?—Yes, for 20 years.

19,928. Are the habits out of the mine of the Cornish miners and of the Welsh miners different ?—No, I should not think that there was a great deal of difference.

19,929. There is no such difference as to interfere with their health ?—No.

19,930. There is nothing in the habits of the Welshmen out of the mine which would conduce more to health than in the habits of the Cornishmen ?—No, I think not.

19,931. Are their lodgings as good here ?—I think that they are very good here.

19,932. Have they much garden ?—No, they are not at all like the Cornishmen for gardening.

19,933. They do not employ themselves so much as the Cornishmen ?—No, they are lazier people than the Cornishmen.

19,934. And yet they are a healthier class ?—Yes, but it is a healthy place ; the mines here are as healthy as they can be. As to sobriety, it is good; you know that it is improving everywhere, but here it is pretty good, with the exception of this town ; this town I think is very dissipated indeed.

19,935. (*Mr. Holland.*) What stone do you work in in your mine ?—Limestone. We have a great deal of the siliceous stone.

19,936. Chirt ?—Yes.

19,937. Is there any marked difference between the men who work in limestone and the men who work in chirt ?—Yes. I would rather do work in what is called the mountain limestone ; there certainly is better air in the mountain limestone or the carboniferous limestone ; ours is carboniferous limestone. There is better air in the compact mountain limestone or the carboniferous limestone than in the chirt or the shale. There is always some carbonic acid lurking about in the shale and in the chirt.

19,938. Are the men who work in the chirt decidedly less healthy than those who work in the limestone ?—We have not experienced that, but I should say that they would be ; we have not had sufficient experience to prove that.

The witness withdrew.

Mr. EDWARD WILLIAMS, of 4, King Street, Wrexham, examined.

E. Williams.

19,939. (*Chairman.*) What are the mines of which you have charge in this neighbourhood ?—The Park mines, the South Minera, and the Wynnstay Mining Company.

19,940. Do you know about the number of men in each of those mines working underground ?—In all there would be about 115 men ; the underground men would be, perhaps, about 95.

19,941. As to the Park mine, how many are there ?—About 45 men.

19,942. Are the workings in the Park mine connected throughout below ground, or are they worked separately ?—They are separate ; the eastern workings are separate from the western.

19,943. Do you use any artificial means of ventilation in any of these mines ?—We have a fan in the lower level which Mr. Kendall was down yesterday.

19,944. How is it worked ?—By two boys.

19,945. What is the extreme distance which you drive from any shaft or winze ?—We have a double

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level for nearly 200 yards from the shaft ; the current of air is through the lower one, and then there is room for it to pass over into another level. We have passed it, I think, from 80 to 100 yards, and our fan is placed about 30 yards on the shaft side of the ventilator.

19,946. Do you find that the carrying of the two levels by a division gives perfect ventilation ?—Yes, in the adit level it does so ; it will clear away the smoke of perhaps five or six blasts at the same time, in about three or four minutes.

19,947. Have the men any changing houses when they come to the surface ?—Yes, we have changing houses by all the shafts.

19,948. What quantity of candles are the men allowed ?—Generally speaking one set of 6 men take 12 lbs. every week.

19,949. What are they charged for the candles ?—About 6*d.* to 6½*d.* per pound ; they vary ; there is a small profit on them.

19,950. And for powder 6*d.* ?—Yes.

19,951.–Have you any doctor attached to your mine ?—Yes, Dr. Jones, of Ruabon; the men pay 6*d.* per month each to the doctor's fund.

19,952. Do you keep the account of the doctor ?—We keep the money.

19,953. The doctor is appointed by the adventurers ?—Yes, and he has his medicine and surgery on the mine, visiting the works every week.

19,954. Is there any accident club ?—No, we have been very free from accident.

19,955. The men do not pay anything as club money for accidents ?—No, we have only had three or four accidents within 16 years. One was a severe one ; a man lost his arm ; there has been no fatal accident.

19,956. Was the severe accident by blasting, or how ?—It was by the engine ; he got into the cog-wheel ; it was from his own carelessness ; he wore a long canvass coat, and it caught in the cog-wheel.

19,957. In the old workings do the men go down by ladders ?—Yes.

19,958. Do they go down the old workings principally, or any new workings ?—They go down the new workings and the old ; they go down the new shaft, and down to the deep level ; the shaft is 86 yards deep.

19,959. And they go by ladders ?—Yes.

19,960. (*Mr. Kendall.*) At present you are not doing much in the way of raising lead ?—No.

19,961. You are hampered by water ?—Yes.

19,962. By a large river which passes under ground in the Park mine ?—Yes.

19,963. What are you now doing in order to get rid of that water ?—We are driving a deep adit level.

19,964. How much deeper will that adit level come under the old workings ?—30 fathoms.

19,965. You have rich ore, but cannot follow it on account of the water ?—Yes ; the best ore lies about 4 feet wide.

19,966. How many fathoms will you drive before you cut the vein ?—We have to drive about 230 yards before we shall reach the average line of it.

19,967. How far have you gone at present ?—We are nearly 1,100 yards from the mouth of the adit.

19,968. Between the 1,100 yards and the adit end have you any shaft ?—Yes.

19,969. How far back from the adit end have you a shaft ?—A little more than 550 yards.

19,970. Are the men working in good air there now ?—Yes.

19,971. How was that effected ?—By means of a wall 2 feet of air-way is left by the side of the level.

19,972. What is the size of your level ?—At 7 feet 3 inches wide and 6½ feet high.

19,973. And you have a partition of what ?—Of stone and brick.

19,974. Is it air-tight ?—Yes.

19,975. You have a trap door near the shaft ?—Yes, the passage of the shaft is closed.

19,976. Then the air goes in from the adit end ?—Yes.

19,977. To the very end ?—Yes.

19,978. It comes round the division and up the shaft ?—Yes, the tramway is closed at the shaft : there is no way for it to get back again.

19,979. Is the air perfect in the end ?—Yes, quite.

19,980. How many men have you working in that end ?—12 ; they are now working 6 hours, three at a time in the end.

19,981. Is that as many as can work ?—No, we could put another man there.

19,982. Why do you not put another man there ?—We find that the 12 men drive just as much as the 16.

19,983. It is not on account of the air ?—No, it is from the room for working.

19,984. Do you find that sometimes there is a difference in the air in the end, that it is at one time better than another ?—Very seldom in that end ; the current is very strong.

19,985. Suppose you omit to carry up your division pretty close, do you not find a difference at once ?—Yes, no doubt of it, if it is left more than about 20 yards behind the end we find a difference ; we must not bring it too near the end or the current would be too strong. The men could not stop there, it would be too cold.

19,986. (*Mr. Holland.*) It would blow their lights out ?—Yes, and the blast would break down the wall.

19,987. Would it inconvenience them in any other way except in putting the lights out ?—Yes ; they would have to check it in some way, and the air would be very cold. We intended to put a donkey on the level to draw the stuff from the end, but we think that it would not live there ; that it would be too cold.

19,988. Have you observed a considerable difference between the health of the men who work in the chirt and the health of those who work in the limestone ?—In this district we have no chirt that they are working upon ; but in the Flintshire district there is a great difference. There is about ten years in the average age in favor of those who are working in the limestone.

19,989. To what do you attribute that great difference ?—We think that the dust of the stone is more injurious to the men.

19,990. Do you mean injurious to their lungs or in some other way ?—I do not know. The doctors will know that. It kills them sooner.

19,991. In what way does it injure them ?—In asthma ; they generally die of asthma.

19,992. The men working in the chirt are much more liable to asthma than the men working in the limestone ?—Yes.

19,993. That you are sure of ?—Yes, even in that district.

19,994. Is it due to the badness of the air at all ?—I do not know. I think that the dust would act in the same way without speaking of the ventilation.

19,995. Is there any difference in the quality of the air in mines in the two rocks, except the dustiness ? That I cannot tell.

19,996. Is there any difference in the air of which you are sensible ?—I cannot tell that.

19,997. Cannot you tell whether there is any difference in your sensation ?—I do not know that I can in those places. It is from the dustiness.

19,998. You are not aware of any difference ?—No.

19,999. Is the powder smoke very annoying ?—Very annoying.

20,000. Does it appear to injure the men ?—Yes, I fancy that it would.

20,001. Is it very important to get rid of it ?—It

would be, I think, a most important thing to get rid of it. In the case of men going into the powder smoke in the end the spit would be quite black for nearly the whole day afterwards; and the water which is thrown down upon the bottom of the shaft is very much discoloured, and it smells very bad.

20,002. That is the water which you use to wash the air. Yes; the water which is thrown down after the blasts have been made. We have a little stream which is dammed up in the cross-cut, it rises about a foot and a half in the floor of the level, while the men are sinking in the bottom. When they put their blasts out, the tap is taken out and the water goes down. When that water comes up it is black.

20,003. How long is it before the smoke is cleared away by that water?—It is a very short time; perhaps about ten minutes.

20,004. (*Mr. Kendall.*) From your experience can you state what the difference would be between the time in which the smoke would be cleared without water and with water?—It would be there for hours without water; in fact it would not clear away for the whole day after putting one blast there.

20,005. (*Mr. Holland.*) Have you seen cases in which men have suffered very much from cold after coming out of the mines?—Yes, when the weather on the surface is very cold, and the exertion on coming out of the mine is very great, particularly in the case of old miners.

20,006 Have you seen their clothes freeze on them?—Yes, at the new shaft which you saw yesterday. I have seen the men come up and their clothes actually freeze on them before they could reach the cabin.

20,007. (*Mr. Leveson Gower.*) Is the system of ventilation by a partition adopted in any other works that you know of?—I do not know any other case except in this level.

20,008. (*Mr. Kendall.*) What induced you to adopt it?—It has been done for the last 50 years.

20,009. Where?—In this very level.

20,010. Do you think that you shall be able to carry out the whole length in the same way?—Yes, I believe that we could go on for two or three miles if we wished.

20,011. (*Chairman.*) Do you think that in all mines where the men have to go by ladders it would be an improvement if they could have cages to go up and down?—Decidedly a very great improvement. We lose the labour of the best miners, that is to say the old tributers, in deep mines. They cannot go up and down the same the a young man, and generally speaking in the end of our own mine the old men have had to leave their work about an hour before the others, and then the young men, perhaps, would get up with them before they reached the top again.

20,012. (*Mr. Holland.*) What loss of effective power is there from climbing up and down say 200 yards?—I am sure that it is equal to half the stem of work for old men, and one fourth for young men; they would feel themselves more at their ease at their work if they did not climb, as they are used to their work.

20,013. (*Chairman.*) Do you know any case where men have lost their lives in air where the candle has been found to burn?—Yes, in the Bryngwyn Mine, near Mold, six men lost their lives, and the candle was found burning within about ten yards of the men.

20,014. (*Mr. Kendall.*) Were the men nearer the end than the candles?—Yes, they were between the end and the candles.

20,015. (*Mr. St. Aubyn.*) What did those men die from?—I do not remember what the verdict was, although I have read it; they were suffocated.

20,016. This is only what you have heard?—Yes. The coroner at Mold could give the particulars.

The witness withdrew.

Captain SAMPSON MICHELL, of Park Mine, Minera, examined.

20,017. (*Chairman.*) You are underground agent at the Park and South Minera Mines?—Yes.

20,018. How many men have you?—115.

20,019. How many underground?—About 100 altogether, spread over the mountain in different parts.

20,020. These mines are not all connected underground?—No, they are not.

20,021. They are separate workings?—Yes.

20,022. What is the deepest working?—The Park is 190 yards.

20,023. Have you on any occasion found the air bad, so that you are obliged to use artificial means?—Yes.

20,024. How do you judge when the air is bad?—We generally find it by the deadness of the candles burning, and its affecting any person who is in it.

20,025. Is that the only means by which you judge of it?—Yes, and the powder smoke lying so that the men caanot get on with their work so well.

20,026. How long does the powder smoke remain in any place where you consider the ventilation deficient?—From an hour to an hour and a half.

20,027. And how long where it is good ventilation?—It goes off in about two or three minutes where the ventilation is very good.

20,028. How far would you drive from any winze or shaft without any artificial means of ventilation?—We drive from 160 to 200 yards; we have done that without artificial means.

20,029. What is the artificial means which you would use in that case?—A fan, a duck machine, a water fall or partition wall.

20,030. In any of the smaller mines do you find any difference in the ventilation from the larger mines?—The deeper the mines are the worse the ventilation is.

20,031. Does not it depend upon the distance from any means of ventilation?—It rather depends upon the distance, but the deeper we go down the warmer it gets.

20,032. (*Mr. Kendall.*) You do not doubt, as I understand you, that if you carry on the division and make it air tight, you will be able to go through the whole length?—Yes.

20,033. What will be the whole length before you cut the vein?—About 230 yards additional to what is already done.

20,034. You think that you will have sufficient draught by this division without any artificial means?—Yes, if we keep it air tight.

20,035. (*Chairman.*) Is the draught of the current of air always the same way along the two divisions?—I have found it different.

20,036. Is it, do you think, affected by the weather?—I fancy that it is.

20,037. Is there a period when it is more stagnant than at other times?—It is a little in warm weather.

20,038. Whether it be a downcast or an upcast, is the air in the end very good?—Yes.

20,039. (*Mr. Holland.*) Does the direction of the wind affect the current?—Yes, it does.

20,040. Have you noticed that with any regularity?—I have not taken particular notice of it, but I should fancy that it would; that when the wind is east it would be more likely to go in at the mouth of the level.

20,041. The adit points east?—Yes, and it comes out at the top of the shaft.

20,042. Does hot weather alter it?—Yes, a little.

20,043. Does it ever make it stagnant?—No, I do not know that it makes it bad at all in this level, but it alters it in the workings on the hill. I have heard no complaint from the men in that level as to the badness of the air.

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Capt. S. Michell.

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20,044. (*Chairman.*) Do the men always complain to you if the air is bad ?—They do mostly if it is so.

20,045. But they will work on sometimes without doing so ?—Yes, they will work their contract through.

20,046. Even although they find the air a little poor ?—Yes.

20,047. (*Mr. Leveson Gower.*) Have you ever known the air bad and the candles not affected in the burning ?—No, I do not remember that I have.

20,048. The minute the air is bad the candles burn differently ?—Yes, and they are obliged to put them on one side.

The witness withdrew.

Mr. THOMAS TAYLOR GRIFFITH, of Wrexham, examined.

Mr. T. T. Griffith.

20,049. (*Chairman.*) You are a surgeon ?—Yes, consulting surgeon.

20,050. In the course of your experience have you ever met with cases of men suffering from miners' disease ?—Yes, some years ago I was more in the habit of seeing the miners frequently and constantly ; at one time I attended pretty nearly all the mines in this district and therefore the diseases which did occur fell very much under my observation.

20,051. Amongst them what was the principal disease ?—Asthma. That was a kind of generic term, which included many pulmonary diseases, bronchitis, and diseases of the heart and obstruction in the lungs ; but there was nothing very peculiar : the same diseases might have been produced very much under any circumstances which were favorable to them. The complaint which was most specially connected with mines certainly was lead colic.

20,052. Did you find that with men working underground ?—No, it was chiefly with men who were obliged to reside within the atmosphere of the smelting houses ; there were three at that time.

20,053. And they suffered ?—Yes, especially.

20,054. As regarded men working as miners underground, you do not think that there was any special affection ?—Probably there were dispositions created from circumstances. I should say especially that I think that posture contributed very much to the younger men being affected.

20,055. Do you think that that tended to shorter life among them ?—Certainly, as a cause. I am speaking of 30 years ago ; the miners were then short lived.

20,056. Have you any experience now ?—No, I have none which could enable me to speak to that point.

20,057. You do not attend any miners ?—No, I have not done so for the last few years.

20,058. (*Sir P. Grey Egerton.*) How does the disease which you call miner's asthma generally commence in this country; by bronchitis ?—Yes ; and then it depended upon family disposition or individual peculiarities as to its further progress. If there was a family tendency to consumption the bronchitis very often degenerated into consumption. A man might be very delicate or a very drunken man ; that modified the ultimate effects of the disease.

20,059. Do you find, in fact, that miners' asthma often degenerates into true phthisis ?—No ; I do not think that miners were very much disposed to that termination of asthma ; as it seemed to be more connected with and more liable to bring on heart disease than consumption.

20,060. In cases of miner's asthma, do the miners themselves attribute it to catching cold or to being exposed to dust or bad air ?—Bad air. I think that there are three circumstances which make miners, especially the younger miners, susceptible of bronchial disease—one is certainly the position.

20,061. You mean stooping ?—The cramped up posture, working in a gallery only about three feet any way, so that they must accommodate their position to the nature of the work ; they have no choice —that is one thing.

20,062. Then in addition to the deleterious air, the position is such as to prevent the free action of the lungs ?—Yes, and the diaphragm.

20,063. And the respiratory organs ?—Yes.

20,064. What is the next stage in the progress of the disease ?—Supposing a man begins with what may be called asthma, that is to say, supposing he suffers from difficulty of breathing, that perhaps passes off ; it is only whilst he is in the mine. It is not that they are liable here so much to any special noxious gases which have a name, it is rather a negative state, the absence of fresh air, from lights burning, and from a number of men destroying the oxygen of the atmosphere ; it does not arise, as in the coal mines, from chemical changes naturally existing, but from accidental circumstances ; perhaps the place may be a confined gallery with lights constantly burning, and a number of men working, inhaling the fresher air and expelling a quantity of deleterous air with carbonic acid gas ; and then certainly what does affect all miners is the absence of sun and sunlight.

20,065. Do you think that the exertion of going up ladders has any effect upon the miner's health ?—It may do so, but I cannot say ; here it has not been very great ; they are not obliged to go quickly, and very often here the ladders are assisted by ropes and chains down a shaft.

20,066. At what period of the disease do you find the complication of heart disease supervening ?—What are called their stems here are long, very often 12 hours. I have since learnt that stems in the mine are only of 8 hours continuance. But in most collieries they are all 12 hours long. A man struggles with it, and, perhaps, he is unwilling to apply or does not apply for medical relief till there is some form of bronchitis established, such as chronic bronchitis, and constant difficulty of breathing, and an obstruction in the air passages or bronchial tubes. The heart, to keep up the due relation between its own action and the transmission of the blood through the lungs, has to labour to overcome obstructions ; that leads, in some cases, to a thickening of the walls of the heart, or to an over action and attenuation and thinning, or, perhaps, both at once.

20,067. Or valvular diseases ?—Valvular diseases sometimes come on, if there is anything in the person's constitution leading to a deposit about the valves, but it does not necessarily follow ; it may be and frequently is a disease connected with it.

20,068. Did you ever see black spit in this district ?—I never saw it in a miner.

20,069. In case of death, what is the condition of the lungs after death ?—I have had no opportunity of judging, owing to the prejudice here against post mortem examination ; it is only very lately that a post mortem examination could ever be obtained, unless there was reason to state to the jury that there had been a want of proper treatment, or unless there was something upon a post mortem examination to necessitate a coroner's inquest; such a thing never occurred within my own experience.

20,070. But by a stethoscopic examination you have been able to form an idea ?—Yes.

20,071. What is your opinion ?—The stethoscope is a more recent instrument, and in my early practice it was very little used ; it is a thing of only 40 years existence in this country.

20,072. In your opinion is the result the hepatization of the lung or emphysema, or what ?—Emphysema. I should say very often bronchitis, and then chronic bronchitis with a permanent cough and emphysema. It depends on the state of the man ; if he happens to have in addition to bronchitis an attack of pneumonia, then that is followed by hepatization and consolidation of the lungs. If there is pleurisy, then there is effusion, and any or all of them may lead to chronic disease of the heart.

20,073. From your great experience in this district,

what should you suggest as the best remedial measure for the miner?—First of all, shorter periods of continuance in the atmosphere of the mine. To be 12 hours in an atmosphere very much deprived of its oxygen, with no sunlight, and breathing an air, formed in some measure by the combustion of candles, must be injurious. Then there should be as much dryness as possible; that is very often quite unattended to, and there is a trickling of water, and if a man is not inconvenienced by it, very little attention is paid to it. When the temperature is at all increased, a good deal of evaporation must go on, so that very often they are breathing a damp atmosphere loaded with an undue proportion of carbonic acid gas. I should say that the remedy would be dryness, shorter stems, and, above all things, ventilation.

20,074. (*Mr. Leveson Gower.*) Do you think that the health of the miners is inferior to that of the agricultural labourers?—Decidedly. When I was acquainted with them—(I could not speak statistically)—I should think that the average of 45 years was a longish life for a miner.

20,075. (*Mr. Holland.*) Are miners unusually liable to rheumatism?—Yes.

20,076. Much more than other men?—Yes, they are liable to it. With this class of men, unless you investigate their complaints, or they produce an inconvenience, you hear but little of them. But if you took 20 miners walking into this room, and asked them, you would find that most of them were subject to more or less rheumatism, but they would never think of mentioning it.

20,077. Is that rhematism chronic rheumatism?—Yes; I cannot recal many cases of acute rheumatism.

20,078. You attribute their pulmonary diseases to several causes; you mentioned bad air and inconvenient position?—Yes.

20,079. And what others?—The absence of sunlight for 12 hours, that is half of a man's life. Six months of a year that man passes in an artificial condition.

20,080. Is the dust of the mines likely to cause a pulmonary disease?—To a certain degree, from the chipping off of the stone, and the currents of air keeping the finer particles suspended.

20,081. Do you think that the powder smoke is a cause of that disease?—Where powder is used undoubtedly the combustion would assist in destroying the oxygen of the atmosphere.

20,082. The mines are stated to be much warmer than the outer air?—Yes.

20,083. Is the constant change from warm to cold air prejudicial?—Generally speaking; and no doubt miners bronchitis is very often produced by it.

20,084. By the alterations of temperature?—Yes. A man works below in a higher temperature; he comes up thinly clad, whatever the temperature may be at the pit's mouth. It may be in March; it may be snowing or raining; he retires to a small cabin and puts on some clothes, and then makes his way perhaps over the side of a hill for half or three-quarters of a mile.

20,085. I think you said that all men are liable to disease but miners in a particular degree?—Yes, all men are liable to take disease from variations of the atmosphere and so on.

20,086. But miners are liable to the same thing in a much greater degree?—More frequently in a greater degree.

20,087. Are miners as a class very much more liable to pulmonary disease than other men?—I should not say so.

20,088. You have attended colliers as well as miners?—Yes.

20,089. Is there a marked difference in the condition of those two sets of men?—Certainly. I should say that there is a greater tendency in colliers to pulmonary disease, and that they are not so liable to have heart disease with it; from family dispositions it more frequently ends in phthisis than with the miners. The miner's death is very often caused by obstruction within the chest, either through the lungs or through the openings of the heart, producing œdema in the legs, and hydro-thorax. If you enumerated the causes producing death in a certain number of miners and in the same number of colliers, I should say that you would certainly have a larger proportion of men among colliers dying of some form of consumption, and with the miners the largest proportion would be those dying from disease of the heart and dropsy of the chest.

20,090. Which class of men lives the best at home?—I think the miner; because he is more regular in his habits of living; he is more temperate; he has a better house; he has more cleanly habits; he is a better conditioned man, and therefore eats and drinks under other circumstances; he is not often drunk. The collier will only work five days in the week, and will drink for the remainder of the time; or he will perhaps devote Friday, Saturday, Sunday, and Monday to regular drinking: he makes no secret of it.

20,091. Is that very rare among miners?—Very rare; as far as my own personal recollection goes, I think that it is a thing almost unknown. You may have had of course a drunken miner now and then; but he was distinguished; he was known.

20,092. Are not colliers much more liberally paid than miners?—I do not know; but they are more regularly paid.

20,093. But notwithstanding the less regularity of payment of the miners they are more regular in their living?—Yes, and they are more provident men.

20,094. Notwithstanding that greater regularity of living, are they more unhealthy?—I should say that their complaints formerly had a more fatal character than with colliers.

20,095. They were shorter lived?—Yes.

20,096. There is no doubt about that fact?—Not in my own experience.

The witness withdrew.

Mr. EDWARD WILLIAMS, M.D. surgeon, of Wrexham, examined.

Mr. E. Williams, M.D.

20,097. (*Chairman.*) You have no cases of miners' disease under your attention?—I have not any, and I have come here in obedience to the wishes of the chairman; but I have so little to say, that I really hardly know how to begin to say it. I have no mining cases under my hands at all now.

20,098. But you know of the fact of the men suffering in mines?—Yes, that is very common,

20,099. Do they not apply to you?—Very seldom indeed. I do not recollect that I ever attended them for the miners' asthma.

20,100. Why do you think that they do not apply?—Because I think that they look upon it as part and parcel of their business. A man embarks as a miner, and he looks forward to the day when he will have this disease; he expects it,—he reconciles himself to it,—and puts up with it; and I think that he does not seek any advice from, perhaps, the misfortune that we cannot give him much assistance. It is a thing which goes on—he has other complaints—perhaps he may be laid up with a fever or with some other complaint, and then of course an enquiry is made into all the circumstances connected with his case, and we discover that he is labouring also under the miners' asthma. I never recollect being called in particularly to a case of miners' asthma.

20,101. But you have met with it in the course of your practice?—Yes, very often. The men think that there is no remedy; it is a thing which they think that they have to submit to, and they submit to it with the best grace they can, and they drag on their existence as well as they can.

20,102. And you think that it tends to shorten life?—Certainly.

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20,103. Do you think that it is general amongst miners?—It is very general amongst the miners working in lead mines.

20,104. (*Mr. Holland.*) At about what age do they get it?—That question I cannot answer.

20,105. (*Mr. Leveson Gower.*) Has there been any improvement with regard to the health of the miners within the last ten years?—I cannot speak to that, my experience with them was some years ago. I used then to come into contact with them much more frequently than I do now.

20,106. Can you state their average ages?—No, I have no statistics, but we always look upon them as a short-lived race of men.

20,107. (*Sir P. Grey Egerton.*) Are the cottages of the miners tolerably comfortable and healthy?—A great many of them live in their own dwellings, and are so.

20,108. Freehold?—Freehold, in some cases I think, and speaking generally, a great many of them are tolerably clean, and being on the side of the hills which we have up at Minera, I should say that they are generally speaking pretty well ventilated. Taking them as a class of people, I should say that they are quite as well off in their dwellings as their neighbours under the same circumstances. I should say that they are better off than the colliers.

20,109. What is your opinion of the general hygiene of the miners' families; are the families, generally speaking, a healthy race?—I should not hold them up as special examples of healthy people.

20,110. Are they as healthy as the agricultural population of the district?—No, I should say not.

20,111. To what cause do you attribute that?—I do not know that I can attribute it to any one cause specially. I cannot say that they inherit it, though possibly they may do so; but it is the impression on my mind that they are not such healthy people as the agriculturists.

20,112. Cannot you trace that to any cause, either to the habitations or to the habits of the people?—Not absolutely, though in many cases these doubtless have their influence.

20,113. I speak entirely of the families of the miners, the women and children?—I could not say that there was anything to which I could trace delicacy, but the numerous accidents incident to mining and the consequent loss of wages of the family, is a fertile source of poverty and privation, which of course must tell injuriously upon the health and vigour of their children.

The witness withdrew.

Mr. EDWARD DAVIES, surgeon, of Wrexham, examined.

Mr. E. Davies.

20,114. (*Chairman.*) I believe that you attend the different mines in the neighbourhood?—I do, more than other medical men here.

20,115. Will you state some of the principal mines?—There is the Minera mine, and there is the Union; those are the chief; there are several other smaller mines.

20,116. How are the doctors appointed to those mines?—Originally at the large mine the medical man was appointed by the company, but it seemed to give so much dissatisfaction to the men, that the directors left it to the men to select their own medical man, and to make their own terms with him.

20,117. Do the men pay so much?—they pay so much a month.

20,118. Do they pay it to the adventurers or to the managers of the mine, or to whom?—The carpenter receives the money; he is a man who has had a little education, and they pay it to him.

20,119. So that it is in fact quite an independent club?—It is quite independent of the masters or directors, or anything.

20,120. How long has that system been adopted? I have had it between five and six years, and I believe that that form of medical club was in existence for three or four years before.

20,121. What is the amount which the men pay?—6*d.* each a month.

20,122. Is that for themselves?—For themselves and wives, except in midwifery cases.

20,123. (*Mr. Holland.*) Does it include their families?—No, only the husbands and wives.

20,124. (*Chairman.*) In case of any accident is there any extra payment?—None whatever.

20,125. (*Mr. Holland.*) That is for both sickness and hurt?—Yes.

20,126. (*Chairman.*) Since you have been in this neighbourhood as medical man attending the mines, have you had any cases under your notice of what is called miner's disease?—I do not know exactly what that term would mean, but I have never found any disease peculiar to miners.

20,127. You have observed no particular affection of the bronchial tubes?—No. I have done so in coal miners, but not in lead miners.

20,128. Have you never found any of their respiratory organs particulary affected?—No, not more than I find in the ordinary agricultural districts.

20,129. Should you say that this is, speaking generally, a healthy district as regards consumption or any of that class of diseases?—No; there is a good deal of chest disease in this country, and it seems to be more prevalent in the mountainous parts than in the flat part of the neighbourhood.

20,130. Do you attribute that to any particular cause?—No, only to the great change in the weather more than anything else.

20,131. (*Mr. Holland.*) Alternations of temperature?—Yes, sudden changes.

20,132. (*Chairman.*) With regard to the houses, are the men well lodged, generally speaking?—The miners' houses round Minera are generally good houses, comparatively.

20,133. Are you subject to any epidemic fever?—There has been a good deal of fever among children, typhoid fever and scarlet fever, but no fever peculiar or prevalent among the miners themselves.

20,134. Then on the whole you would say that they were a very healthy class?—I should consider them very healthy.

20,135. And as long lived as others?—Yes, I think, equally so.

20,136. (*Mr. Holland.*) Do you say confidently that there is no excess of pulmonary disease among the mining population?—Yes. Since my attention has been drawn to this matter, I have taken particular notice.

20,137. There is no greater amount of bronchitis among them than among the ordinary population?—Just so.

20,138. You say that there is an excess of pulmonary disease generally in the district?—Yes.

20,139. And you attribute that to alternations of temperature?—I do not know to what other cause to attribute it.

20,140. Are not miners exposed to more frequent alternations of temperature than ordinary labourers whom you visit, the work being hotter?—I do not know much about the interior of the mines, and therefore I can hardly speak about that.

20,141. Have you ever noticed miners when they come up from the mines?—Not particularly.

20,142. Do you know that it is common for miners to be in a state of profuse perspiration when they come up from the mines?—I have never noticed it, but very likely it is so.

20,143. Are the miners in this part of the country in bleak situations frequently?—There are some of them sheltered between hills, or little rocks or mountains in the valley part, but most of them are in exposed situations:

20,144. Have not the miners frequently to go con-

siderable distances home from the mines?—Most of them in Minera; many live in the immediate neighbourhood; some live four or five miles off, but there are very few who do not live in the immediate neighbourhood.

20,145. If miners get hot at their work and have to go in bleak situations to their homes, it must predispose them to pulmonary diseases?—Yes, in some measure.

20,146. But you do not think that those diseases are more frequent with them than among the rest of the population?—My attention has not been particularly called to the fact of there being more chest disease among miners.

20,147. Are not they much more exposed than the rest of the population to breathing dusty air?—Yes, I should say so, from the nature of their occupation.

20,148. Is not that likely to produce pulmonary disease?—Yes.

20,149. Miners are exposed to a great deal of hard work in climbing?—Yes.

20,150. They are apt to be heated by that exertion?—Yes.

20,151. And they have then to go home long distances in very exposed situations?—Yes; of course it would to a certain extent predispose them to those diseases, but this is only supposition; their occupation is laborious, and the exertion of getting up to a certain height must make them warm, but I am not aware that they are so.

20,152. If the population generally are peculiarly liable to pulmonary complaint from the alternations of temperature, and if the miners are more exposed to those alternations of temperature than the rest of the population are not the miners more liable to pulmonary disease?—Yes, it would seem so.

20,153. After that, do you still adhere to the opinion which you have expressed?—Yes.

20,154. (*Mr. Kendall.*) Notwithstanding all these probabilities which you have heard of, yet you feel certain from your practice that the miners are as healthy as the agriculturists?—Yes, they are.

20,155. And that the miners' children are as healthy as agriculturist's children?—Yes, they are.

20,156. Before having to do with the mines, had you much to do with the agricultural population in those districts?—I have had to do with it sometimes. The miners country is very populous; the agricultural districts are not so.

20,157. Do you go over as much of the area of the agricultural districts as of the mining districts?—I travel a great number of miles in the agricultural part, but the districts are not so populous.

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20,158. Take the relative number of cases which you attend, is it two miners and one agriculturist?—For one agriculturist I attend six miners.

20,159. In this district, did you attend the agriculturists before you took to the miners?—No; my practice commenced chiefly in the mining district.

20,160. How many years have you been in practice?—I have been in practice in this neighbourhood six years next August.

20,161. Before you came here did you attend any miners anywhere?—I attended them in this neighbourhood before I came to reside here permanently.

20,162. At that time had you a good deal of agricultural practice as well as with miners?—No; nearly every medical man has more to do in the mining districts, because they are far more numerous.

20,163. Was the district in which you first started a mining district?—Yes, in the neighbourhood of Minera.

20,164. Then the whole of your practice has been amongst miners?—Yes.

20,165. But as far as it has gone among miners and among agriculturists, do you find the health of the one as good as the health of the other?—Just the same.

20,166. (*Mr. St. Aubyn.*) You mean to state generally that as far as your experience goes, the miners are not liable to any particular complaint arising from their calling?—I cannot name one. I have thought over everything since the question was put to me, and I cannot call to mind one.

20,167. (*Mr. Leveson Gower.*) Do the miners continue working in the mines to as late an age as labourers in the agricultural districts work in the fields?—There are several old men, but not very many. I cannot call to mind very many old lead miners. I can bring to mind several old coal miners, but not lead miners. I know one of 74 now working in a coal mine.

20,168. To what age do miners generally live?—A little over 50; from 50 to 60.

20,169. You have no statistics as to that?—I have not.

20,170. (*Mr. Holland.*) Do miners of 50 look as young as agricultural labourers of the same age?—Some of them look equally well.

20,171. I mean as a class?—Not meeting with an equal number on each side, I can hardly contrast them; the agricultural district here is comparatively very thinly populated.

The witness withdrew.

Adjourned to To-morrow, at Mold.

MOLD.

Thursday, 16th July 1863.

PRESENT:

The Right Hon. Lord KINNAIRD, K.T.	NICHOLAS KENDALL, Esq., M.P.
Sir P. GREY EGERTON, Bart., M.P.	JOHN ST. AUBYN, Esq., M.P.
The Honourable E. F. LEVESON GOWER, M.P.	P. H. HOLLAND, Esq.

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

Captain JOHN FLOYD, of Westminster Mine, near Mold, examined.

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20,172. (*Chairman.*) You have charge of the Westminster Mine?—Yes

20,173. Have you charge of any other mines?—None particularly; a small mine or two, but nothing to signify. I just go there now and then.

20,174. Of what description is the ore in the Westminster Mine?—Lead ore.

20,175. How many men have you working underground?—We have 48 now; we have 50 sometimes.

20,176. What is your lowest level?—Taking the lowest level, reckoning the engine shaft and altogether, it is 120 fathoms from the surface.

20,177. How long have you had charge of the mine?—I have been 20 years in the mine.

20,178. Are you a Cornish man?—Yes.

20,179. From what district of Cornwall did you come?—The western part; from Marazion to Hayle.

20,180. Did you work in the mines there?—Yes.

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20,181. How do the men ascend and descend ?—By ladders.

20,182. How do you draw ?—By the wem engine.

20,183. With a skip ?—No ; with kibbles.

20,184. Have you steam power ?—Yes.

20,185. How many shafts have you ?—We have two principal shafts, but we have small ladder road shafts as well.

20,186. But you have two principal shafts to the day ?—Yes, one east and the other west.

20,187. Are they connected below ?—Yes.

20,188. What is the principal level which you are now working at ?—It is 64 fathoms from the surface.

20,189. Have the men any place to change when they come to the surface ?—Yes, they have a cabin prepared for them with steam pipes in it to warm it.

20,190. Have they any warm water ?—Yes, there is warm water condensing from the engine.

20,191. Do the miners reside near the mine ?—Yes, within two or three miles.

20,192. What allowance of candles have they per week ?—2 lbs. for each man.

20,193. What is the price charged ?—8*d.* a lb. we charge the miners.

20,194. And the same for powder ?—Yes.

20,195. Is there any deduction for club ?—No ; we have no club now ; we had a club until within the last 12 months.

20,196. Is there any subscription for doctor ?—Yes.

20,197. Is the doctor appointed by the adventurers ?—By the adventurers and the miners. The miners pay 6*d.* per month each man.

20,198. Who has the choice of the doctor ?—He is chosen by the men.

20,199. How is it managed ?—It goes by vote. We let them elect their own doctor.

20,200. Have you done that for some time ?—Yes, three years ago.

20,201. Did you make any change for any reason ?—We made a change. One doctor that we had before lived in Mold, and the doctor that we have now lives at Ruthin. The men were dissatisfied that the doctor living in Mold did not attend regularly, and they wished to change, and we let them choose their own doctor.

20,202. Do you keep a month in hand of the pay ?—Yes.

20,203. Do you pay in notes or in small change ?—In gold and silver.

20,204. Do you know of any men suffering from working in mines ?—There are a few old miners who have been working underground all their days who suffer a little, more or less.

20,205. You yourself have suffered ?—Yes.

20,206. Where were you working when you were affected ?—I worked some years before I had the management of mines in the mines in Flintshire, and I think that I am suffering from that.

20,207. You think that it was brought on by working ?—Yes, in the lead ore.

20,208. What do you think it was occasioned by ?—I do not know, excepting it was from the dust from the lead ore.

20,209. Do you think that it was from working in bad air ?—Yes. I have been working in bad air, and whether it has had some effect or not I do not know.

20,210. (*Mr. Leveson Gower.*) Do you consider the air better now than it was when you were working ?—When I was working myself I was working in Flintshire. It is not the same mine. Our mine is now in Denbighshire.

20,211. Do you consider your mine better ventilated than it was ?—It is very good air.

20,212. It is better air than where you worked ?—Yes.

20,213. At what age do the miners generally leave off work ?—We have some miners of 60 or 70 years of age working now. They generally leave off working at from 60 to 70.

20,214. (*Mr. St. Aubyn.*) You have had some experience in Cornish mines ?—Yes ; I worked a little there when I was young.

20,215. Comparing these mines with the Cornish mines should you say that they were more or less healthy ?—I think that these mines are worked on just the same system as the Cornish mines.

20,216. But with regard to ventilation how is it ?—I think that the ventilation is quite as good here as there.

20,217. With regard to the health of the men working in the mines do you think that they complain more or less here than they do in Cornwall ?—I think that they complain less here than they do in Cornwall.

20,218. Is there less of what you call the miners' disease here than in Cornwall ?—Yes, I think there is.

20,219. When did you leave off working in Cornwall ?—I was 18 years of age when I left Cornwall ; that is about 35 years ago.

20,220. The mines are not so deep here ?—No, not by a great deal ; some of the mines in Cornwall are very deep.

20,221. The men invariably ascend by the footways here ?—Yes, except in the coal mines ; in the coal mines the men go up and down in buckets and skips.

20,222. Do you think that it would be an advantage for the men if they were brought up in skips ?—I do not know ; as the mines are now worked I think that it would be of very little advantage where they work in different levels.

20,223. You do not think that the climbing is injurious to them ?—No, because they are working in different levels ; if the men all worked in the bottom of a deep shaft I think that skips would be advantageous.

20,224. Do you go much underground yourself now ?—Yes.

20,225. To what depth do you go ?—The bottom is about 120 fathoms from the surface.

20,226. Do you feel any inconvenience result from climbing ?—Yes, compared with what I did when I was younger.

20,227. If you could come up by any other means than by the footways you would not feel the same amount of inconvenience ?—No.

20,228. Therefore, in your opinion, it would be a good thing to have some other method of ascending ?—It would be an advantage to come up by skip instead of climbing.

20,229. Has that ever been suggested here ?—I do not know that it has, because no mines are worked to a great depth here excepting such as the old Minera Mine ; the mines generally in this neighbourhood are rather shallow.

20,230. You do not consider that a depth of 100 fathoms is so great as to induce the managers to bring the men up in skips rather than by the footways ?—To bring them up by skip a plim shaft would be more convenient and the shafts here generally go down with an underlay according to the vein.

20,231. But skips can be used in a diagonal shaft ?—Yes.

25,232. (*Mr. Kendall.*) What is the deepest mine in which you ever worked in Cornwall ?—I should think about 100 fathoms.

20,233. Whereabouts was that ?—In the parish of St. Hilary.

20,234. What was the mine called ?—Old Bertha Croft.

20,235. You never worked in Cornwall deeper than 100 fathoms ?—No.

20,236. Have you worked at 100 fathoms here also ?—Yes.

20,237. Do you find any difference at that depth here and in Cornwall ?—I think it is rather warmer in Cornwall ; I think it is cooler here.

20,238. You would rather work at 100 fathoms here than in Cornwall ?—Yes.

20,239. You think that you suffer less ?—Yes.

20,240. Do you think that there is less dust here?—I do not think there is.

20,241. You say that you cannot go up and down as well as you could; does that arise from your being an older man than you were some years ago or from any other cause?—I am certainly older than I was then and I have worked very hard and a good deal in mines, which perhaps has affected my lungs, so that I cannot climb now as I could then.

20,242. You think that it is partly from age and partly from the work?—Yes.

20,243. I observe that you have 50 men engaged here in picking ore; is that so?—No.

20,244. How many men have you?—50 altogether, that is driving and sinking and picking ore.

20,245. How many men have you picking ore?—In the dead bargains they are picking a little ore; we are getting a little ore in most of the places that we are working in.

20,246. Are you picking ore on the surface?—A little in waste washes and the hillocks.

20,247. (*Chairman.*) Is it in old workings that your men are principally employed?—No; we are extending our levels and sinking in new ground; there are 50 men altogether employed in picking in the old workings and engaged in the new ground.

20,248. (*Mr. Kendall.*) How do the men pick; is it by day work?—So much a ton.

20,249. Have they any shelter?—Yes, in wet weather; they do not require it otherwise, because they are working perhaps two or three hours in one place and three or four hours in another, where they can get a bit of ore.

20,250. Do they pick over all the old workings?—All the old hillocks.

20,251. How many men and boys have you upon the surface picking the old workings?—Two men and five or six boys.

20,252. What end where you are now working is farthest off any shaft?—We have rises and stopes working.

20,253. Have you any ends at all?—We have only one end which is carried on as a dead bargain, and that is not more than three yards from a shaft.

20,254. Where is your rise?—Sixty-two fathoms from the surface.

20,255. How far is your rise from any shaft?—About 35 fathoms.

20,256. Thirty-five fathoms in from the shaft you have a rise?—Yes; there are two shafts and there is a rise in the middle, and they have a thoroughfare of air from one shaft to the other.

20,257. How many men have you there?—We have ten men stoping in that rise.

20,258. Is it a rich part there?—Not very rich; the vein is large and it is worthy of trying.

20,259. Have you any close end where you are obliged to use a fan?—No, not at present.

20,260. Have you any end where the candles burn dull?—No; the candles burn well everywhere.

20,261. You say "not at present;" have you ever had such an end in the last twelve months?—No, not in the last twelve months.

20,262. In the last two years?—Yes.

20,263. Where was it; in what level?—It would be about 90 fathoms from the surface.

20,264. How far off from a shaft was it?—That end was continued, but we have had rises from there up to another level.

20,265. When the air was bad how far off was it from any shaft; I mean before you holed?—Before we holed it was 50 fathoms from a shaft, then we sank and rose to meet and then we had plenty of air, but before that the air was flat.

20,266. Before you holed was the air bad both in sinking and in rising?—Before holed the air was rather dead.

20,267. In the deadest time, how many men could you put there?—It only requires two men in the 8 hours each piece, 6 men in 24 hours.

20,268. Had you six men altogether?—We had two men working there and two men in the roof working eight hours, and when the air was very flat we only put them six hours.

20,269. Was the air ever so bad that they could not work six hours?—No.

20,270. Were the candles ever dull there?—The candles always burn dull when the air is flat.

20,271. Did you use any fan at all?—Yes.

20,272. Did that give you a good supply of air?—Yes, there was plenty of air.

20,273. (*Sir P. Grey Egerton.*) What age were you when your health gave way?—I do not know; my health has been failing for the last 20 years. I was abroad in North America for two years, in North Carolina, looking at the mines there, and I think that it injured my health very much; it was very hot there.

20,274. You suffered, you say, from lung disease?—Yes.

20,275. Had you any black spit?—Yes, when I was working, but not now.

20,276. What was the first commencement of your illness; did it begin with catching cold?—I was continually catching cold.

20,277. And then you got worse and worse?—Then I got feebler and feebler.

20,278. Had you any pain across your chest?—No.

20,279. Had you shortness of breathing?—Yes.

20,280. Did you find those symptoms aggravated when you were working in dead air?—Yes.

20,281. Do you think that dust and powder smoke had anything to do with your illness?—I think that dust had a good deal.

20,282. Then it might be the effect of the dust?—Yes.

20,283. Do you think that the powder smoke affected you at all?—I do not think that it did in the commencement at all, but in later years I think that it did.

20,284. Had you any palpitation of the heart?—I suffered a good deal from it some time ago, but I do not now; that is better.

20,285. Can you go up the ladders now?—Yes, but I must go up quietly. I cannot go up the ladders as I did 30 years ago. I think that I climbed too fast when I was young.

20,286. When you found your health failing, did you give up working in the mine?—When I found my health give way I was obliged to take it more quietly.

20,287. Did you put yourself under medical treatment?—Yes; I had some medicine from the doctors.

20,288. Did they advise you not to go on working?—No.

20,289. They let you go on working?—Yes.

20,290. Was that when you were working in Flintshire?—Yes.

20,291. When did you cease working underground?—It is nearly 30 years ago.

20,292. Has your health been good since?—No; my health has been poor ever since then.

20,293. Do you think that your health is worse than it was?—Yes; a great deal.

20,294. And you attribute it to the effects of the disease which you had when you were working underground in your youth?—No; I cannot tell what brought it on.

20,295. I thought you said that it was brought on by working underground?—No; I did not say that it was brought on by working underground, but I have been affected now for years.

20,296. But it was aggravated by working underground?—Yes; it fretted me very much; I was worse than I am now.

20,297. You were continually catching cold; and you attribute your illness to working underground, and getting hot and coming up to the surface in a perspiration, and not taking care of yourself when you arrived at the surface?—I dare say that it is a good deal from that.

MOLD.

Capt. J. Floyd.

16 July 1863.

20,298. (*Mr. Holland.*) Are you very liable to catch cold?—No; I am better than I was.

20,299. You say that you think that the mines here are cooler than in Cornwall at the same depth?—Yes.

20,300. What is the cause of that in your opinion?—Zinc strata is more porous. I think the copper mines are generally hotter than the lead mines.

20,301. Are these mines all in the limestone?—Yes.

20,302. Is there any chert?—There is chert in the eastern parts of these mines.

20,303. Is there much chert?—No.

20,304. Is there any differenee in the health of the men who are working in the chert and the health of those who are working in the limestone?—Not much difference I think.

20,305. How long does the powder smoke generally hang about in your levels?—It is according to the air.

20,306. What is the common time?—In our mine I do not think that it lasts more than an hour in the worst time.

20,307. How long does it hang so as to prevent the men from working?—It does not hang more than 10 minutes to prevent their working.

20,308. In Cornwall does not it hang longer?—Yes, in close places.

20,309. Is the ventilation much alike here and in Cornwall?—I think that the mines are worked on much the same principle here as in Cornwall.

20,310. And is the quantity of air passing through them much about the same?—Yes; but I think the Cornish mines are generally warmer than here.

20,311. At the same depth?—Yes.

20,312. Are a good many of your men affected in their chests?—A good many have been so affected about the country, but I do not know that they are all our men.

20,313. At about what age do they generally become affected?—It depends entirely upon where they have been working, whether in bad air or in good; some men are affected sooner than others.

20,314. Do a large proportion of the men become affected at about 40 years old?—I think about 50 generally.

20,315. Is it so large a proportion as to be remarkable among them?—No; I think not.

20,316. Have you many miners who attain the age of 50, without being very greatly affected?—I do not know, it may be so. You may find men in the country who are not affected at all.

20,317. Is it usual for them to be not affected when they are so old as that?—I do not know. The men in this county are not brought up entirely to mining the same as they are in Cornwall; they are brought up in farming, mining, and jobbing about; but the miners in Cornwall generally commence in the mines when they are young, and they continue in the branch that they are brought up to.

20,318. At what age do they generally begin working as miners here; are they generally fully grown men?—Quite young men.

20,319. They do not begin as boys?—No; not so young as they do in Cornwall.

20,320. Do you know about what age they are when they begin?—I should think from 18 to 20.

20,321. Rarely below 18?—I think that there are very few under 18 here.

20,322. Do men begin mining at 20 and 25?—Yes; I have known many men come from farms and from the surface.

20,323. Have you noticed that those who begin later in life bear the work better, or worse, than those who begin young?—I do not think that they are affected so soon.

20,324. Those who begin later in life, at 25 or so, are not affected so soon as those who begin earlier?—No; I think not.

20,325. You mean that they work a greater number of years before they become affected?—Yes, I think so.

20,326. Have you sufficient cases of that to be sure that that is a correct observation?—I do not know; I never studied the matter.

20,327. (*Mr. St. Aubyn.*) What is the size of the levels here as compared with those in the Cornish mines in which you have worked?—I think that the levels as driven now are much about the same size—6½ feet by 3½ to 4 feet wide.

20,328. (*Chairman.*) Do you come across any shale in your mine?—Yes; there is shale covering the runs of ore generally.

20,329. Does it ever happen to you that any carbonic acid gas comes from that shale?—I have never remarked it.

20,330. Do you consider it a good sign to meet with shale?—Yes; as a covering for the ore.

The witness withdrew.

Mr. GEORGE HUGHES, of Halkin, Flint, examined.

Mr. G. Hughes.

20,331. (*Chairman.*) I believe that you are the Mining Agent for the Marquis of Westminster?—I am.

20,332. You have the letting of the sets?—I have.

20,333. Will you describe to the Commissioners the mode in which you let them, whether for long or for short periods; are there a number of small sets let?—There have been a great many, but there are not so many now.

20,334. Those small sets are let for how long?—They are annual grants, renewable every year.

20,335. Other sets are let to adventurers for a period of years?—Yes; the smaller grants are swallowed up in a great measure by the larger ones now for which leases are granted for periods of 21 years. The present terms are 20*s.* a ton for a twelvemonth, renewable every first Monday in May; but I have very few of the smaller grants now.

20,336. You have a book showing the mode?—Yes (*producing a book*).

20,337. Has this system gone on for some time?—Yes; this system of letting has been going on for many years. They are on strings or veins which are numerous, close together, and bear shallow. They are generally let in small patches of 60 yards by 30, which they call two meres of ground.

20,338. Do the men who are working in other mines take any of these small sets?—Yes; that is almost invariably the case.

20,339. The miner works for how many hours in your mines?—Six hours; and he occupies the other part of the day on his own account.

20,340. That might tend to overworking; do they overwork themselves?—No, I do not think that they do; there has been a great strike about the overworking in our district; they will only work for six hours. In other places I find that they work for eight hours.

20,341. Does the six hours include changing at surface, or do they change down below?—I believe that the six hours embrace the whole, going down and coming up as well.

20,342. Should you say that the miners suffer in their health from working?—I do not mean to say that they suffer; but I cannot say that it is so healthy an occupation as surface labour.

20,343. I believe that the parish where you reside is principally a mining parish?—It is the greatest mining parish I suppose in the county; there is more of it in lead mines or open waste than is the case in any other parish.

20,344. Should you judge from the amount of poor rates in that parish that the miners die early?—Yes, there is no doubt about that; I conclude that from the pressure upon the parish in the poor rates.

20,345. How is that pressure upon the poor rates shown?—We pay more rate per pound by a good deal than the adjoining parishes.

20,346. Do you think that that arises from the families of miners coming upon the parish?—I cannot attribute it to anything else.

20,347. Could we get any return from the parish registrar showing that?—Yes; I have a return here (*producing the same*).

20,348. That return is for Halkin parish and Northop parish?—Yes.

20,349. Northop is not so much a mining parish?—Only a small portion of it.

20,350. Will you state what has been the amount of the rate in those two parishes for the last ten years?—In 1853 Halkin was 4*s.* 3*d.* in the pound and Northop 3*s.* 6*d.*; in 1854 Halkin was 4*s.* 6*d.* and Northop 2*s.* 6*d.*; in 1855 Halkin was 4*s.* and Northop 3*s.*; in 1856 Halkin was 3*s.* 6*d.* and Northop 2*s.* 6*d.*; in 1857 Halkin was 5*s.* and Northop 3*s.*; in 1858 Halkin was 7*s.* and Northop 3*s.* 6*d.*; in 1859 Halkin was 3*s.* 6*d.* and Northop 3*s.*; in 1860 Halkin was 6*s.* 3*d.* and Northop 3*s.*; in 1861 Halkin was 4*s.* 3*d.* and Northop 3*s.*; in 1862 Halkin was 5*s.* and Northop 3*s.*

20,351. Do the royalties pay a poor rate?—No, it is never asked; quarries pay but not mines; mines are very uncertain with us, we are not the same as they are in some countries, where a mine lasts for ages; even our best mine lasts for a very short while, as it is generally a shallow bearing.

20,352. What are the principal mines let to adventurers?—Rhosesmoor is the chief one; there are also Parrys Mine and Longrake; the others are all small mines and are nearly worked out.

20,353. Have the miners generally a piece of land attached to their cottages?—Some of them. A great many have stolen a bit of the common from time to time, and they keep a cow; the common is of great assistance towards keeping a cow; they make use of the piece which they have taken (perhaps an acre or two) for the purpose of getting grass for the cow in the winter, and in the fine part of the year they turn the cow upon the open common for which they pay nothing.

20,354. What does their food chiefly consist of?—I think that the miner lives quite as well as the farm labourer in this country, if not better; they grow potatoes, and they kill a pig, and they have a cow and butter and wheaten bread; sometimes they mix barley and wheat.

20,355. Have they meat?—Yes, occasionally; they manage to get a little meat, especially if times are good with them; then they have bacon; they have milk and potatoes, and bread and butter.

20,356. (*Mr. Loveson Gower.*) Did I understand rightly, that you attribute the higher poor rate of the mining district, compared with the agricultural districts, to the greater unhealthiness of the miners?—I cannot account for it in any other way. The pressure upon the poor rates must be from the number of paupers in the parish, and if it is not the miners that cause it I do not know what does it.

20,357. Would not uncertainty of employment cause it?—No, I do not think that it would; they move about. When the Minera Mine started we had very few miners in our district; they go away if they find any place where they can do better on their own speculation, and fall back upon their own adventure if the price of lead ore is high. The prices are very good now; we have 13*l.* or 14*l.* a ton for our ore.

20,358. Is there not a large floating mining population which is unemployed?—There always will be, I suppose, in all mining districts. I do not know that there is more in our district than anywhere else; I think that ours, if anything, is better than elsewhere.

20,359. As comparing a mining district with an agricultural district would not that rather account for it?—No, I think that it is quite as regular as in an agricultural district, for it depends in a great measure upon the price of corn how many labourers the farmers will keep; it is low now, in fact it is so bad with the farmers in our district that I do not know what is to become of them if it lasts much longer; the price of corn is so very low and the yield is so excessively small, that they cannot afford to keep the number of labourers upon their farms that they used to do.

20,360. Are the miners a provident set?—I cannot say but that they are; when they get a great deal of money in a very short while, like most speculators, it excites them, and there is a little stir among them.

20,361 (*Mr. Kendall.*) Have you ever gone though the cases of pay in any of your parishes; is the pay to the widows and children of miners principally?—We have a vestry periodically for that purpose.

20,362. Do you find that the recipients of pay are principally the widows and children of miners?—We have hardly anybody else in our district; they are all miners nearly.

20,363. Or is it more to worn out miners?—I suppose both; the young men die as well. There is a certain kind of stone which does not agree with them; we have a certain stone at times which tells very heavily upon a man's health, and it is so in all mining districts that I have been at. At Talargoch it is so.

20,364. You have spoken of small sets renewable year by year; you say that the men who work in the large mines only work for six hours, and spend also a portion of their time in working these little private concerns of their own?—Yes.

20,365. Do the adventurers and captains and agents of these large mines object to men working in both mines?—Not at all, except it is the pitman or anybody of that sort, where the whole of his care should be devoted to the large mine.

20,366. But when a man only works six hours a day, they do not at all care where he works afterwards?—Not at all.

20,367. There is no suspicion that he will only work light for them and harder for himself?—They do not care if he does, because it is either by ton or yard work.

20,368. Supposing a man is on tut-work and only works four hours, do they take notice of it?—Yes.

20,369. They make him work six hours?—Yes, the agent generally goes there to see the men go down and come up.

20,370. Have you any of those small sets within reach of this place?—About three or four miles off.

20,371. In these small workings do the men sink deep at all?—No.

20,372. How deep do they ever go?—They start from the surface.

20,373. And how many yards down do they go?—It depends upon circumstances.

20,374. What is the deepest?—Our district will not I think pay for working above 80 yards deep. We have seen bunches. Rhosesmoor is an exception, because they did not find the lead ore there till they got 80 yards deep; it is the same range of bearing measures.

20,375. In these small workings, how far do they generally go?—From five and six up to 20, 30, and 40 yards down; if they get anything which makes it worth while; they go down after it.

20,376. Do they ever work at risk to their health as regards ventilation?—I do not know that they do; the bearing is so shallow, that it will pay them better to sink a bit of a hole; they can do nothing if they have no air, and the expense is so trifling to relieve themselves of the foul air that it is easily adopted.

20,377. Can you sink at small expense?—Yes; I should think that you can sink at 10*s.* a yard, up to 20 yards deep in many places, except it is in rock.

20,378. How many men together generally take these little workings, two or three?—We generally let 60 yards by 30 for two, that is our rule, and I believe it is generally carried out.

20,379. I suppose that the same takers have the

[*continued on page* 477

PARISHES.	Population in 1851.	Averages declared in 1851.	Averages declared in 1867.	Average.	PAUPERS RELIEVED. In-door. Adults. Males.	Adults. Females.	Children under 16.	Vagrants.	Total.	Collective number of days in the House.	Out-door. Adults. Males.	Adults. Females.	Children under 16.	Vagrants.	Total.	Gross Total.	Deduct persons relieved both In-door & Out-door, & included twice in the Gross Total.	Net Total.	RECEIPTS. Balance due to the Parish at the commencement of the Half-year.	Paid to the Treasurer.	Repayment of Relief.	Total (including balances in favour).
		£	£																£ s. d.	£ s. d.	£ s. d.	£ s. d.
CAERWYS	947	232	194	2,600	2	1	-	-	3	389	6	22	9	-	37	40	-	40	30 16 10¾	176 0 0	-	206 16 10¾
CILCEN	1,163	335	377	5,350	1	2	7	-	10	1,317	18	44	13	-	75	85	-	85	85 9 9	380 0 0	-	465 9 9
FLINT	2,845	417	353	1,600	7	3	11	-	21	2,311	19	45	40	-	104	125	2	123	37 11 5	416 0 0	-	453 11 5
GWAENYSCOR	373	53	92	792	-	-	-	-	-	-	2	10	9	-	21	21	-	21	21 2 1½	84 0 0	-	105 2 1½
HALKYN	1,777	342	423	2,110	1	2		-	6	438	13	67	41	-	121	127	-	127	121 5 11½	386 0 0	-	507 5 11½
HOLYWELL	11,301	1,966	2,273	7,263	18	12	36	-	66	8,023	100	342	241	-	683	749	4	715	393 2 3¼	{ 2,230 0 0 / *70 19 1 }	19 15 0	2,718 16 4¼
LLANASA	2,732	421	523	5,605	1	2	3	-	6	1,016	36	77	90	-	203	209	-	209	93 15 7	590 0 0	-	683 15 7
MOLD	9,286	2,114	2,097	14,124	8	10	14	-	32	3,730	116	286	243	-	645	677	9	668	330 0 11½	2,000 0 0	-	2,330 0 11½
NANNERCH	331	69	127	2,700	-	1	6	-	7	1,456	2	16	10	-	28	35	-	35	- - -	192 0 0	-	192 0 0
NERQUIS	434	99	154	1,881	-	-	-	-	-	-	9	19	9	-	37	37	-	37	32 4 3½	170 0 0	-	202 4 3½
NEWMARKET	612	102	206	943	-	-	4	-	4	728	4	17	17	-	38	42	-	42	57 19 11½	210 0 0	-	267 19 11½
NORTHOP	3,567	791	701	8,000	6	5	9	-	20	2,032	40	103	70	-	218	238	7	231	180 18 5½	936 0 0	6 16 6	1,123 14 11½
WHITFORD	3,884	869	929	6,852	2	7	18	-	27	3,454	43	120	86	-	249	276	8	268	133 17 6¾	914 0 0	-	1,052 17 6¾
YSCEIFIOG	1,710	390	552	5,857	1	1	1	-	3	310	20	60	31	-	111	114	1	113	187 7 3¼	576 0 0	-	763 7 3¼
Chargeable to the Union	- -	- -	- -	- -	14	12	23	115	164	5,004	250	597	570	321	1,738	1,902	13	1,889	—	—	—	—
TOTAL	41,047	8,200	9,209	65,834	61	58	135	115	369	30,308	673	1,830	1,479	321	4,303	4,677	44	4,633	1,715 12 5½	9,330 19 1	26 11 6	11,073 3 0¾
Corresponding half of last Year	- -	- -	- -	- -	74	67	178	156	475	34,449	707	1,840	1,625	241	4,413	4,888	85	4,803	—	—	—	—
Increase	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	80	- -	- -	- -	—	—	—	—	—
Decrease	- -	- -	- -	- -	13	9	43	41	106	4,141	29	10	116	- -	105	21	41	170	—	—	—	—

PARISHES.	EXPENDITURE. Balance due from the Parish at the commencement of the Half-Year.	In-maintenance including clothing.	Out-Relief including Relief to non-resident Poor.	Maintenance and Expenses Lunatics.	Extra Medical Relief.	Relief to irremoveable Poor and Vagrants apportioned by the Averages.	Vaccination Fees.	Registration Fees.	County Rates.	Police Rates.	Funeral Expenses.	Salaries and other common Charges apportioned by the Averages.	Workhouse Loan and Interest repaid.	Apprenticing Fees.	Education of Out-door Children.	Collector's Salary.	Remittance of Surcharge.	TOTAL (exclusive of Balances).	BALANCES. Due to the Parish at Lady-day.	Due from the Parish at Lady-day.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
CAERWYS	- - -	6 9 3	76 4 4	- - -	- - -	42 0 7¾	1 5 3	1 6 0	12 13 1	7 11 5	- - -	12 4 2½	8 19 0	- - -	- - -	- - -	- - -	168 13 2½	38 3 8½	- - -
CILCEN	- - -	22 7 7½	167 15 6	- - -	0 5 0	81 13 4¾	0 2 6	1 7 0	24 12 11	11 14 8	0 19 9	23 14 6½	16 7 10	- - -	0 15 10	- - -	- - -	354 16 6½	110 13 1½	- - -
FLINT	- - -	33 7 11½	160 19 4	11 10 0	- - -	77 2 5	7 19 0	4 4 0	33 19 8	- - -	0 17 3	22 8 1½	10 11 5	- - -	1 19 0	- - -	- - -	369 18 2	83 13 3	- - -
GWAENYSCOR	- - -	- - -	40 9 6	- - -	- - -	19 18 7	0 10 0	0 3 0	4 11 0	2 14 6	- - -	5 15 9½	2 14 9	- - -	- - -	- - -	1 2 6	77 19 7½	27 2 5¾	- - -
HALKYN	- - -	7 5 6½	207 6 4	- - -	0 5 0	91 12 8½	1 15 0	2 4 0	16 2 0	9 12 8	- - -	26 12 5½	14 5 2	- - -	1 6 4	- - -	- - -	378 7 2½	123 18 9	- - -
HOLYWELL	- - -	123 6 1½	1,008 13 9	71 12 6	1 5 0	493 9 9½	9 2 9	14 4 6	130 6 3	70 19 1	2 5 0	183 7 7	75 1 4	4 0 0	4 18 0	- - -	- - -	2,162 11 8½	556 4 8½	- - -
LLANASA	- - -	16 17 7½	239 4 11	23 0 0	1 0 0	113 5 11½	2 6 6	3 12 0	44 3 4	25 8 0	- - -	32 18 6	19 2 4	- - -	1 1 8	- - -	- - -	533 0 10½	130 14 7½	- - -
MOLD	- - -	61 19 6½	954 4 3	36 15 6	10 0 0	454 5 7½	14 17 0	14 9 0	146 6 1	87 9 2	- - -	131 19 9	72 1 5	2 10 0	13 15 4	- - -	- - -	2,020 12 7½	309 8 3½	- - -
NANNERCH	5 14 9½	24 3 10	54 10 10	0 5 0	- - -	27 10 2¾	- - -	0 9 0	12 18 4	7 2 5	- - -	7 19 10½	6 9 5	- - -	1 1 8	- - -	- - -	142 10 7	43 14 7¾	- - -
NERQUIS	- - -	- - -	83 9 6	- - -	- - -	33 7 2½	- - -	0 6 0	9 9 2	5 13 2	- - -	9 13 10½	6 4 7	- - -	0 4 4	- - -	- - -	118 7 9½	53 16 3½	- - -
NEWMARKET	- - -	12 1 11	73 6 6	- - -	- - -	44 12 6¾	0 12 9	0 14 0	8 0 4	4 15 11	- - -	12 19 3¾	5 7 11	- - -	- - -	5 10 0	- - -	168 1 2	42 18 9½	- - -
NORTHOP	- - -	34 15 4	426 13 1	23 0 0	0 5 0	195 3 10½	9 9 0	4 19 0	64 12 0	38 12 6	- - -	56 14 2½	35 18 7	- - -	1 11 1	- - -	- - -	891 13 7½	232 1 3½	- - -
WHITFORD	- - -	57 11 1½	429 14 1	12 7 6	- - -	201 5 0½	5 12 0	4 17 6	59 6 10	35 5 9	- - -	58 9 5½	29 15 2	- - -	4 9 6	- - -	- - -	893 6 11½	154 10 7½	- - -
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Chargeable to the Union	- -	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
TOTAL	5 14 9½	420 8 10½	4,172 13 5	221 13 9	13 0 0	1,994 19 7½	53 17 3	54 9 6	592 16 1	326 10 6	4 2 0	579 12 6½	325 0 0	6 10 0	32 13 1	5 10 0	1 2 6	8,804 19 1	2,262 9 2½	—
Corresponding half of last year	- -	516 6 2¼	4,178 17 11	235 8 9	8 5 0	2,038 7 5¾	95 7 9	51 13 6	549 9 11	490 11 1	12 15 3	695 8 0	337 10 0	2 10 0	25 19 6	5 10 0	—	—	—	—
Increase	- - -	- - -	- - -	- - -	4 15 0	- - -	- - -	2 16 0	43 6 2	- - -	- - -	- - -	- - -	4 0 0	6 13 7	- -	1 2 6	—	—	—
Decrease	- -	95 17 4¼	6 4 6	13 15 0	- -	43 7 10½	41 10 6	- -	- - -	164 0 7	8 13 3	115 15 5½	12 10 0	—	—	—	—	—	—	—

first chance on the set being again let?—We never take it from them as long as they wish to work it.

20,380. (*Sir P. Grey Egerton.*) Do both men of the pair work underground, or is one bringing out the ore and the other working?—They both work underground.

20,381. Till they have an accumulation of ore?—Yes, and then they get assistance to bring it out; they very often get a man at the top while they are both below; if they can manage without assistance they do.

20,382. Do they dress the ore themselves, and prepare it for market?—Yes; sometimes when they are not used to it they get a man to finish it.

20,383. Have you any check upon them?—Yes.

20,384. Are the cottages of the miners tolerably comfortable?—Some of them are; I think that you will find them, for the most part, clean and tidy; they are chiefly cottages built by themselves; they are squatters; rather than get a comfortable good cottage for 2*l.* a year, which is our usual rent, a man would prefer spending 100*l.*, or the whole of his labour, let him be ever so lucky.

20,385. But whether they live in their own cottages, or lease them from Lord Westminster, you think that they keep them clean?—Yes.

20,386. Are they a sober set?—Yes; the Welch miners are rather religiously disposed.

20,387. Are they Methodists?—Yes; different kinds of Methodists; Independents and Wesleyans and Baptists, and so on.

20,388. What schools are there of yours?—Lord Westminster has his own school at Halkin, to which all the children of the parish are invited; he pays the master and mistress, and has built the school and houses, and every accommodation, and he pays rates and tithes, and everything else connected with it.

20,389. It is entirely at his own expense?—Yes; he pays sufficient for a good master and mistress, but I believe that the clergyman charges some few pence to the children.

20,390. Is it under Government inspection?—Yes; it has been placed so not long since; in fact a Government inspector has always been invited to inspect it.

20,391. And you find that sufficient for the children of the district?—Yes, it is ample; there are three or four schools upon the Common.

20,392. Private schools?—No, National Schools.

20,393. In addition to Lord Westminster's?—Yes; and he subscribes very liberally to each.

20,394. (*Chairman.*) What precaution do you take in any of these small workings, when they are abandoned, to prevent any accident?—We bind them to close them up and secure them, and we fill up many of them every year; but still you will find a great many of them merely covered over; we covered the whole of them over a short time ago, but the boys about there take delight in knocking them down, and it is fine fun for them.

20,395. (*Mr. Kendall.*) Are there any take-notes in these sets?—Yes.

20,396. (*Mr. St. Aubyn.*) Do you bind the renters to cover them up?—Yes.

20,397. (*Mr. Kendall.*) Do they do it?—If they do not, we do it, or try to do it.

The witness withdrew.

[*The table on page* 476 *was attached to the evidence of this witness.*]

Captain JOSEPH NINNIS, of Maes-y-safn, near Mold, examined.

20,398. (*Chairman.*) Of what mine have you charge?—Maes-y-safn.

20,399. Have you charge of any other mines?—No.

20,400. What is the description of ore of your mine?—Lead.

20,401. How many men are at present employed underground?—About 210.

20,402. What number of hours shift do they work?—Eight hours.

20,403. Are there any boys?—Three boys underground.

20,404. What are those boys employed in?—They assist the men in beating the borer.

20,405. Do the men go down by ladders?—Yes.

20,406. What is the deepest level at which you are now working?—310 yards from the surface.

20,407. What are your principal operations now in the mine, are you driving or sinking?—We are sinking two shafts and driving a great many levels, perhaps ten.

20,408. Are the men principally tut-work or tribute men?—Tut-work.

20,409. What allowance of candles have the men?—Two pounds a week.

20,410. What are they charged for them?—Eightpence.

20,411. And for powder the same?—Yes.

20,412. Is the mine worked by water or by steam power?—We pump by two steam-engines, and have one water-wheel.

20,413. Was not the water very much in the mine when you had charge of it first?—Yes; about 50 yards at the bottom of the mine was filled with water and sand.

20,414. Is that the case now?—It is all cleared now.

20,415. I think that you have not put up any changing houses yet?—No.

20,416. Did you know a case where a man suffered before you came there?—I was informed so by the men.

20,417. What was it?—That a man came one morning, and his underground trousers were frozen so stiff, that they could stand up, his partners tried to persuade him not to go down in them, he said "nothing will hurt me." He came up and took cold, and was in his grave about two months after that, so I was informed.

20,418. So that you consider changing houses very important?—Yes.

20,419. Do the men pay club money?—No; only the doctor; the men pay 6*d.* a month to the doctor.

20,420. Is the doctor appointed by the adventurers?—Yes.

20,421. What is his name?—Dr. Hughes of Mold.

20,422. Is a month kept in hand of the pay of the men?—Only a fortnight.

20,423. Are any women employed in the mine?—No.

20,424. (*Mr. St. Aubyn.*) Did you ever work in Cornish mines before coming here?—Yes.

20,425. Whereabouts?—In different mines; chiefly at Perran St. George and Perranzabuloe.

20,426. How many years were you working there before you came here?—I have been agent about 16 years; I have been here for two years.

20,427. You are very well acquainted with the condition of the miners in Cornwall?—Yes.

20,428. Speaking generally, what should you say was the condition of the miners here as compared with that of the miners in Cornwall as to health?—I should say that it was equally as good; I am not much acquainted with the district; I have only come from Cornwall about two years, and have been confined to the mine that I am engaged in.

20,429. Are the mines here better ventilated than they are in Cornwall?—They are equally as good here.

20,430. Not better?—No, I do not say that they are; it depends upon the management of the mines in Cornwall. Where there is pretty good management, there is pretty good ventilation. Where the management is defective, the ventilation is defective.

20,431. Is the management better here generally than it is in Cornwall?—It is just the same.

20,432. In Cornwall you knew men who were suffering from the miners' disease?—Yes.

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Capt. J. Ninnis.
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20,433. Do men suffer from that here?—I have known of one or two cases of men, about 50 or 55, I should think that it was what they call the miners' consumption.

20,434. Do as many suffer from it here as in Cornwall?—I should think not.

20,435. To what cause do you ascribe that difference?—Perhaps it may be from a difference in the ventilation of the mines, or the purity of the air underground; I do not know any other cause of it; but I think that this is a very healthy climate.

20,436. Do you mean to say that the air is more healthy above ground in Wales than it is in Cornwall?—I do not know, I get on a little better here than I did in Cornwall; there, there are different gases. I am no chemist, but I question whether lead would throw off the gas that copper does. Copper and mundic or iron pyrites may be more injurious to the constitution than lead.

20,437. You think that the better health of the miners, is owing to the nature of the mines?—Yes.

20,438. And not owing to any improved system of ventilation?—No.

20,439. Or any improvement in the management—No.

20,440. (*Sir P. Grey Egerton.*) Are you of opinion that working in limestone is more healthy than working in killas or granite?—I think that limestone is pretty good, but I think that the shale is heavy; there is some little shale in our mine, and the miners complain when they get into that rock to work.

20,441. (*Mr. St. Aubyn.*) Are your mines as deep here as they are in Cornwall?—Much about the same I think.

20,442. What is the depth of your mine where you are working now?—About 155 fathoms below the surface—310 yards.

20,443. (*Mr. Kendall.*) Did you come from Perranzabuloe?—No, I came from St. Agnes; but I worked when a young man at Perranzabuloe for ten years.

20,444. Where did you first pitch in Cornwall to work?—In St. Agnes.

20,445. Did you work much out of St. Agnes?—Only in Perranzabuloe.

20,446. Are not St. Agnes and Perranzabuloe supposed to be very healthy parts of Cornwall?—Yes; but more particularly St. Agnes.

20,447. I believe it is assumed to be the healthiest part in Cornwall; taking that and taking this district, you think that the miners on the whole have less disease here than they have in Cornwall?—I should think they have from what I have seen of it; two years is not much experience. I came direct from the Marazion district here.

20,448. You say that you are no chemist; you do not offer an opinion on it; but you fancy that the gases may be different here from what they were in Cornwall?—Yes.

20,449. But still your experience here is long enough to tell you that the moment the men come to shale they suffer?—Yes.

20,450. Did you ever see a candle go out in shale; did you ever see a candle go out in any of your mines here?—No; I have seen it in Cornwall, but not here. Men now work in our mines who are upwards of 70 years of age, and who have worked in Maes-y-safn Mine all their days.

20,451. How many men have you altogether?—Two hundred and ten.

20,452. Out of the 210 have you 20 men working of 60 years of age?—I think that we have.

20,453. Have you five men of 65?—No, hardly, underground; we have three old men 70 years of age and above.

20,454. Do you take in any men above 20 who never were miners to work underground?—Yes, we have done so; first of all they go to fill the kibbles and underground waggons, then they get in as labourers, as bargain men, and so on.

20,455. Have you any Cornish men working with you in your mine as miners?—We have three Cornish men as pitmen, and a timber-man, and there is another young man, but he is on the surface at present.

20,456. Did they work much in Cornwall?—Yes, all their days.

20,457. Have you heard any of them say that they find their health better here than in Cornwall?—No, I have not heard them say so, but they enjoy their health very well.

20,458. Are they all young men?—One is about 48 and the other two about 24.

20,459. Is the man at 48 strong and healthy?—Yes.

20,460. How long has he been in this neighbourhood?—Two years.

20,461. He came up with you?—Yes, about the same time.

20,462. You say that you have been here two years as agent?—Two years last month.

20463. When you came here was it the first time the mine was started afresh?—Yes.

90,464. At that time the mine was in a very bad state as far as ventilation went?—No.

20,465. The old miners followed the ore wherever they could?—Yes; they went down in the bottoms.

20,466. Without regard to ventilation or anything else?—They had pretty good ventilation, because the bottom was open and they had a railroad right in the middle of the workings; the ventilation was as good as it is now.

20,467. The ventilation was good, but then the woodwork and things of that kind were in bad order?—Yes.

20,468. Since you have been here your ventilation has been pretty good, except just before holing?—Yes.

20,469. Before holing have you ever had it so bad that you have been obliged to put the men to work short stems?—Never.

20,470. Now you can work 16 hours out of the 24?—Yes, pretty well.

20,471. Sometimes you only work eight hours?—Yes.

20,472. Do you not think it worth your while before holing now and then to have a fan?—I do not know; the air is only bad for a short time, and then it is not very bad; it is fairish air for underground. I have seen ten times worse air; I do not think that the air is injurious at present.

20,473. The men do not complain?—Not at all.

20,474. And they do not seem to suffer?—They do not.

20,475. The candles burn brightly?—The candles burn quite upright. In a month or two more we shall hole.

20,476. How many fathoms do you drive off from an air hole before you begin to feel a difference, as far as the candle goes, generally speaking?—The candle will burn very well for 30 fathoms, but after that it gets very flat.

20,477 How long is it before it begins to show a difference; ten fathoms?—Yes.

20,478. As a fan is not an expensive instrument, might it not be an economy to use a fan the moment you find a difference in the candle?—I think that the best way would be when we get the mine in a proper course of working to keep air sollers, that is the best ventilation, that is always drawing, but a boy does not work.

20,479. Do you not think that the moment the air begins to get a little dull you ought to have either a soller or a boy; would not that be economy?—Yes; a soller would be the best.

20,480. (*Sir P. Grey Egerton.*) Would it not pay you to get rid of the smoke in a shorter time out of that end?—I do not think that we could get more work done.

The witness withdrew.

Mr. Peter Parry, of Mold, examined.

Mold.

Mr. P. Parry.

16 July 1863.

20,481. (*Mr. Holland.*) You are the coroner for this district?—I am coroner and a general practitioner; I have been coroner for 47 years; I am the oldest coroner in England.

20,482. How many inquests have you held?—I have held 3,256 inquests in this county, besides having acted in Denbighshire upon two occasions, upon the death of one and the removal of another coroner. I held last year 99 inquests in this small county and 28 adjournments, most of the adjournments were in colliery cases.

20,483. Are the inquests chiefly among colliers or miners?—Colliers.

20,484. Do fatal accidents occur among miners?—An accident occurred and 16 miners were killed at Bryngwiog Mine, near Halkin Mountain in Halkin parish.

20,485. What caused their death?—An overflow of water; it came down in torrents upon them, and drowned them all from the old workings.

20,486. How long ago was that?—I think it was on February 12th, 1862; inquests concluded March 6th, 1862.

20,487. Did you hold an inquest lately upon a miner?—Not later than yesterday.

20,488. What was he killed by?—He fell down a shaft by going down in a kibble.

20,489. At what mine was it?—Axton Mine, parish of Llanasa.

20,490. Have you had other such inquests as that?—Yes several; there were three going down in this case, the man's hand slipped and he fell to the bottom.

20,491. From the kibble?—Yes; there were three in the kibble.

20,492. Have you had accidents from falling from the ladders?—Yes, at Talargoch and other places.

20,493. Have you had inquests upon men killed by powder blasting?—Yes.

20,494. Several?—Not many, considering that it is a mining district.

20,495. You are a practitioner as well as a coroner?—Yes; I have been a practitioner 56 years.

20,496. Are injuries by powder blasting, which are not fatal, common?—Not very common, but I have met with very dreadful cases of that kind; I have been surprised that they have got off with their lives, and they are disfigured sadly at times.

20,497. Has there been loss of eyesight?—Yes.

20,498. Which are the healthier men, colliers or miners?—I see colliers who are old, but I cannot find an old miner.

20,499. Are there many old colliers?—Yes.

20,500. What disease shortens the miners' lives?—Their general health is affected, their stomach and bowels get out of order, and it affects the whole system, the lungs and everything; they become asthmatical and affected in their breathing, and in their bowels too; they have very acute pain sometimes in the bowels and stomach; I do not know what that is from.

20,501. Do a large proportion of them become asthmatical?—Yes, a great number; we have some poor people now begging about; I have not been so much amongst miners of late years.

20,502. Is disturbance of the stomach and bowels very common among them?—Yes, very common.

20,503. (*Chairman.*) Did you ever hear of an explosion of fire damp in any mine?—Yes, about 25 years ago in Talargoch Mine, a lead mine; there is coal in that neighbourhood, and it must have been from that coal.

20,504. Did persons loose their lives from it?—Yes, two persons lost their lives from explosion; I held an inquest. The Inspectors of Mines were astonished at it. The memorandum I have in my book 25 years ago does not say the men died. One man died from the fall of the roof at that date.

20,505. (*Mr. Holland.*) Was there any coal at all in that mine?—I did not observe it; it must have been there; the miners did not tell me that there was any. There are coal and lead at Trelogan Mine.

20,506. (*Chairman.*) Have you a record of six cases at Bryngwyn Mine on which you held an inquest?—There were seven cases and the following are the particulars of them:—James Clarke, aged 24 years, miner, Mold, died September 4th, 1854; inquest, September 6th, 1854; verdict, casually killed by foul air in a lead ore mine shaft. John Jones, aged 16 years, miner, Mold, died September 4th, 1854; inquest, September 6th, 1854; verdict, casually killed by foul air in a lead ore mine shaft. George Oldfield, aged 42 years, miner, Mold, died September 4th, 1854; inquest, September 6th, 1854; verdict, casually killed by foul air in a lead ore mine shaft. Thomas Oldfield, aged 14 years, miner, Mold, died September 4th, 1854; inquest, September 6th, 1854; verdict, casually killed by foul air in a lead ore mine shaft. Charles Matthews, aged 44 years, miner, Mold, died September 4th, 1854; inquest, September 6th, 1854; verdict, casually killed by foul air in a lead ore mine shaft. William Oldfield, aged 22 years, miner, Mold, died September 4th, 1854; inquest, September 6th, 1854; verdict, casually suffocated and smothered in a lead ore mine shaft from the effect of impure air. Thomas Morgan, aged 29 years, miner, Mold, died September 4th, 1854; inquest, September 6th, 1854; verdict, casually suffocated and smothered in a lead ore mine shaft from the effect of impure air.

The witness withdrew.

Mr. Robert Parry, of Mold, examined.

Mr. R. Parry.

20,507. (*Mr. Holland.*) How long have you been in practice as a surgeon?—About 35 years.

20,508. Have you had much practice among miners?—Yes, a great deal; and before I was in practice for myself.

20,509. Is lung disease very unusually prevalent among them?—It is a very common disease among them. Lung disease is the principal disease which the lead miners have.

20,510. Have many miners the disease before they apply for medical assistance?—They are ill for many years, and they say that they are not ill, and they do not apply unless they contract to pay the medical man, and then they will come at any time they like; but others do not apply at all, or very seldom. The fact is, that they cannot afford to pay.

20,511. What number of hours do the men generally work?—Six, and some of them eight; there was a dispute about it. I have asked the miners when they were in health, and they say that six hours is plenty for any man.

23,512. Have you noticed that the men who work eight hours are more unhealthy than those who work six hours?—No; I cannot say as much as that, because I never took that notice. But they tell me themselves that they cannot stand the eight hours; that it is too much for them, and that six hours is as much as ever they can stand. I have often asked them why they did not work longer, the same as the collier. The collier works 12 hours.

20,513. What do you hold the disease to be that they suffer from?—We have never had an opportunity of a post mortem examination, but there is evidently a shortness of breath. I should say that it was chronic bronchitis, but they do not complain of acute pain; we do not see them then.

20,514. Does the disease come on very slowly?—A boy goes to mine work here at 11 or 12 years old, and they do not complain much until they are 25 or 30.

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Mr. R. Parry.
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20,515. Do they commonly go underground so early as 10 or 12 years old?—They go underground to watch doors, or something of that sort. Most of those boys who are employed at 12 are washing ore upon the bank.

20,516. At what age do they go underground?—Say at 16 to begin with, or 18; most of them at 18.

20,517. Do you often see them ailing below 25?—No; not often. Most of the miners go mining, and then they go to farmers, and then when they get married, they go to the mines again.

20,518. At about what age should you say that they begin to show evident disease?—Between 40 and 50. A miner is a very old man I should say, in his constitution, at 45.

20,519. Are there many miners of 45, who are quite sound in their lungs?—I do not think that there are many of 45 who are not affected if they are constantly underground as common miners, though agents and others who do not go underground often are not so affected.

20,520. Do you consider a miner of 45 an old miner?—Yes; and at 50 a very old miner upon the general run.

20,521. Is there much spitting with this complaint?—Not at first, but at last there is. All of them smoke tobacco, and they drink a great deal. They drink as much as ever they can catch hold of, and they are not paid so often as colliers are; colliers are paid every week or every fortnight; the miner is only paid every month, and they cannot get drink unless they have money in their pockets, and that is the chief time when they get it.

20,522. What do they drink chiefly?—They drink nothing but ale.

20,523. Does their drinking hurt them much?—No; I think that it does them good.

20,524. How?—It acts upon the bowels; they always say that they are better after drinking.

20,525. What sort of ale do they drink?—Bates's ale.

20,526. Do they drink it quite new?—Yes; if it froths up like cream on the top of the glass it will do.

20,527. We have been told that there is not a special amount of lung disease among miners, is that so?—There is no doubt about it.

20,528. You are quite sure that there is?—There cannot be a doubt about it; I could bring you the miners to show you. At this time of year the bottom of the place is very close, but then the miners work a great deal upon land at this time of the year; the miners go out to harvest; they go out a great deal to the hay harvest.

20,529. Do they mend in health after working at the harvest?—Yes; they have good health then, and they go to the corn harvest. Mine work in this country is not so good as it used to be. We have hardly any lead mines in Flintshire, unless it is at Talargorch.

20,530. (*Mr. Kendall.*) How many mines do you attend?—I do not attend many mine works now; we have none in the neighbourhood. The small miners do not club together at the mines, but attend a great many beneficial societies, and most of the members of those societies are lead miners.

20,531. They belong to a club?—They belong to a beneficial club and I attend a great many of those clubs, all the large mines have a medical man attending to the works, but we have none in this immediate neighbourhood at present except Maes-y-safn Mine. I attend a great many club men who are nearly all miners.

20,532. Taking your patients what is the proportion of your miner patients to the agricultural patients?—They seem to be mixed; we cannot tell in the club.

20,533. You know when a man is a miner and when he is not a miner?—Yes; but I never made the calculation.

20,534. Upon the whole what should you think when you have to attend a patient, you can decide at once whether he is a miner or not?—Yes, you can easily tell; in a collier the disease will work off, but if a miner once begins in the lungs you very seldom see him recover but it rests upon him all his lifetime and he drops off. I have seen men that I would say were not fit to crawl out of bed or over the door sill going to their work and doing a day's labour as they say.

20,535. I understand you that in consequence of many of these men having little mines of their own there is no mine club?—Not many.

20,536. And they do not belong to clubs, and therefore they will let the disease go on before they go to the expense of employing a medical man?—Yes; that is what I mean.

20,537. Many of those men being private speculators and poor men they do not belong to a mine club to avoid the expense of a doctor they allow incipient disease to go on, and it becomes chronic?—Yes.

The witness withdrew.

Captain Francis Evans, of Wain near Mold, examined.

Capt. F. Evans.

20,538. (*Chairman.*) Of what mines have you charge in this neighbourhood?—Bryngwiog Mine, Longrake, Billins, Pentre, Devereux, and Little Cathole.

20,539. How many men altogether have you working underground?—We have 110 men at Bryngwiog, 30 or 40 at Billins, those are the principal mines, the others are small.

20,540. Bryngwiog is the principal mine?—Bryngwiog and Longrake are the principal mines just now.

20,541. Are you sinking there or driving or both?—The principal thing which we are doing in the four mines is sinking an engine shaft, we have four engine shafts sinking.

20,542. Where you are sinking have you any artificial means for providing air?—None at all, except in many cases from the different levels. We always take care to have winzes sunk in advance of the levels so as to get down by the time the levels reach them; we sink the winzes before the driving so that when the driving comes up underneath them we communicate. We consider 20 fathoms generally speaking far enough.

20,543. You would not recommend driving a level further than 20 fathoms?—No; you cannot ventilate the bottom of a mine sufficiently unless you do that; that I believe is the system generally adopted in Cornwall and that is what I carry out here.

20,544. Have you no deficiency of air?—No, except in very hot weather in the summer, and I think that that occurs almost everywhere whether shallow or deep, from what I have seen.

20,545. It does not depend upon the depth of the mine?—No, but upon the atmosphere.

20,546. How many hours shift do the men work?—They work very little in this part of the country; I should think that four or five hours is quite as much as they do.

20,547. They work six hours shifts do they not?—They call it six hours but they relieve at surface, and by the time the parties get up and the other parties get down there is a difference of an hour or an hour and a half I should think.

20,548. Do the men work on their own adventures; do they employ their spare hours in working small adventures?—A great many of them do, but we object to it; we pay them what we consider fair wages and we expect to have their labour.

20,549. But you do not get so much work done as you think they might be able to do?—We consider not.

20,550. Do you know of any men suffering from the work?—We do not see much of it.

20,551. Where do they reside?—Most of them reside in the neighbourhood of the mines.

20,552. Have they houses of their own and a bit of land?—Some of them have, but generally speaking they are not very careful people.

20,553. Do they belong to the neighbourhood generally or do they come from a distance?—They generally live in the neighbourhood of the mine.

20,554. What amount of candles are allowed them?—We allow them 2 lbs. a week each, but they do not burn them; it is the custom of the country.

20,555. What do they pay per pound?—We charge them 8*d.*

20,556. And the same for powder?—Yes; every mine has its different price generally.

20,557. Have you a mouth in hand of the pay?—No, we only keep a fortnight; at some of our mines we only keep a week; but I think that a fortnight is the time which ought to be allowed.

20,558. You think that it is quite possible in mines to pay, only keeping a fortnight in hand?—Yes; I think that a fortnight is quite long enough; I should say that there ought to be a fortnight and that a fortnight ought to do.

20,559. Would a month in hand lead the men to be more in debt?—I should think that a month was too much generally speaking, unless it was a very large establishment.

20,560. (*Mr. Kendall.*) What are the average wages of the miners here?—They do not work at all under 15*s.* a week; I think that they get that throughout the country.

20,561. Working five hours a day they get equal wages to the Cornish men who work eight hours?—Yes, they get even better wages; they strike if they do not.

20,562. What do they do in the remainder of their time?—I am sorry to say that a good deal of it is spent in the public houses.

20,563. They drink a good deal do they?—They do.

20,564. Have you worked in the deep mines in Cornwall?—Not very deep; I have not been much connected with a deep district. The deepest that I have worked in was 90 fathoms.

20,565. What is the deepest mine you have been in here?—Ours is the deepest; it is 90 fathoms.

20,566. Do you think that the air in the 90 fathoms here is purer than in 90 fathoms in Cornwall?—I think it is.

20,567. Do you know why; is it from the difference in the strata or not?—It is particularly as to copper mines; the air in copper mines is hotter, In tin mines I think it is just the same as it is here; just the same as in lead mines, except that in the shallow mines here the air is very bad but they are not worked on the vein, they are worked on what they call flats, beds, and then the stratification is different, it is more of a clay and sand and soil.

20,568. And that is bad?—It is.

20,569. Where have you any lead deposits flat in this neighbourhood?—All east of Maes-y-safn on this side of the hill.

20,570. Is the flat lead immediately under the mountain limestone?—No, it is rather over it; they get a kind of limestone, but it is mixed a good deal with clay and sand.

20,571. How is it in the shale?—The shale deposits of course are connected with the coal formation; the shale and dark limestone and sandstone generally are between what they call the white limestone and the coal formation; it is on the borders.

20,572. What is the thickness of your deposit of lead generally speaking?—Some of the flats lying on this side of the hill towards the coal formation have an abundance of ore; in some places it is 16 feet thick.

20,573. And then they dip out?—They dip out at the surface.

20,574. Can you speak of the air in the neighbourhood of shale?—Those flats are not so easily ventilated, because the levels have to be driven almost horizontally.

20,575. Do you think that any gases come out?—I have never proved it.

20,576. Is the health of the miners generally throughout this district pretty good?—Very good.

20,577. Do they suffer much from cough and asthma and that sort of thing or not?—Not to the same extent that Cornish miners do.

20,578. Notwithstanding that they drink more than the Cornish miners?—A good deal.

20,579. Still their health on the whole is better?—We do not see many sick miners amongst them. They take a great deal more care of themselves.

20,580. You mean that they do not work so hard?—They do not work to the same extent, and when they get to a certain age they manage to do without working somehow. They go off to farming or get a little venture by themselves, and do a little.

20,581. After they get to a certain time of life they contrive to get other occupation?—They will leave off underground work if they can once get a little venture of their own, as they call it, where they can pick up just a little piece of lead. They live cheaper than Cornish men; at least they are more contented.

20,582. They do not live so well as Cornish men?—No. The Cornish men as far as animal food goes, I think, make use of more of it; bread and butter is the principal diet here. They are more contented with their coarse living.

20,583. They have more money, the living is cheaper, and they drink more?—They spend it in drink. They have a custom, no matter what family they have, of giving their wives 12*s.* a week and no more, and spending the rest.

20,584. It is an understood thing?—It is a custom amongst them.

20,585. That the home consumption is 12*s.*, and whatever the size of the family is the man drinks the rest?—Yes.

20,586. (*Sir P. Grey Egerton.*) If he gets 15*s.* a week he only keeps 3*s.*?—Yes.

20,587. (*Mr. Kendall.*) Do they work much on tribute here or not?—Yes. They are not bad tributors.

20,588. Do they get many starts here or not?—The present system is to limit them as to the quantity.

20,589–90. You prevent their getting starts?—We prevent their getting starts if we have an opinion of the place where they work. It is of no use to give them extra wages, they only stay away from their work, and spend their time, and lose their money. They go to Liverpool and one place and another, and stay away till they have spent the whole.

The witness withdrew.

Adjourned to To-morrow at Rhosesmoor Mine.

MOLD.

Friday, 17th July 1863.

PRESENT:

The Right Hon. Lord KINNAIRD, K.T.	NICHOLAS KENDALL, Esq., M.P.
Sir P. GREY EGERTON, Bart., M.P.	JOHN ST. AUBYN, Esq., M.P.
The Hon. E. F. LEVESON GOWER, M.P.	P. H. HOLLAND, Esq.

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

RHOSESMOOR MINE, NEAR MOLD.

Mr. THOMAS ROBERTS, of Rhosesmoor Mine, examined.

MOLD.

Mr. T. Roberts.

17 July 1863.

20,591. (*Mr. Kendall.*) You have a large interest in this mine, have you not?—I have one eighth of it.

20,592. You know a good deal about the mine; you are here a good deal, are you not?—I am here almost every day.

20,593. You do not go underground much?—I have not been underground these two years.

20,594. But still you know all about it from hearsay?—Yes.

20,595. How is the air in your mine?—Very good; there is plenty of air.

20,596. Have you any bad air in the 100-yards level west, in the end?—Yes. We have stopped that. The object of it was to make a day level. We went many yards, and then stopped it; there was no ore in it.

20,597. How far off from the west whim shaft have you gone?—I suppose it is nearly 100 yards.

20,598. You went about 100 yards, and the air was bad?—Yes; and it was very hard. We were driving this to meet the level.

20,599. You found the air bad, and the end hard?—Yes.

20,600. Do you recollect how many pounds you were giving a yard when you stopped?—*5l.* 10*s.*; another was 6*l.* That was in October last.

20,601. Did you use any artificial means of throwing in air,—any fan machine?—No.

20,602. How many men worked in the west end during the 14 hours?—Only six. It was standing from 12 at night till 6 in the morning; there were six hours that they were not working.

20,603. But even with that the air was bad?—Yes, very bad. We found that there was no sign of commencing the day level.

20,604. How many men have you working altogether?—66.

20,605. Do you work upon tutwork or upon tribute?—Both.

20,606. Is the tribute so much a ton?—Yes.

20,607. I suppose that it varies a good deal?—There are different prices.

20,608. From what to what?—From 15*s.* perhaps to 7*l.*

20,609. What wages do you let your men get upon the whole; what do they average?—I cannot tell.

20,610. 3*l.* a month?—There are different prices, according as we set a bargain.

20,611. But will they average, taking one with the other, about 3*l.*?—Somewhere about 3*l.* It is more or less; we cannot say.

20,612. In what part of the mine are they now working principally?—From the west to the east.

20,613 On the 120?—Yes; they are working in different. parts.

20,614. From the 120 up to the 100, have you taken away nearly all the ore?—Yes.

20,615. Then you have not got much reserve?—No. We have been getting some here lately (*pointing to the plan*), above this level.

20,616. How deep is your sumpt shaft?—These two shafts are 140 yards deep, and we are now driving two levels; one to the west and one to the east. We think that we can get this level to the west a little further.

20,617. Have you tapped the water going west as yet?—No.

20,618. Are you now going through a good course of ore?—Yes. In driving this 140 level we expect that we shall tap the water.

20,619. Have you had any accidents this year?—No.

20,620. Have you had any since you have been in the mine?—Only one.

20,621. How did it occur?—It was the boy's own fault.

20,622. What was the accident?—It was at the dinner hour.

20,623. What did he do?—He went down the footway shaft, and when they were coming up there were three or four of them; and when he was below, about two yards from the top, down he went.

20,624. (*Mr. Leveson Gower.*) Was he killed?—Yes.

20,625. (*Mr. Kendall.*) How do you go up and down; by ladders?—By ladders.

20,626. It is all by ladders?—Yes; they can go down this engine shaft with ladders.

20,627. Which is your winding shaft, the eastern or the western one; you have two east whim shafts?—Yes.

20,628. Which of those two easterly ones do the men go down?—The engine shaft; there is no winding up this shaft.

20,629. Is there any division in that shaft which the men come up, or do they come up in the same shaft without any partition?—There is no partition.

20,630. So that there is no division between the ladders by which the men come up in that shaft and the engine?—No, I do not think there is. They generally go by the other shaft, that is to say, the footway shaft.

20,631. (*Mr. Holland.*) But they go by the engine shaft sometimes?—Yes.

20,632. (*Mr. Leveson Gower.*) Have you any boys now working underground?—No; the boys are all in the washing.

20,633. How old was the boy who was killed?—I cannot say; perhaps 14; but it was not his business to go down, it was only his wickedness.

The witness withdrew.

BRYNGWIOG MINES.

Captain FRANCIS EVANS further examined.

Capt. F. Evans.

20,634. (*Mr. Kendall.*) How long have you been working these mines?—About four years.

20,635. How long had these mines been working, from report, before that?—The old mine, I have heard, was working 60 or 70 years ago.

20,636. And how long had they stopped before you resumed working?—This was a separate company to the old mine (*pointing to the plan*).

20,637. Your present mine embraces two old mines?—Yes.

20,638. One old mine was stopped many years ago?—Yes; the western part stopped 70 years ago.

20,639. The eastern part stopped how long ago?—I have heard 15 or 20 years ago.

20,640. Were there any working plans of either of those two mines left?—No, I believe not.

20,641. Neither the old nor the new?—No, not to show the extent of the mines.

20,642. Did any accident occur in consequence of your not having those plans to refer to?—Yes; the first extended on the 52 fathoms level west.

20,643. How far did you extend?—About 80 fathoms.

20,644. Why did you stop then?—Because we were afraid of the old mine water.

20,645. Then you commenced driving on the 66 fathoms?—Yes.

20,646. How far did you extend?—About 60 fathoms.

20,647. What occurred then?—We broke into the old mine then.

20,648. You suddenly came upon water?—Yes; and in consequence 16 men were drowned.

20,649. Having extended about 80 fathoms on the 52, I suppose you thought you were quite safe in going as far as that on the 66?—Yes; and that came out in evidence on the coroner's inquest.

20,650. Can you explain why you should happen to tap the water on the 66 fathoms level?—The old men found a bunch of ore on the 52 fathoms level, and they followed it down in a diagonal direction, going east; and, besides that, the level from the old mine was driven further east than people generally said, and there were no plans to show the exact state of the underground workings.

20,651. Do you not think that it would be very desirable that it should be enforced that all parties should keep plans of mines?—I think that it ought to be done.

20,652. So as to be accessible in case of workings being renewed?—Yes; every mine which is abandoned should have a complete plan.

20,653. There should be a place of a deposit for plans?—Yes.

20,654. In fact, if there had been a working plan of the old mines left, this accident never would have occurred?—It could not have occurred. We keep up our plans.

20,655. As far as working plans go of the modern workings, are they generally adopted throughout this country?—No, they are not, as far as I see.

20,656. (*Sir P. Grey Egerton*). How do the miners get access to these workings?—By means of a footway furnished with ladders.

20,657. Are the ladders very steep?—No; they are on the vein generally speaking; there is an underlay of about two feet in a fathom.

20,658. Are they wood or iron?—Iron and wood. We put in iron staves every new one that we make.

20,659. Are these the old ladders which you purchased with the rest of the plant, or are they new ladders?—Some of them are old ladders which we found in the mine.

20,660. Do you find that those old ladders are serviceable?—They do very well till the staves get worn out, and then we put in iron ones.

20,661. Then when there is any appearance of a stave being unsafe, you replace it?—We replace it directly.

20,662. When the men come to the surface do they change their clothes?—They do not, generally speaking, here.

20,663. Have you any dry provided for them?—Yes; we have three houses, but they generally come from home in their underground clothes.

20,664. Do the men prefer going home in their dirty clothes rather than taking the trouble of changing in the dries?—They, generally speaking, adopt the colliery principle of walking in their underground clothes. Some of them change at the mine.

20,665. (*Mr. Leveson Gower.*) Have they far to go?—They live almost close to the mine.

20,666. (*Sir P. Grey Egerton.*) Do you find that colds and coughs are prevalent here?—They are not.

20,667. (*Mr. Holland.*) Do they generally put on any over clothing when they have their mine dress?—They are generally pretty well clothed, and have pretty good shoes.

20,668. (*Sir P. Grey Egerton.*) About what distance have they generally to walk?—They live within a mile.

20,669. (*Mr. Holland.*) Do they generally use a separate footway, and not the one in the engine shaft?—Yes.

The witness withdrew.

RHEWL MINE.

JAMES GODDARD examined.

20,670. (*Mr. Kendall.*) You are a working miner?—Yes.

20,671. Do you only work in this mine?—Yes.

20,672. You have a share in this mine?—Yes, a small share.

20,673. How many shares are there?—16.

20,674. How many have you?—One share out of 16—an ounce.

20,675. Are they all divided between 16 poor miners?—No, they are from Liverpool, Staffordshire, and Birmingham.

20,676. This is not quite a poor man's mine?—No.

20,677. But several poor men work here?—Yes.

20,678. How do you manage about collecting money when a call is made?—They pay what they have to pay, and we are in loss afterwards. We work out our shares.

20,679. When they pay cost, you work up your cost?—Yes.

20,680. How do you work; by the month?—By the yard.

20,681. Who sets the work to you?—The man over the other party.

20,682. How often do you balance your accounts?—Every month.

20,683. And sometimes you have very little to receive?—Yes.

20,684. And a great deal of your money goes towards your cost?—Yes.

20,685. Are you raising any lead now?—Yes, we have very good lead.

20,686. How many tons do you raise a month?—We have just come to it.

20,687. And you hope to follow it now?—Yes; it will pay us now.

20,688. What is the width of the lode?—About a yard or four feet in some places.

20,689. How many tons will it turn out to a fathom?—I cannot tell.

20,690. Have you a rich vein now?—Yes, very rich.

20,691. And you hope to make money now?—Yes.

20,692. As I understand, you have no stage or resting place from the surface till you get to the bottom of your mine?—No.

20,693. What is the depth?—120 feet.

20,694. Then you have to go up and down 120 feet without resting?—Yes.

20,695. Have you ever have any accident?—Never.

20,696. The ladders are all safe and tight?—Yes.

MOLD.
J. Goddard.
17 July 1863.

20,697. Where were the ladders made ?—In Halkin.

20,698. Do you find it fatiguing to go that depth without stopping ?—No, I think not.

20,699. Do you ever buy a second ladder ?—No.

20,700. How is the air at the bottom of your mine? —Very good indeed.

20,701. You have a funnel at the top, and it is found to be good all the way down ?—Yes.

20,702. How far from the bottom of the shaft is the end ?—About 10 yards.

20,703. How many ends are you driving ?—Only one.

20,704. On the course of the lode ?—Yes, west.

20,705. Does your candle burn well ?—Yes, capitally.

20,706. And I suppose you turn your funnel against the wind ?—Yes; it will turn in a minute.

20,707. If it is a very calm day, with no air at all, do you find any difference then ?—Yes, a little; not much.

20,708. Ho long do you think you shall drive before you have another shaft ?—We have put it out about 40 yards off.

20,709. Have you pitched it?—No, but we are very near.

20,710. How many men have you working at a time ?—Two.

20,711. Do you work six hours at a time ?—Yes; we have six men.

20,712. Then you have six hours rest ?—Yes.

20,713. (*Mr. Holland.*) Is the mine quite dry ?—Yes.

20,714. (*Mr. Kendall.*) Who draws your water for you ?—Nobody; it takes itself off.

20,715. Where do you think it goes ?—We have what we call a swallow taking it also.

20,716. Have you a swallow close by ?—Yes, within 15 yards of the shaft.

20,717. How long is it since you cut the vein ?—Eleven weeks.

20,718. Is there any blasting ?—No.

20,719. It is all pick work ?—Yes.

20,720. Does either of the miners working here work at any other mine ?—Not now, but they have been.

20,721. Do you know any men who work some time in the day in a regular mine, and then work at their own mine afterwards ?—We have been so.

20,722. What was your last call ?—16*l.*; 20*s.* a share.

20,723. Did you work up your 20*s.* ?—Yes.

20,724. Did you work it up all at once ?—No.

20,725. You did it by degrees ?—I have to pay my call every month.

20,726. You work up your call every month ?—Yes.

20,727. And you receive the difference ?—Yes.

20,728. Supposing at the end of your month you had earned 5*l.*, you would only receive 4*l.*?—Yes.

20,729. When poor men have these mines there is no overlooker or captain, is there ?—Yes; there is a man to look over.

20,730. You appoint a man among yourselves ?—Yes.

20,731. Is he a working man also ?—Yes.

20,732. Generally, when poor men have works of their own, they are their own masters; there is nobody to interfere with them; it is their own property, and there is nobody to say that they shall do this or that ? —Just so.

20,733. (*Mr. St. Aubyn.*) They can change their captain whenever they please, cannot they ?—Yes.

20,734. Has he anything extra for being overlooker ?—Yes.

The witness withdrew.

HOLYWELL.

Dr. JESSE CONWAY DAVIES, of Holywell, examined.

HOLYWELL.
Dr. J. C. Davies.
17 July 1863.

20,735. (*Chairman.*) I believe that you are a member of the College of Physicians of Edinburgh ?—Yes, and of the College of Surgeons of England and of the Apothecaries Company, and a Doctor of Medicine.

20,736. Have you practised long in this locality ?—Ten years, I think. I was House Surgeon to the Dispensary here for three years before that.

20,737. During your practice have you had under your care any men who were working as miners ?—Constantly.

20,738. Have you observed that they are affected in any different way from other classes ?—Yes; we find that they are affected with what we call the miners' asthma.

20,739. Do you observe that in its incipient stage; how does it first develop itself ?—Very often it comes on like the symptoms of chronic bronchitis; at other times it comes on with symptoms of affection of the heart—enlargement of the heart.

20,740. Should you consider that the lives of the miners are shorter than those of men in other employments; that their lives are shortened by their occupation ?—No doubt of it.

20,741. In cases which come to you have you ever observed them get perfectly free of it; do they recover completely ?—No, not if they have been working in mines for some years; but if they have only been for a few years, from seven to ten years, and they are recommended to change their occupation altogether, and do so, then they get free from it.

20,742. But if they persevere in their occupation they seldom recover ?—Just so; miners generally calculate upon working for twenty years; they say, "If we do not continue at it much more than twenty years we may escape." But it is not often that a miner escapes entirely; at least that is my experience.

20,743. (*Mr. Holland.*) Do a very small proportion of them escape if they work twenty years ?—As far as I can recollect and call to memory there are very few indeed who escape if they have worked for twenty years.

20,744. If they work steadily on for twenty years as miners ?—Yes, and some of course suffer much earlier than that.

20,745. At about what age do they generally begin decidedly to fail in health ?—If a miner has been working in a mine from childhood then he will not go very much beyond 40 before his health fails.

20,746. At what age do they generally begin working underground ?—They go as soon as they are able to do anything.

20,747. At 16 or 18 ?—Earlier than that.'

20,748. They work underground younger than that ? —Yes.

20,749. (*Chairman.*) Have you any cases at present which could be seen?—No; I have made inquiry since I saw your lordship, and it so happens that I have not at the present moment any case. If the inquiry is to be extended over some short period then I am sure that I could produce cases. I intend making post morten examinations as early as an opportunity is afforded me, and also as often as I can meet with subjects, so that I might arrive at the true pathology of the disease.

20,750. (*Mr. Holland.*) To what cause do you attribute the miners' asthma chiefly ?—I fancy myself that it must be a complication.

20,751. What are the complications ?—It is com-

plicated with emphysema, enlargement of the heart, and bronchitis.

20,752. To what circumstances attending their employment do you attribute these complaints chiefly?—To the want of oxygen.

20,753. Poor air?—Yes; bad air in the mine.

20,754. Do you think that they breathe sufficient udst to produce much irritation of the membrane?—No, I think not.

20,755. Do you attribute much to powder smoke?—No, I do not think that the men do.

20,756. Do you think that much of the mischief is to be attributed to coming out of the mines hot and getting cold?—That is the case sometimes; it produces a cold, and with those who are at all prone to congestion of the membrane it will produce bronchitis. Of course that will assist; and I think that it is bad air, the want of oxygen. The blood is not thoroughly decarbonised, and therefore the pulmonary circulation must be retarded in consequence; and there is a tendency to congestion of the mucous membrane of the air passages and of the lungs, and then a greater work is thrown upon the heart, and an enlargement takes place.

20,757. Are a large number of the men ill before they apply for medical aid?—Yes, very often; in fact the miners consider, when they get 45 or 50, and begin to feel a difficulty of breathing coming on, and a cough and expectoration, and so on, "Well, it is the miners' complaint." They suffer considerable distress, but they do not apply for medical aid.

20,758. We were told at Wrexham that the miners were in the habit of considering their complaint incurable, and that they bore with it; that is the case here?—Yes. If they have a medical man that they can go to, if there is a club belonging to the mine, then of course they very often go; but they consider generally among themselves here that if once they are affected with miners' asthma it is incurable.

20,759. Have you noticed that miners are more liable to phthisis, true consumption, than other men?—No.

20,760. (*Mr. Leveson Gower.*) Do you attend any colliers?—Yes.

20,761. Is there any mining disease among them?—No, we do not observe much here.

20,762. Have you ever seen a case of it in a colliery?—No, I never saw a case among colliers here of the black expectoration, or anything of that sort; nor have I seen any cases where I could say that they were suffering on account of working in collieries.

20,763. To what do you attribute the difference; better ventilation?—Yes. Collieries are much better ventilated than mines generally.

20,764. (*Sir P. Grey Egerton.*) I think you stated that the miners' disease sometimes originates in cold?—Cold very often assists, and may prove a serious complication.

20,765. As far as you have had an opportunity of observing, are the miners a careful set of men or not, as to changing their clothes when they come out of the mine; do you think that they take the necessary precautions to avoid catching cold?—I think so.

20,766. Is it the general habit of the miners here to change their clothes when they come to the surface before walking home?—Yes, generally, especially in large mines.

20,767. Are proper places provided for them for changing?—Yes, generally.

20,768. Have you visited the dries, as they are called?—Yes.

20,769. Do you think that they are adapted for the purpose?—Yes, I think that they are.

20,770. Do the adventurers supply the miners with water to wash in the dries when they come out of the mine?—I could not say that. I have not made inquiries into that.

20,771. Is it your opinion that if proper places were provided, and the men took advantage of them, it might obviate the predisposing cause of the miners' disease, as far as catarrh is concerned?—Yes, decidedly. There is no doubt about that. Dyspepsia follows miners' asthma on account of the congestion of the stomach and liver which takes place, and often also of the kidneys, producing albuminuria. The postal system is frequently implicated, and the patient has hemorrhage often from the bowels, and piles is a common complication.

20,772. (*Mr. Holland.*) Are miners unusually liable to dyspepsia?—No, I do not think that they are particularly.

20,773. Are they unusually liable to rheumatism?—No, I do not think that they are. I think that farmers' labourers are more liable.

20,774. Miners are not remarkably so?—No.

20,775. *Mr.* (*Leveson Gower.*) Do you see any difference in the health of the miners in the different mines; do you consider some mines more unhealthy than others?—As regards the mines which are badly ventilated, if foul air or the want of oxygen predisposes to pulmonary congestion and so on, of course the worse the mine is ventilated the worse it is for the miner.

20,776. Have you had more cases from certain mines than from others?—I could not say so as regards any of the public mines; but small mines, small ventures, and so on, where, perhaps, four or six men are working in their own mine, are, I think, the worst ventilated. There was an instance here the other day: two men were working in the bottom of a shaft, but the air was very bad, so that they could hardly breathe, but they had heard from somebody that if they had a stove in the shaft it would cause a better ventilation, and they took a stove down to the bottom of the shaft, and of course it had not been there above three or four minutes before they both fell senseless at the bottom of the pit.

20,777. (*Mr. Holland.*) Do you mean a stove without a flue?—I do not know what kind of stove it was. Of course that destroyed the oxygen, and converted it into carbonic acid gas at once, and the men could not breathe, and they fell senseless. Of course the fire went out directly that the oxygen was exhausted. I suppose that it must have been the heat from the stove that caused a little disturbance in the air of the pit, so that oxygen replaced some of the foul air where the men lay, or otherwise they would both have been dead.

20,778. (*Mr. St. Aubyn.*) Have you been able in your practice as a medical man to distinguish amongst your patients those who have worked in the large mines, and those who have worked for small adventurers, so that you could speak from your own experience as to the relative healthiness of those who work in the small and those who work in the large mines?—I know as a fact that those who work in the small mines suffer more.

20,779. Have you found that from your own experience?—Yes, I am positive of it.

20,780. In what particular forms of complaint are those who work in the small mines less healthy than those who work in the large mines?—They become more liable to miners' asthma.

20,781. Are they attacked at an earlier age, or when the disease attacks them is it in a worse form?—Whatever gives a tendency to it is increased. In a badly ventilated mine, of course, the miners will suffer more.

The witness withdrew.

Mr. JAMES WILLIAMS, Surgeon, of Holywell, examined.

20,782. (*Chairman.*) Have you been for a long time practising at Holywell?—In my own practice I have been here since 1851—12 years; but I had been here with my father all my life previous to that.

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20,783. So that you know the district well?—Yes. I was bred and born here.

20,784. During your practice have you many men who are working in mines who come to you for advice?—Yes, a large number.

20,785. Do you find that there is any disease peculiar to miners?—Yes; they are all very liable to what is commonly called asthma. Here the thing is proverbial, and they call it the miner's asthma.

20,786. You refer to those in the metal mines?—Yes, lead miners; not colliers.

20,787. At about what age should you say that they die?—They all die what is called young; some of course live to a greater age. I never made any average of any sort, but I should say at a guess perhaps 45 to 50.

20,788. Do they come to you at the commencement when they first feel affected?—No; as a rule it comes on very insidiously and quietly; the symptoms, at the commencement, not being so urgent as to prevent their going on with their work.

20,789. Have you any case where a man has recovered?—No, I do not know of an instance.

20,790. They still continue working?—Yes. Their bodily health, as a rule, in other respects is good,—they are simply short-winded.

20,791. In your opinion does that render them liable to other diseases of the chest?—Yes; it commences as a case of asthma, and eventually ends in dropsy, or it brings on consumption or chronic bronchitis.

20,792. In case of death, under what disease do you suppose that it would be registered?—I should say that the majority of them would be registered as cases of asthma.

20,793. They would not be registered as phthisis?—I should think not, except, perhaps, those cases which end in phthisis.

20,794. Is there any register of any kind which would give information with regard to the proportion?—Yes. I happen to be Registrar of Deaths, and I have no doubt I could furnish you with tolerably correct information on the subject.

20,795. Will you have the kindness to do so?—I shall be very happy to do so. The register book in my possession begins in March 1862, and from that date up to the present time there have been 16 deaths of lead miners. I just went over the causes of death, and three out of the sixteen have died from other causes than disease of the chest; therefore 13 out of the 16 have died of disease of the chest, principally asthma, chronic bronchitis, and phthisis.

20,796. (*Mr. St. Aubyn.*) I think you said that you had never known a case in which a man has recovered from this miners' disease?—I have not.

20,797. Do they consult you in the earlier stages of the disease, or do they let it run on till it gets too far?—They let it run on until it incapacitates them from following their work; they then, perhaps, apply to a medical man, and when they get better they resume their work.

20,798. If a man who was attacked with this disease was to consult you in the earlier stages of it, and then was to take some other occupation, such as an agricultural life, do you think that it would be incurable in that case?—I am hardly able to give an opinion upon that point; I have never tested it, but I do not think that the disease could be cured by such means. It perhaps might be suspended for a length of time.

20,799. Have you been in the habit of going underground yourself?—No. I have not seen any lead-mine workings.

20,800. What, in your opinion, is the cause which induces this complaint?—I see no cause for it myself, except a man being habitually accustomed to breathe a vitiated and close atmosphere, which is also, perhaps, well charged with dust and powder smoke.

20,801. Do you think that anything arises from climbing the ladders; does it affect the heart in any way?—I think not. In this district there is very little climbing, for the mines are not of a great depth; and, from what I have heard about mining, the ladders are short, and then, perhaps, there is a little incline, and they walk it, and then there are the ladders again. There are other occupations in life where there is a great deal more climbing; sailors, for instance. I do not think that that will be found to bring on asthma.

20,802. Have you seen the places where the men change on the surface?—Yes.

20,803. Are they sufficient for the purpose; do they always get dry clothes on when they come up from work?—Yes; they are dry for them.

20,804. You do not think that keeping their wet clothes on, or exposure to the air when they come up from the mine, has anything to do with the disease?—It has a tendency to bring on colds.

20,805. If they do so?—Yes.

20,806. But it is the habit in this district to do so?—A great many do, I think; I often see men walking about in their wet clothes.

20,807. Then you would say that, that as well as the bad air, would affect them?—Yes; but that of itself would not necessarily bring on asthma; it would give them a cold, and there would be an end of it. If a man has worked in bad air, and he is subject to asthma, remaining in his wet clothes would develop it.

20,808. (*Mr. Holland.*) Is this disease which you call miners' disease quite distinct from common consumption?—Yes; I look upon it as a different disease altogether; the symptoms are different, and it is in fact of a different character.

20,809. What do you think it is chiefly?—It begins as asthma. I should say that it was emphysema of the lung, complicated, perhaps, with chronic bronchitis.

20,810. When do you think that bronchitis comes on?—It comes on in consequence of accidental circumstances, I suppose. I look upon the disease as beginning with pure asthma, but from accidental circumstances it may go on into chronic bronchitis or phthisis.

20,811. Is there much complication of heart disease with it, in your opinion?—No, not often.

20,812. Do the miners complain much of dust as an irritating cause?—Yes, they complain a good deal of dust.

20,813. Is there much difference as regards the irritation from dust in different kinds of mines?—Yes, according as the mine is wet or dry.

20,814. Do they complain much of powder smoke?—Yes, they complain a good deal of powder smoke.

20,815. Do you think that the exposure to cold after working is an important cause of the disease?—It may help to bring it on, to develope the thing more decidedly, but I do not think that it would bring on this peculiar disease of itself.

20,816. Do they complain of their great liability to catch cold?—No, they do not complain so much about that. They expose themselves very unnecessarily, I think, sometimes. They say that they prefer working in a wet place to a dry one; that is my experience of them.

20,817. Is that because they have less dust?—Because they have less dust and smoke. They consider it much more wholesome.

20,818. Then it would seem as if the dust was more injurious to them than the damp?—I put that question to many of them, and they do not consider that the dust brings on their disease, but that it irritates them very much, and is a great nuisance to them. I have asked several very intelligent and experienced men about it, and they all say that the thing which injures them is the bad air,—being obliged to work in places where their candle will hardly burn.

20,819. Do you think that if they could be induced to wash themselves or bathe after coming out of the mines they would be less liable to catch cold?—I hardly think that they would. I think that if they took off their wet clothes, and put on dry ones, and walked home in dry clothes, they would be tolerably safe; but I should say that walking home in wet clothes is decidedly bad.

20,820. (*Mr. St. Aubyn.*) You have spoken of the

men complaining to you that they have been obliged to work in places where the candle would not burn?—Yes.

20,821. Is that a frequent complaint?—Yes. I spoke to half a dozen different men a few days ago, in different parts of the district, and they said the same thing, that they had frequently worked where the candle would only just burn and give light.

20,822. Did they say that they were obliged to work in such places?—That they went on working.

20,823. Where the candle went out or where it burnt badly?—Where it scarcely gave any light.

20,824. Was this in the Halkin district?—Yes, Halkin and Ysceifiog.

20,825. Did you gather from what the men told you that the overlookers were aware of the fact?—Yes; but I believe that it is a custom of the country, and I do not believe that the men think much about it; they seem to look upon it as a thing to be done.

20,826. It is a common practice?—Yes, decidedly, from what I hear.

20,827. (*Mr. Leveson Gower.*) Do you know of any lead mine where those who are working in it are generally free from miners' disease?—No.

20,828. Is the disease alleviated or retarded by medical treatment?—It has not much effect upon it, I think, except that it alleviates an occasional attack sometimes. They are worse at times than at others; but the moment they get a little better they go back to their work, and they are just in the same plight.

20,829. In fact it is only cessation from work which relieves them?—Yes. I do not know of anything else which would cure it.

20,830. (*Mr. Kendall.*) I suppose that they are bad patients; they come very late, and if there is the least improvement they go to work again?—Yes.

20,831. They ought to come to you before, and when they do come they do not take care of themselves?—Yes.

20,832. (*Mr. Leveson Gower.*) Are their wages low?—The work is very precarious; I believe they average about 15*s.* per week; but sometimes they make more or less, according to their contract with their employers.

20,833. In the course of the year do not they get higher wages than the agriculturists?—Yes, I should say they do.

20,835. Are they an improvident set?—As a class I do not think that they are improvident; but only getting wages about once a month they have no notion, I think, of laying them out to the best advantage.

20,836. Are they generally sober?—As a class I don't think they are regularly intemperate. When they receive their monthly pay they may perhaps have a drinking bout; but I don't consider them systematically drunkards.

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20,838. Have you seen any improvement in that respect, or in their condition, since you first knew them?—I am told that they are improved in that and every other respect in the last 20 years.

20,839. (*Sir P. Grey Egerton.*) I think you have stated that consumption is not uncommon amongst the miners?—No; it frequently comes on.

20,840. Have you ever met with a case of true phthisis being a consequence of the miners' disease where the constitution of the man or of his family has not been of a phthisical diathesis?—I cannot call to mind any particular instance of that sort, and I should myself almost think that it would require a consumptive diathesis to develop the disease in a miner.

20,841. The mischief to the lung tissue in the miners' disease is not necessarily tuberculous?—Exactly; that is what I mean.

20,842. But it is rather an induration or hepatization of the lung?—It is an emphysematous state of the lung.

20,843. Have any of the cases which you have attended been complicated with the black expectoration?—I do not remember any well marked case.

20,844. Whence do you think that that colouring matter arises?—It is supposed to arise from the inhalation of smoke, coal-dust, or other carbonaceous matter.

20,845. Then if that be so, it is not peculiar to miners' asthma?—No, I do not consider it so at all.

20,846. Therefore the occupation of a miner does not render him more liable to the black sputa?—No, I should say not so liable as that of a collier or other workman more particularly exposed to smoke or coal dust.

Return of ages and causes of death of lead miners in the parishes of Holywell, Halkin, and Ysceifiog:—

Number of deaths from all causes - -	112
Proportion of deaths from diseases of lungs	76
Average ages at death, from all causes -	52
„ „ from diseases of lungs	50

The diseases of the lungs are nearly all of a chronic character,—asthma, chronic bronchitis, œdema, phthisis, &c. Not more than 6 out of the 76 are of an acute character.

The witness withdrew.

Adjourned to To-morrow at Rhyl.

RHYL.

Saturday, 18th July 1863.

PRESENT:

The Right Honourable Lord KINNAIRD, K.T.	NICHOLAS KENDALL, Esq., M.P.
Sir P. GREY EGERTON, Bart., M.P.	JOHN ST. AUBYN, Esq., M.P.
The Honourable E. F. LEVESON GOWER, M.P.	P. H. HOLLAND, Esq.

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

TALARGOCH MINE.

Captain WILLIAM BOWEN examined.

20,847. Of what mine have you charge?—Talargoch Mine.

20,848. Have you charge of any other mine?—No.

20,849. What is the ore of the Talargoch Mine?—Lead principally.

20,850. Is there much silver?—From 10 to 12 ounces in a ton, in some parts of it 7 or 8; there is also blende.

20,851. Do you meet with any other description of ore?—A little copper sometimes, but not to pay.

20,852. About how many men have you working under ground?—About 300.

20,853. Are there any boys among them?—No, we have none less than from 15 to 16 or 18.

20,854. How do the men ascend and descend?—By ladders.

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20,855. How many shafts have you to the service?—We have 12 shafts.

20,856. Do the whole of the workings communicate under ground?—Yes.

20,857. What is the deepest level at which you are are now working?—220 yards.

20,858. Are you sinking there still?—No, we have stopped for the present; we shall commence driving out. We are putting a lift down.

20,859. You are driving from the 220 yards?—Yes.

20,860. Are the men working mostly by tribute, or by tutwork?—They are getting ore by tribute, and doing the yard work by tutwork.

20,861. Do you know the proportion of men on those two descriptions of work?—Yes. I should think that about half are on yard work, and the other half on lead ore.

20,862. Is there much blasting?—A good deal in some places.

20,863. Have you any accidents from blasting?—None whatever; there was one man hurt here a good many years ago but there has been nothing in my time.

20,864. How many hours do the men work?—Six.

20,865. Do they relieve at the surface?—Very near the surface, they meet one another about half way.

20,866. So that they do not actually work the whole six hours?—No they do not work above five.

20,867. What allowance of candles have the men per week?—A pound and a half or two pounds, just according to the difficulties,

20,868. What are they charged for the candles?—Just according to the price of them; 7*d.* we charge them now I think.

20,869. And how much for powder?—About the same price.

20,870. Do the men live near here?—Some of them live close by, some live a good way off.

20,871. Have they any other work, agricultural or otherwise?—We do not allow them to work in mining elsewhere, but if they like to do something on the surface for their own good they are quite welcome to do it. We do not allow them to go under ground in any other place.

20,872. Do you know how the men employ themselves at home?—Some do nothing, and some attend to their gardens and just attend a little to their family affairs, nothing more; some will take a little job by which they get 4*d.* or 6*d.*, or half a day's work.

20,873. Where do the men change when they come to the surface?—In the cabins here.

20,874. Do they change in the boiler house?—No, we do not allow them to go there.

20,875. You have rules against it?—Yes, they are not allowed to go there unless sometimes their clothes are very wet, and they cannot dry them quick enough, and a man goes to lay them there and fetch them from there. We have a cabin here heated with pipes coming underneath the boiler.

20,876. Do they change their clothes when they come up?—Yes, in the cabins, but not in the engine house—they dare not go there.

20,877. Do those who reside near change at home, or do they still change in the cabins?—A great many of them go home to change, those who are close by; they prefer going home to stopping here.

20,878.—But they have an opportunity of changing here?—Yes.

20,879. What distance should you say that a man residing away from the mine would go without changing his clothes?—About five or ten minutes walk I should think, when they work in dry places; but when they work in wet places they change their clothes before they start from the place; some of them are as comfortable on coming up, after working six hours, and as dry, as I am now.

20,880. Is it a wet or a dry mine on the whole?—Very dry, except just the lower level.

20,881. You have printed rules?—Yes.

20,882. When the men are engaged how do they see the rules?—We share them out; we give one to each corps.

20,883. Are they in Welsh as well as in English?—Yes.

20,884. Is there any doctor belonging to the mine?—No, they choose their own doctor; they prefer choosing their own doctor; there have been three or four doctors attending here. We have a place on purpose for the doctors to attend.

20,885. Is there any deduction for payment of the doctor?—The men pay themselves, quarterly.

20,886. Who collects the money and manages that matter?—The doctors themselves. There was a great dissatisfaction amongst the men—one was for one doctor, and another for another, and the secretary who was here before this gentleman could make nothing of them about the doctor's money as there was so much grumbling altogether—we therefore gave it up, and left them to pay their own doctor.

20,887. Do they pay any club money, or is there any other deduction?—Nothing whatever, but I sometimes make a collection among the men in cases of necessity when somebody is very bad and very poor.

20,888. Do you find the men willing to assist when you apply to them?—Yes, sometimes they are very good; we have collected some 5*l.* 6*l.* and 8*l.* here.

20,889. Except for the materials no deductions are made.—Nothing whatever.

20,890. Is there a bill showing the deductions?—Yes, pay bills.

20,891. How often are the wages paid?—Monthly.

20,892. How much do you keep in hand?—Our settling day terminates on the last Saturday in the month, and we pay them on the first Saturday after the second Thursday in the month. The sale of ore is on the second Thursday.

20,893. They are paid within a fortnight?—Yes, and sometimes less, and sometimes more; it is just according to how the month terminates.

20,894. In the bill which you have produced the doctor is printed?—Yes, but nothing is charged.

20,895. This is an old form?—Yes, we leave what we like out of it.

20,896. Do you pay in notes or gold or silver?—In silver and copper as much as we can for the convenience of the men, to save their going to the public houses, but in notes for tradesmen and so on. We mostly pay the men in gold and silver.

20,897. You think that that is a good plan?—Yes, the men settle on the surface, and it saves their going to the public houses.

20,898. (*Mr. Kendall.*) With regard to the men's houses, are they well accommodated in those houses or not?—They are very good, especially some of them, I think that on an average the houses are very good here.

20,899. Do they sleep two or three in a room, or how?—The whole family will sleep in two rooms, most of the houses have only two rooms.

20,900. Where do the unmarried miners lodge?—At home with their friends; I do not think that there are half a dozen lodging men in the place.

20,901. Most of the men who work in these mines are men who have worked here for a very long time or whose relations have worked here?—Yes.

20,902. They do not shift about much?—No, very seldom, and if they do they very soon come back.

20,903. What do you allow them to earn during the month?—15*s.* a week is our average rate, but they have been getting up as high as 100*l.* in a month. We let it at so much a ton. We say "You shall have 5*l.*, 6*l.*, 7*l.*, and 8*l.* a ton, and you may get as much as you like."

20,904. They sometimes get into a bunch?—Yes.

20,905. Taking the average do you think that they get more than 3*l.* a month per man?—Yes, it will do more than that all the year round.

20,906. Are the men here provident and sober, do they save money?—Many of them have saved a good deal of money.

20,907. Do they put it in the savings bank?—Yes; they have bought ground.

20,908. And have built houses?—Yes, several have gone very large farmers from here.

20,909. You have worked yourself in several mines; upon the whole were they better or worse ventilated than this one?—This is one of the best that I was ever in, this and Maes-y-safn Mine—it is now under the management of Mr. John Taylor, — the Maes-y-safn Mine and this are the two best ventilated mines I was ever in.

20,910. When you get near the coal here, have you not some gases sometimes?—Yes, there is some gas at the western end it smells a little obnoxious in this level, but the other part of the mine is quite sweet.

20,911. Do the men complain much of it?—Sometimes when it happens to come very strong.

20,912. Do they leave work or no?—No they get air; we drive and sink sumpts to get air on the levels.

20,913. Before you completely get a thorough draught of course they must suffer for some time; how do you manage then?—They cannot suffer but very little.

20,914. Why?—Because we have pipes and water falls.

20,915. When you find the air becoming close you have recourse to fans or water jets?—Yes.

20,916. Which do you use most?—We prefer water as it is more regular.

20,917. Taking an end where there is no gas, and an end where there is gas, how far in the end where there is no gas do you generally drive without having recourse to a water fall?—30, 40, 60 or 100 yards.

20,918. Do you find that you can go as much as 40 and 50 and 60 yards without inconvenience?—In some places you may go to 100 yards, and in another place you could not go 40 yards.

20,919. Can you account for the difference?—I cannot.

20,920. Can you go as far in shale as you can in lime?—No.

20,921. The moment you find that there is the least close air from whatever it may arise you at once have these appliances?—As quickly as possible always, we make a preparation for it before they have to complain.

20,922. How do you ascertain when it is close; what makes you find it out?—It will begin to feel warm and get more difficult; the candle will show in a moment if it is not good.

20,923. Is the candle your principal guide?—That and the smell; you can tell by the smell in a moment.

20,924. That is where there is gas?—Yes; and before there is gas, if the air is getting short you can tell by the smell as well as anything.

20,925. There is a closeness?—Yes.

20,926. Can you tell by the smell before the candle will guide you?—Yes; the smell will be unpleasant.

20,927. And injurious?—There is no doubt about that.

20,928. You can tell the smell when there is no gas?—Yes.

20,929. You also of course can tell it when there is gas; that is another kind of smell?—Yes. I could not tell the difference by the smell of fire-damp gas. I could not tell that it was fire-damp gas or what gas it was, but I should know that there was some kind of gas which ought not to be there.

20,930. You cannot distinguish between the different gases, but you are satisfied in your own mind that there is a certain gas there which is injurious?—Yes.

20,931. But apart from all these gases you think that in some parts of the east end where there are no gases you can distinguish before the candle will show that there is close air?—Yes.

20,932. You cannot describe what sort of smell it is?—No, it is impossible.

20,933. But it is a peculiar smell?—Yes.

20,934. You do not smell anything like it above ground?—No.

20,935. When you are talking of the close air which you can smell, does that arise from powder blast?—No, it may be in a place where you do not use powder at all, but as for the powder smoke I do not mind so much about that, that is not so injurious as the bad air; any person can tell when he gets into a fore-breast if it is beginning to get a little close, and especially if he is accustomed to go down.

20,936. (*Mr. Leveson Gower.*) He can tell from the smell and not from the difficulty of breathing?—It is not from the difficulty of breathing, for I have been working myself and I have been three or four months before we had any apparatus to blow, in mines where I have been in. I have told the captain, "There is beginning to get a little smell, we shall be short of air very soon." He has said, "We will make preparations and have air quickly."

20,937. (*Mr. Kendall.*) As I understand, the moment you anticipate any difficulty at all with regard to air you have your appliances all ready?—Yes.

20,938. Are those appliances expensive or not?—Sometimes they are very expensive.

20,939. Take your 140 yards level; supposing you are near a shaft, and you want to put an apparatus near the shaft, and want to blow 40 yards, what will it cost you?—It will take from 30*l.* to 40*l.*, I have no doubt, with timber and sawing and nails, and putting them in their places, and everything. It is just according to the size that you make the pipes. For 40 yards only it would not cost so much as that, but you would get three or four baulks, and cut them up to make air pipes. It is according to the size and thickness and strength of the air pipes. You would get very little timber for 15*l.* or 16*l.*, and then there is the trouble of sawing them, and measuring them, and putting them up in their places. They will not go very far.

20,940. Will it cost from 25*l.* to 30*l.*?—No, I should think not. All the timber would not go for that purpose. The cost would be reduced by using them in other places.

20,941. The cost would be reduced, inasmuch as when a communication was made, you could apply the wood for other purposes?—Yes.

20,942. The actual fan itself, and I suppose the box for the water jet, and so on, could be conveyed elsewhere?—Yes.

20,943. Do you ever use zinc instead of wood?—No, we have had no zinc here. We did not get the pipes large enough. We had some four-inch pipes; but we have been taking them away, and putting in some eight-inch pipes.

20,944. You think that an eight or ten inch square wooden soller or pipe is better than a four-inch iron pipe?—Yes, better than three four-inch iron pipes. Iron pipes would be better, if you had a great pressure of air to force upon them, on account of their strength; but if you want air to go quickly with a slight pressure, the larger the pipe the better.

20,945. (*Mr. St. Aubyn.*) What is the general condition of the miners in this mine as regards their health?—Their health is very good.

20,946. Do any of them suffer from what is called miners' asthma?—Very few. There is only one that I know of who has left the mine for the last six years, and he is a very old man. His name is David Morgan. He has worked in the mine for a number of years.

20,947. He is the only man who has left the mine, since you have been here, on account of bad health?—Yes.

20,948. Have you any old men working on the mine?—Yes.

20,949. Have you many?—Yes.

20,950. Above 60 years of age?—Yes.

20,951. How many have you upwards of 60?—We have one 77 years of age. He is at home now. He had a slip, and hurt himself a little, or he would have been here.

20,952. Up to what age do they generally work in this mine?—They work up to 60 and 70.

20,953. As a rule?—There are some as old as that.

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20,954. As a rule, speaking roughly, if a man comes here to work when he is 18 or 20, how long will he continue to work?—He will work here for 40 years.

20,955. The mine, speaking generally, is very well ventilated?—Very well. I can safely say that it will be the best in England if we have a cross driven south; that is the only difficult place which there is, it will be through in a very short time.

20,956. (*Chairman.*) When you meet with gas how does it affect the men?—It is a little sharp on the eye, the same as if you were peeling onions or something of that kind.

20,957. (*Mr. Leveson Gower.*) Is the candle ever affected from bad air without your perceiving any smell at all?—We perceive the smell before it shows upon the candle.

20,958. You always do so?—Yes; unless it is from a man's carelessness that he does not take notice of it, it is plain enough to be observed.

20,959. Is the candle ever effected by bad air without your perceiving any difference in the smell?—No I have never had it so; it is impossible that the air can be good in every place although the candle burns.

20,960. (*Mr. Kendall.*) Did you ever see the candle burning badly without your smelling at the same time that the air was bad?—No.

20,961. (*Mr. Leveson Gower.*) Then the candle is of no use as showing the badness of the air because you can always smell it without?—You can smell the commencement of it before it takes effect upon the candle. I have worked in several places where the air has been very bad, and the candle would burn very well, and we could do our work very well.

20,962. (*Mr. Holland.*) Is your mine pretty free from dust?—Yes, where it is a little damp, but where it is dry there is sure to be dust.

20,963. Is the dust chiefly in the limestone rock?—Not so much; by boring there is a little dust, but we put water in to cure the dust.

20,964. Then the men are not much annoyed by dust?—No, very little.

20,965. Do the men work much in chert here, is there much chert?—A little at the east end.

20,966. Are they annoyed by dust there?—About the same as in the limestone, because they use water there too, and as you get a little deeper in the ground, there is a little dampness, so that the dust cannot fly about.

20,967. Is the water quite effectual in keeping down the dust of the chert?—Yes, if you get water in the hole you will have no dust, unless it is a hole in the roof, and there you cannot get any water in, you must chance that.

20,968. (*Sir P. Grey Egerton.*) Are your rules and regulations strictly enforced?—We do not enforce them very strictly; we do not press upon the men too hardly; as long as they will behave themselves and attend to their work, we very seldom interfere with them; we ask them to come and do a proper day's work, and they do as they like.

20,969. When you do enforce the rules, what means do you take for that purpose—by fines or dismissal?—We very seldom make them pay; and if we do we keep it just to pay the doctor, or something of that sort.

20,970. I see that for certain transgressions there are fines enforced?—Yes.

20,971. How do you apply that money?—We have never had any money for anything except for drinking—a few half crowns—and then we pay it over to the doctor, or give it to some of the men who are sick or have been crippled in the mine, and so on, if they are poor.

20,972. I see that by the first rule the men are obliged to relieve one another at their place of work?—Yes, but they do not do it.

20,973. That rule is not enforced?—No, nothing to compare to it.

20,974. I see that by another rule there is a fine of 2*s.* 6*d.* for any man drying his clothes in the engine or boiler house; is that rule enforced?—Yes; but we have had no occasion to enforce it; they dare not go there, for if they did go they would be in danger, worse than the fine, of losing their work.

20,975. In fact these rules and regulations are rather to frighten the men?—Yes, we seldom fine them for anything, we only give them a good scolding and let them go.

20,976. As the men are not allowed to change their clothes in the boiler or engine-house, have you any means provided, by which they can dry their clothes?—Yes, we have a flue coming underground, and there is a damper to make it hotter or otherwise, as is necessary.

20,977. And you find that sufficient, so that the men find their clothes perfectly dry on coming up?—Yes.

20,978. Have you any water for the men to wash in?—They will not do it; we have provided a very good bath for the men, but not one of them will go into it.

20,979. (*Mr. Holland.*) Are your men as well lodged as the farm labourers in the district?—Better ten times over.

20,980. And they are not more crowded?—No, not so much I think, taking it in the long run.

20,981. Which get the best earnings, farm labourers or miners?—Miners.

20,982. Very much the best?—Yes, a great deal.

20,983. Are your men as healthy looking as the farm labourers of the district?—Yes, and better by half than one half of them, and the miners have less difficulty of breathing at this moment, taking them in the long run and taking the farmer labourers. I am quite sure that if you picked 800 men, or any number of men about the district, you would find the miners with better chests.

20,984. (*Mr. St. Aubyn.*) Take the case of a man who has been 20 years in the mine and a man who has been 20 years an agricultural labourer in this district, you say that the man who has been 20 years in the mine will be less subject to chest disease than the agricultural labourer?—Yes, I have no doubt of it, that with the farmers the men have more difficulty of breathing than in this mine.

20,985. (*Mr. Leveson Gower.*) About what are the wages of the agricultural labourers?—7*s.* a week and their meat; some get 10*s.* and some 11*s.*, and find themselves; we give 12*s.* to labourers, and to strong boys we give 10*s.* and 11*s.* and 12*s.* a week, and when they get to be 16 or 17 years of age we put them down.

20,986. Then are the miners better fed than the agricultural labourers?—I cannot say that, because there is a difference in the food; there is no doubt that the farmers servants food is good and strong, but they do not live the same—farmers servants eat butter and cheese, the miners are more for tea and milk and things of that sort.

20,987. (*Sir P. Grey Egerton.*) You have stated that your artificial ventilation is by means either of fans or of water falls?—Yes, when it is required, but it is very seldom required.

20,988. But when you use artificial ventilation, you use either fans or water falls?—Yes.

20,989. Do you find that very expensive?—The water falls are not so very expensive, there is only the expense of making the air pipes.

20,990. Did you ever try ventilation by means of a furnace?—No, we could not get it to act here.

20,991. Why do you think it would not act?—Because it is not like a colliery, the air would be tumbling up and down first one way and then another, and perhaps it would kill all the men in the mine.

20,992. Is the upcast always upcast and the downcast always downcast?—No, it changes perhaps six or eight times in a day sometimes.

20,993. Then according to that a furnace would not be more variable in its action than your present ventilation?—I do not think that a furnace would act at all unless we had only two shafts to keep the current regular.

20,994. You have never tried it, at all events?—No, we never had any occasion to try it.

The witness withdrew.

Adjourned to Monday next at Llanrwst.

LLANRWST.

Monday, 20th July 1863.

PRESENT:

Sir P. Grey Egerton, Bart., M.P.
The Hon. E. F. Leveson Gower, M.P.
Nicholas Kendall, Esq., M.P.
John St. Aubyn, Esq., M.P.
P. H. Holland, Esq.

NICHOLAS KENDALL, Esq., M.P., in the Chair.

COED MAWR POOL MINE.

Mr. Edwin Aspinall Beech, of Gwydyr Ucha, Llanrwst, examined.

20,995. (*Chairman.*) This mine is on the property of Lord Willoughby ?—Yes.

20,996. And you are Lord Willoughby's agent ?—I am.

20,997. You do not interfere at all with the mining operations here ?—Not at all.

20,998. Saving granting sets ?—Just so.

20,999. Is this the largest mine on his lordship's property ?—It is.

21,000. What are the royalties ?—One tenth.

21,001. What is the term of the lease ?—21 years

21,002. Have you any other leases of mines besides these ?—Yes; and of quarries.

21,003. Slate quarries ?—Slate quarries and sulphur mines. We have a very fine sulphur mine on the estate.

21,004. That is from iron pyrites ?—Yes; it contains about 40 per cent. of iron.

21,005. Is that a sulphur mine or a sulphur quarry?—A sulphur mine.

21,006. What are the royalties there ?—2*s.* 6*d.* a ton.

21,007. Besides that, have you other mines let to poor men ?—Yes.

21,008. On what terms do you let to poor men ?—Exactly the same as we do to others.

21,009. For one tenth ?—Yes.

21,010. But not so long a lease ?—Yes; we give them a lease of 20 or 21 years, I forget which. We first of all give them a take-note of three years, and at the expiration of three years they are at liberty to take a lease or abandon the works.

21,011. How many have taken leases after they have had take-notes in the last 12 takes; half ?—More than half.

21,012. How long have you been agent here ?—I have been here about seven years.

21,013. From what you have learned, and from what you have known by your own experience, do you think that the letting of these small mines is advantageous or disadvantageous to the possessor of the soil ?—I think that it is a great disadvantage to the possessor of the soil.

21,014. Why do you think that it is a disadvantage ?—I think that the workings are spoilt by small takes, and having small miners—nothing but labouring men—working them. They have not the means of working them properly, and they grub the lead from the surface, and spoil the workings for large companies when they come in.

21,015. You do not think that they are pioneers for large companies, and make discoveries for them ?—They do in some measure.

21,016. Supposing that a poor man were to make a discovery, how would you manage unless you did give him a take-note ?—I cannot say, but I think he ought to be protected in some way.

21,017. But nothing of that kind has occurred as yet ?—No.

21,018. That is the system which you would recommend ?—Yes.

21,019. You do not speak as to the working of the mines at all ?—No.

21,020. Can you speak as to the health of the miners in the neighbourhood ?—I think that they are generally very healthy.

1,021. Do you mix up with their clubs at all ?—No.

21,022. Or their schools ?—We have three schools on the estate, but I do not interfere with them.

21,023. After a grant is made by you, whether to wealthy lessees or to poor men, the thing is out of your hands ?—No, it is not exactly out of my hands; we have a mine inspector, who visits the mines monthly, and he sends the reports in to me.

21,024. What is the object of the mining inspector; is it to see as to the ventilation, or to see as to the proper working of the mine as far as the lord is concerned ?—He looks to the royalty and the working, and reports the quantity of men employed in each mine. We take account of a mine which stops, and give notice to the lessees.

21,025. Supposing the men were working where there was bad ventilation, you would not interfere with it ?—No. We never have any complaint as to ventilation.

21,026. Then all that you look to is the royalty ?—Yes.

21,027. The object with you is money ?—Certainly.

21,028. And, provided a good royalty is paid, that is all you care about ?—Certainly.

21,029. (*Mr. Holland.*) Do you know the miners pretty well ?—I know many of them.

21,030. Are they a well conducted and steady class of men ?—Very.

21,031. Are they as well clothed and as well fed as the agricultural labourers ?—Decidedly better fed and better clothed.

21,032. Are they in the habit of having a drinking bout when they get their money pay ?—Very few of them; as a rule it is not so; they are very steady.

The witness withdrew.

Captain Matthew Wasley, of Coed Mawr Pool Mine, examined.

21,033. (*Chairman.*) You are the head agent of this mine ?—Yes.

21,034. Is it a limited liability company or not ?—Limited liability.

21,035. How long have you been agent here ?—Six years last June.

21,036. When you began this mine was it a new mine, or did you resume old workings ?—Old workings.

21,037. How old were the workings ?—I do not know. It appears that it had been worked, some say, in the days of the Romans; but this company, I believe, have had it somewhere about 11 or 12 years now.

21,038. When you came here how deep was the mine ?—The deepest level was about 25 fathoms from the surface at one place.

21,039. Have you any adit level ?—No.

21,040. How deep are you now ?—We are down more than that. There was only one part which was that depth; but the general bottom level was 15 fathoms from the surface.

21,041. What is the extent of the 15 fathoms level ?—There are different shafts, and it is from 15 to 20 fathoms each way from each ventilating shaft.

21,042. How many shafts have you ?—We have several shafts.

LLANRWST.

Capt. M. Wasley.

20 July 1863.

21,043. When you came here was the ventilation good?—No.

21,044. Where was it bad?—It was bad at the shaft called No. 2, and they went to the 15 fathoms and extended the levels, and there was only one shaft.

21,045. How far did they extend the 15 fathoms from that shaft?—About 30 or 40 fathoms.

20,046. Had they any jet of water or any air pipes at all?—No, there was no jet of water then.

21,047. Did you ascertain at that time that there never had been any use at all of jets or fans?—They had fans; we have the same fans here now.

21,048. After you came here you soon had a communication?—Yes; we had a shaft sunk from the surface.

21,049. At once?—Yes.

21,050. From that time to this have you had any bad air?—No; the air is very good.

21,051. What is the furthest end?—The 28 fathoms is our bottom level.

21,052. Are you driving from a sumpt shaft?—Yes. We are not two fathoms off from a winze.

21,053. How far are you off from a shaft?—About 10 or 12 fathoms. We are driving a cross cut from the engine shaft about seven fathoms. We cut the lode and we put a winze on the course of the lode; that is just as we came in.

21,054. So that there was no loss of time in getting good ventilation?—No. We prepared it all the way.

21,055. What size is your vein generally?—It varies from five or six inches to two or three feet sometimes.

21,056. Are these openings made by veins coming across, by feeders, or how?—There is generally a change in the strata.

21,057. What sort of country are you in now?—On the top, we have in some places a chert, or a trap rock, as some call it. In Cornwall it is called clay slate or capel, but here and in the lead districts it is called trap rock or chert. Then we have the elvin vein.

21,058. How wide is the elvin vein?—About 150 fathoms wide.

21,059. When it gets into the elvin vein how does it make?—It becomes more refined. There are bunches of ore; there is very little sulphur in the lode when you get into the elvin vein.

21,060. What is the produce in the elvin vein, compared with the other?—We have had some very good bunches in the trap rock, but the elvin vein is better; the ore is more refined, and a better produce.

21,061. What is the relative produce of the two?—That depends upon the market; we have made as much as 18*l.* of the elvin vein.

21,062. That is the price, but what per cent. of metal will there be?—I do not know that I can name the contrast between the two.

21,063. You are perfectly satisfied that your ventilation is good from beginning to end?—Quite so.

21,064. What number of men have you working under ground?—We have at present about 14 here.

21,065. How do you keep your water generally; by water wheel or by steam?—By lakes in the mountains.

21,066. You collect water when there is rain?—Yes.

21,067. And you have large reservoirs?—Yes.

21,068. I suppose the reservoirs now are pretty empty?—Yes.

21,069. How much water have you in the bottom?—About 20 fathoms of water.

21,070. What was the size of your lode in the bottom level when you left off?—About three feet wide.

21,071. How many tons of ore would it turn out?—About one ton to the fathom when we left off.

21,072. Have you any means of driving in from the valley, so as to tap the whole of the water underneath?—Yes. It might go out to the Bettws river; there are two palces; one at the south, and the other at the west.

21,073. Would that not be the way to work?—Yes.

21,074. But it would cost money?—It would certainly cost money, but it would drain all the property of the hills for miles round. We are draining the mines for miles round.

21,075. How much do you allow your miners to get a month?—About 3*l.* 6*s.*, 3*l.* 5*s.*, 3*l.* 4*s.*, and so on.

21,076. Are they mostly married men, or single?—A great many are married men.

21,077. Have they a club?—No.

21,078. They go to the doctor when they like?—Yes.

21,079. What is their health generally?—Pretty good.

21,080. Are they at all consumptive?—No.

21,081. Are you a Cornish man?—Yes.

21,082. Have you worked in Cornish mines?—Yes, nearly 300 fathoms deep.

21,083. In what mines have you worked there?—The Great Consols in Gwennap.

21,084. You have seen the hot mines?—Yes.

21,085. Did you suffer much yourself?—No; I was generally a tributer, and did not work in close ends.

21,086. Do you know any other mine in Wales besides this?—I never visited any mines in Wales but this.

21,087. Which are the healthiest men, the miners in Cornwall, or the miners here?—The miners here, because the mines are more shallow.

21,088. Taking a mine as shallow in Cornwall as here, which is the healthiest?—In Cornwall the adits are generally as deep as the mines are here.

21,089. Do you think that there is any other reason besides being a shallow mine why the men are healthier here?—It is possible to have a bad mine shallow as well as deep.

21,090. Do you think that there is any other reason besides being a shallow mine why the miners are healthier here than in Cornwall?—They are very steady in their habits; they are the most steady set of men that I ever came across. I have spent many years in Ireland and in Cornwall; but the men here are the steadiest men I ever met with, and the most honest men in their work, and in every shape and form.

21,091. They do not drink much?—No. I do not know that we have one drinking man in the mine. We have had 30 or 40 men in the mine, and I do not know that we ever had two drinking men who continued to work six months in the mine.

21,092. Are they lodged well?—Pretty fair. They live very convenient to this place. Generally speaking they are from this neighbourhood.

21,093. Do many of them sleep in the same room, or not?—I think not. They are generally distributed about on this property, or convenient to the place.

21,094. What is the largest amount of ore in the month that you have ever sold here?—About 20 tons a month.

21,095. How much do you sell to pay cost?—It would pay cost, and a little over.

21,096. (*Sir P. Grey Egerton.*) Are the men in the habit of changing their clothes when they come to the surface, or do they walk home in their mining clothes?—A great many of them who work in dry places walk home in their clothes.

21,097. Have you any place for them to dry their clothes?—Yes; and we keep a boy to watch the clothes.

21,098. Is the place heated?—Yes.

21,099. How many hands have you underground now?—We have about 14 now. When the water is out we have 20 to 25 and 30, and with those on the surface 40 to 50.

21,100. At what age do you take them underground?—There are no small boys working underground like there are in the West of England; they are generally men.

21,101. (*Mr. Holland.*) At what age do they begin?—I do not know that we have one less than 16 or 17 years of age. The reason, generally speaking, is, that they work more single-handed; in Cornwall they work more double-handed.

21,102. (*Sir P. Grey Egerton.*) Is it all blasting?—Not all, but there is only pretty fair blasting, it is

middling peaceable ground; it is, generally speaking, not high price ground, but low price ground.

21,103. Does much dust fly?—Not a great deal, because it is more of a damp nature.

21,104. Do you use water?—We use water in boring.

21,105. Do they bore single-handed?—Yes, generally speaking.

21,106. How long are your shifts?—Eight hours.

21,107. And how many?—In some places three corps, and in some places not more than two, and in some places not more than one.

21,108. Do they shift on the surface or below?—On the surface; but one place up and down is so shallow that they can get up and arrange their tools. It is not like the deep mines; they arrange their business to converse with each other about their future working.

21,109. Have you room in your ends for two men to work single-handed?—Seldom. They do work sometimes two, but where I speak of working single is in the stopeing ground, and not in the drivings.

21,110. Then in some places you work double?—Yes, where there is a wet driving, or a hard cross cut; we are driving a cross cut here where there are two men.

21,111. (*Mr. Leveson Gower.*) I understood you to say that the ventilation is better now than it was when you came here?—It is better, now that we have two shafts open, than when I came. I believe that the reason why they worked so contracted in their shafts was that this was a lake of water some years ago, and they went to a great expense previously to my coming here, and let the water off that lake. That is supposed to be the reason why they were so contracted in their shafts and openings. They were almost afraid to open anywhere previously to letting off the water from the lake.

21,112. Do you see any improvement in the health of the men, since you have been here, from improved ventilation?—When I went underground they were stopeing in the roof at the 15 fathoms; they were down to the 15 fathoms, and I thought that the air seemed rather of a sleepy and stupid nature. I said, "Where is your ventilation?" and they pointed out to me what they were doing in order to arrive at a certain point of ventilation. That was in Mr. Plumer's day; he was about to leave. I came in June; in July we sank a shaft which give us ventilation, and we put a footway. I came here on the 2d of June, and early in July we had a new shaft sunk from the surface, which gave new ventilation. That is all I know about the matter relative to the air being close. If that state of things had continued they would have been unhealthy of course. The men were looking rather stupid in the eyes; I know what bad air is, I can smell it.

21,113. Do you know anything about the state of the ventilation in the smaller mines in the neighbaurhood?—No. I work at another mine and our ventilation is good there. We are in about 15 fathoms, that is all at present, and another shaft is coming down from the surface now for ventilation.

21,114. You do not know of any case of bad ventilation in the neighbourhood?—I do not know any that I can name.

21,115. (*Chairman.*) You say that you can smell the bad air. Can you, from your experience as a miner, which I have no doubt is very great, smell bad air before the candle begins to flicker and to burn dull?—Yes. A practical man can smell the air, and tell that it is injurious.

21,116. Before the candle begins to show it?—Yes. A man will live for many hours where a candle will not live at all; a man can work in the dark.

21,117. Did you ever work in the dark yourself?—A little.

21,118. Upon a good pitch?—Upon a good pitch.

21,119. When you were a tributer, whenever you found the candle failing have you been so anxious to work that you have worked beyond your candle?—Yes. I have kept the candle behind. I have let it incline till it would run itself quite out, and then of course you must give up.

21,120. You felt that the air was very bad?—Yes. You can smell it and feel it.

20,121. How often have you done that in your lifetime?—Not much.

21,122. It is dangerous work?—It is very dangerous work, and I have done very little of it. I always fly from hot places.

21,123. (*Mr. Holland.*) Could you work fairly in such air as that?—No.

21,124. Could you do half work?—No.

21,125. (*Mr. St. Aubyn.*) Do you ever find the candle burn badly here?—No, except it is in a particular place, just before you hole a piece of ground, but not to continue. Our general working is in good air, the place being so shallow, we only being 28 fathoms down from the surface.

21,126. Generally speaking you, can always hold the candle upright?—Yes.

21,127. Are there any old men working here?—At present we have not many old men in the mine; we have one here between 50 and 60 years of age.

21,128. Up to what age do they generally work in this neighbourhood?—I do not know much about that.

21,129. Older than they do in Cornwall?—Yes, I suppose they do, generally speaking.

21,130. To what do you ascribe that; better ventilation?—To the mines not being so deep, and not so distressing to the lungs climbing up. They dwell more convenient to the mines here; they have not so far to walk, and the mines are not so deep, and there are many things.

21,131. There is better ventilation, and not so much climbing?—Yes. Climbing is very distressing; I have found it so.

21,132. (*Mr. Holland.*) What ventilating machines have you used here?—The fan and wooden pipes.

21,133. And a duck engine?—Yes, we have that now.

21,134. And a water blast?—We had a water fall for a little while over at the engine, and it worked very well; and we had a duck machine, or rather a large piston, which worked with the engine.

21,135. Which did you like best?—The piston with the engine worked very well, but there is nothing to beat the water blast.

21,136. Did you put in the ventilating machine before you wanted air to make the candles burn?—Yes. In fact we were aware that we must have it sooner or later.

21,137. Do you put it in before the candles show a want of air?—There may be a dullness in the smoke leaving the place after a blast. There seems to be a kind of cloud in the blast, and then we use it because the peat and clay lies very heavy in this valley. When we found the smoke to lie, though the candle burnt pretty fair we put in this piston with the engine.

21,138. Then before you wanted it to make the candles burn you put it in to clear away the smoke?—Yes.

21,139. Do you perceive the bad air take the strength out of you before the candles show it?—Yes; it will take the strength out of any person; a man will lose the power of his body before the candle shows it.

The witness withdrew.

Adjourned to To-morrow at Parys Mine.

ANGLESEA.

Tuesday, 21st July 1863.

PRESENT :

The Right Hon. Lord KINNAIRD, K.T.	NICHOLAS KENDALL, Esq., M.P.
Sir P. GREY EGERTON, Bart., M.P.	JOHN ST. AUBYN, Esq., M.P.
The Hon. E. F. LEVESON GOWER, M.P.	P. H. HOLLAND, Esq.

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

PARYS MINE.

Captain WILLIAM VIVIAN, of Parys Mine, examined.

ANGLESEA.

Capt. W. Vivian.

21 July 1863.

21,140. (*Chairman.*) What is the name of the mine of which you have charge?—The Parys Mine.

21,141. What is the produce?—Copper.

21,142. How many men have you working underground?—About 230.

21,143. Are there many boys?—There are about 20 boys below surface.

21,144. What work do the boys do there?—They sometimes bore and blast, that is to say, they assist the men to do so, and they remove the ore and do such like general work as an assistance to the men; they are not very small boys.

21,145. What is the age of the youngest?—I should think they are about from 14 or 15 to 18.

21,146. Do the men ascend and descend by ladders?—Yes, by ladders and steps; ladders generally. Where it is very flat we have steps like stairs.

21,147. Where you are principally working, are you now driving or sinking?—We are more sinking immediately now; we have been sinking a shaft up to the present time, and we are preparing to sink again. We have sunk 24 fathoms since this company has been on, which is three and a half years.

21,148. What is the greatest depth?—124 fathoms from the surface.

21,149. At what shaft?—Gwen shaft.

21,150. How many men have you working there now?—There are nine men engaged in the shaft; they are now stripping down the lode in the last sinking, and as soon as that is done we shall put them to sink again.

21,151. Do the men work eight hours shifts?—Yes; that is our general arrangement. Where we want to press them very fast we work six hours only.

21,152. And they work night shifts?—Yes.

21,153. Where are your other principal workings?—Extending the bottom levels east and west from Gwen, and sinking the winzes from the 112 to the 124 fathoms levels, and such like general operations; that is tut work. Then we have stopes working at per fathom.

21,154. Do you use any artificial means of ventilation?—Occasionally, but not at present. We use a fan machine, if in sinking a winze or sump the air is not as it should be; but I do not know that there is one at present in operation in the mine.

21,155. Is it a wet mine at all?—No, it is comparatively dry; it is the dryest mine I have ever seen for the depth.

21,156. Do the men change when they come to the surface, or do they go home?—They go home to their houses.

21,157. Have they any means of changing here if they wished it?—There never has been such a provision in this mine, and we should have entirely to change the system to introduce it. Welshmen, living as they do within a very short distance and the mine being dry, always prefer changing in their cottages.

21,158. Do the miners generally reside near the mine?—I suppose the greater number are within a mile; I should think that two-thirds of the miners are within a mile. I do not know any extreme distances which would go beyond two miles.

21,159. What quantity of candles are the men allowed per week?—Two pounds per man we reckon to be about the thing.

21,160. What do they pay for them?—8*d.* a lb. is the nominal price.

21,161. And the same for powder?—Yes.

21,162. Have the men any club?—Yes; I believe there is a general system of friendly societies among them.

21,163. But is there any club belonging to the mine?—Yes.

21,164. What do the men pay to it?—6*d.* a month for doctor and club; we are obliged to be very economical; but that is all that we take out of their wages. The account of the club is scarcely thriving at present. We are obliged to borrow a little from the mine company; but we hope to make it make it pay at 6*d.* a month.

21,165. You keep a separate account?—Yes, and then when any accident occurs to injure a man, he has 5*s.* a week from that club.

21,166. Is the doctor appointed by the owners of the mine?—Yes, with the general consent of the men.

21,167. So that if the men objected to the doctor the owners would take it into consideration?—Of course they would. It is our object always to conciliate and to do the best for the men in that respect and to meet their wishes as far as practicable.

21,168. What are the earnings of the men?—I was looking over the books this morning. I am sorry that Mr. Williams, the purser, is not present; he has not shown the average for the last two months; but for the four months previous the earnings have been from 12*s.* to 15*s.* a week. I should think about 13*s.* 6*d.* or 14*s.* would be the average.

21,169. Do you keep a month in hand?—A fortnight; the pay is always a fortnight after the taking expires.

21,170. Do you pay in notes or in gold and silver?—Always in gold and silver.

21,171. So that the men can divide it amongst them?—Yes; they have the opportunity, and many of them do divide on the mine.

21,172. Are any women employed in the mine?—Yes, in dressing.

21,173. What are their wages?—Their wages, according to age, range from 5*d.* to 10*d.* a day.

21,174. Are they generally married or single women?—I do not know that there is a married woman on the mine.

21,175. Is there any place where they have their meals?—Yes; on each department floor there is a cottage: a sampling house is one place; they go in when they require shelter if they please.

21,176. There is no one to attend to the cooking of their meals?—No; there is no matron.

21,177. (*Mr. Kendall.*) How young do you employ the women?—There are scarcely any females under 18 years of age, and they are from that up to 20 and 25.

21,178. Do you find them very difficult to manage?—No; they are very tractable. There was the large number of 150 when we came here.

21,179. (*Mr. Holland.*) Do you consider yours a well-ventilated mine?—Yes, exceedingly well ventilated.

21,180. Have you any place where the candles will

not burn freely ?—No, I do not know any ; there was one end rather close but the candles would burn upright there.

21,181. How long does the powder smoke hang there ?—It may be for an hour or two after a blast.

21,182. Is it very unusual for it to hang as long as that ?—No ; that is about what it generally is. It does not clear off unless it is well ventilated by a winze, it will then clear off in a few minutes.

21,183. Is it general in many parts of the mine for powder smoke to hang as long as an hour ?—No, that was a long distance from a winze.

21,184. It was an exceptional case ?—Yes.

21,185. Is any part of the mine very dusty ?—No, I do not think that there is anything of that sort to complain of.

21,186. Do you think that the men suffer from dust at all ?—I do not know that they do ; nothing to any great extent ; the ground is moist enough to prevent making dust though it is comparatively dry as regards engine power pumping.

21,187. (*Mr. Kendall.*) At the 112 fathoms level going from Gwen shaft towards Dyer's shaft, going east, you must have had about 35 fathoms before you made any communication ?—Yes ; we had.

21,188. Did you use any artificial means of ventilation there ?—No artificial means whatever, but we had a very large level ; we have very fine levels.

21,189. What is the size of your levels ?—Nominally 7 feet by 5 feet ; but I believe they are more than that generally.

21,190. Have you any brattice of any kind ?—No.

21,191. You have nothing but the simple level ?—Just so.

21,192. And you only find inconvenience in blasting ?—Yes ; that level is communicated now.

21,193. How many men have you working in that end ?—Six.

21,194. Do they relieve every eight hours ?—Yes.

21,195. Do they relieve in place ?—Nominally.

21,196. Do the candles always burn well there ?—Yes.

21,197. The men never complain ?—I never heard them do so. The only difficulty in ventilation in this mine is during a few days in the most sultry weather in the summer ; there is a peculiarity about that, and it has occurred since Lord Kinnaird was here and underground, in the few hot days of last week ; and to remedy that we threw water down from the 65 fathoms level through one of the shafts (we have full engine power now), we made a first rate water fall and cleared all the levels.

21,198. How soon were the levels cleared ?—Almost instantly ; it agitated the whole air of the mine.

21,199. (*Mr. Holland.*) Did it make a perceptible draught up the up-cast shaft ?—I was not present when it was done in the evening ; they cleared it all out, so that the men had no complaint afterwards whatever.

21,200. (*Mr. Kendall.*) There was almost an instantaneous change ?—Quite so.

21,201. Have you had many drifts of 35 fathoms in that way ?—No, that was about the longest reach in the lower part of the mine that we have had ; it was poor ground.

21,202. I see that from a cross-cut at a 45-fathoms level you drove part of the way on the lode going west, and then came into a sort of cross-cut again ; you lost your lode, and then it appears as if you had a bit of lode again and then you made an angle, having driven 60 fathoms ; you made a turn almost at right angles and went 20 fathoms more, you then made another angle and went 60 fathoms more, that is 140 fathoms from any air communication ?—Yes.

21,203. Had you any fan there ?—No artificial means of ventilation whatever, and the candles will burn in the present end as well as they will in this room.

21,204. Through what did you go ?—Through slate rock entirely.

21,205. Had you any cracks in the slate ?—Nothing to name, only structural seams or cleavage lines.

21,206. How long would it take to clear the smoke there after blasting ?—An hour or two ; we have only worked it latterly with four men, and they have managed blast there just before leaving the place. That is a most remarkable instance. In driving, you should not only have very large levels, but should drive at a perfectly dead level ; the ventilation depends upon its being perfectly level ; if you lose one eighth of an inch in a fathom, your current of air ceases to circulate as you go on, but if you keep perfectly level you may drive for almost any distance, for the current of cold air then goes in at the bottom and the foul air comes out at the back or roof. That is a secret not generally known.

21,207. How large is your level ?—Full eight feet high, and six feet wide.

21,208. Are you always careful to take your stuff out soon ?—Yes, we always remove it a considerable distance backward ; at least as far back as the cross-cut, where there is any danger of obstructing the circulation of air. Taking any impediment out of the way, and driving a dead level, you may drive almost any distance.

21,209. Does not it very much depend upon the strata through which you drive ?—I do not lay much stress on that. An old Welsh agent, who first gave me the idea, drove a level 500 fathoms at Llandudno without any artificial ventilation or any communication whatever, by having a large level and driving it perfectly dead. His nominal loss of level was one inch in eight fathoms, but he did not lose so much as that. I have gone through that level scores of times, since it is communicated with the mine.

21,210. When you were driving the 112 from Dyer's to Gwen shaft, did you drive it in the same way ?—Yes, we were obliged to drive it at a dead level to meet another level.

21,211. Did you meet well ?—Yes, quite well.

21,212. There is no extra expense in driving dead ?—None whatever. My opinion is, that we are not yet up to the proper size for driving, not only expeditiously, but economically, because when we have to blast the ground it requires a certain range or liberty for it.

21,213. For the long crosscut what is your price per fathom ?—From 5*l.* to 6*l.*

21,214. It is very easy ground ?—Very moderate ground.

21,215. There is no timber used ?—Not a bit.

21,216. This mine is in the hands of Messrs. Taylor and Company ?—Yes, as managers.

21,217. They have lately had a grant from the proprietors ?—Yes, the Marquis of Anglesey and Lady Dinorben.

21,218. Did you commence as an agent with the new grant ?—No, my predecessor was, Mr. Henry Thomas, who is now at the Aberystwith mines.

21,219. How long was he here ?—15 months ; but I am acquainted with the history of the mine, for I was inspecting agent to the Lords for three years before our company took it in hand.

21,220. There were certain reasons why the late adventurers did not take a new grant ?—Yes.

21,221. What was the state of ventilation when you came ?—Much the same as at present ; being a rich mine, from the frequent working communications, it was tolerable.

21,222. Are not your veins very uncertain, sometimes very small and sometimes very large ?—Yes.

21,223. When they are very small, if there is room enough for a man to pass through, do you save the expense of making a larger level ?—We make a good level even then.

21,224. Did they in olden time ?—Yes, tolerably good, but not to be compared with ours ; we have greatly improved it.

21,225. Even in olden time they were not content to let the men drag through those places ?—No.

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21,226. But at present you as a matter of economy carry your levels high and wide?—Yes.

21,227. And you find that by driving at a level you can go on at a very great distance without ventilation?—Yes.

21,228. We have heard a good deal in the last week about smelling bad air, have you worked your way up as a miner?—Yes, I have been 35 years practically engaged in mines, two thirds of which as a working miner.

21,229. What is your opinion on this point; can you or can you not from experience, if air is bad, even before before the candle shows it smell bad air?—In some instances I can do so, certainly.

21,230. Before the candle shows a dullness?—It depends upon how the foul air arises. If it is from gas generated from decaying wood, it will naturally give a smell, but if it exudes from the rock itself I doubt whether I could smell it.

21,231. (*Mr. Holland.*) Suppose there is insufficient air?—That, of course, would be much the same as an ill-ventilated room, where we can perceive it in a moment.

21,232. By your own sensation do you feel a deficiency of ventilation before the candle shows it?—When it gets very foul and the candle shows it of course it is very trying to the system, and one can perceive it then, but I do not think that I could always detect it before the candle shows it.

21,233. (*Mr. Leveson Gower.*) Do you find any difference in respect of that between Cornwall and here?—None whatever. I think that that is a general case in all mines.

21,234. Do you consider the health of the miners good here?—Very good.

21,235. How is it in comparison with what it is in Cornwall?—Very good in comparison.

21,236. Is the health better here than there?—Very much better. We are not troubled with the miners' disease as they are in Cornwall. One old miner worked in our mine till he was 72 years of age, until a month or two ago, from the infirmities of age, he was obliged to give up, but still his breath was as good as that of any average man of that age. The old men who were formerly miners are working on our pits, and they are employed on the roads and in various ways, and some are old pensioners.

21,237. Are the men here generally sober?—Yes, they are generally temperate in their habits, as far as my observation goes, with a few exceptions; we are sometimes obliged to exercise discipline, but they are better in this respect than some others, who are considered above them in the scale of social life.

21,238. (*Mr. St. Aubyn.*) Do your men all come up by ladders?—All by ladders and steps.

21,239. Have you it in contemplation to put up a man engine?—No, our mine is not deep enough to warrant the outlay or call for it.

21,240. At what depth should you consider it necessary to put up a man engine?—Perhaps if the mine goes 50 fathoms deeper we might then think of it.

21,241. Say 150 fathoms?—Yes. The men now get up from their bottom places in 20 minutes easily.

21,242. You have stated that as a general rule if you work a level perfectly dead it will ensure good ventilation to the furthest end, within a reasonable distance?—Yes. The level which I spoke of which was driven 500 fathoms is now communicated. It was communicated before I saw it, but they were able to drive it without any artificial ventilation, or any communication.

21,243. Up to what distance should you say that that can be done as a general rule?—I should not hesitate to undertake a cross-cut 250 fathoms. It might depend partly upon the nature of the strata.

21,244. That distance would be modified by the nature of the strata in which you were working?—Most certainly.

21,245. What strata are most favourable for carrying a level through a long distance, and what are not so favourable, comparing for instance slate and granite and killas?—My experience in that respect is confined to the instance in the lime stone of Llandudno, which I spoke of, and the slate rock of this mine. I have never seen that experiment tried in the granite in Cornwall.

21,246. But still that rule of yours of carrying a level perfectly dead would apply to a certain extent to driving through granite, and killas, and so on?—Quite so, in my opinion.

21,247. From your experience, is it generally the practice to carry the levels as dead in Cornwall as here?—I think not. My experience there was derived from 30, 20, and up to 15 years ago, when I left Cornwall; but I had not seen in Cornwall a level so perfectly dead and so wide for the object of securing good ventilation as I have seen since when I adopted it. On this point I may be allowed to mention that I published a letter a short time ago in the Mining and Smelting Magazine, a new periodical in mining, and in answer to that letter Captain Charles Thomas, of Dolcoath, gave a letter stating that if I were to come to Cornwall now, I should find the levels very much improved since I left it 15 years ago.

21,248. (*Mr. Kendall.*) But still coinciding with you?—Yes, he quite agreed with my general views.

21,249. (*Chairman.*) Driving perfectly level, for the object of ventilation, the least accumulation of deads would obstruct it?—Most certainly.

21,250. (*Mr. Holland.*) Have you any levels in your mine which are 8 feet high and 6 feet wide, which are not quite at a dead level?—No, I do not know that we have. Our ordinary levels are 7 feet by 5, although they may be a little more or less, but they are generally more. I require that they shall be a bold good level. I tested the accuracy of this principle at Llandudno mine.

21,251. Is a slight variation in the level very important?—From my experience as a miner, I have proved that if you rise up in the back the air will not circulate up above in a level as it will below, because the fresh air is more dense, and will naturally descend to the bottom; it will not ascend against foul air, and the circulation will not take place as will be the case by the fresh air descending, being more dense. I know from experience that by driving a level perfectly dead you get the chance of the cold pure air coming in at the bottom, and the lighter impure air going out at the top. If the level has no impediment the smoke and foul air will always go out at the roof, and the dense air will come in at the bottom.

21,252. (*Mr. St. Aubyn.*) You have stated that the accumulation of deads would have the same effect as having a bad level?—Quite so.

21,253. How long do you allow the deads to remain here, before clearing them out?—The men wheel them back to a certain point immediately.

21,254. (*Chairman.*) How do you enforce the removal of the deads?—We have a rule and we explain the matter to the men and show the necessity of it for their own sakes, and sometimes we are obliged to use rather harder words, but I do not think that we ever go to the extreme of fining them for the nonobservance of it.

21,255. Have you any accidents from blasting?—In the Parry's mines we have but few accidents arising from premature explosions, notwithstanding the rock constituting the lode, is very hard and fiery, and I attribute this to the precaution of using cartridges enclosing the charge of powder.

21,256. (*Mr. Kendall.*) You say that the miners are healthier here than in Cornwall?—Yes.

21,257. Why are they so?—First, because the mine is not so deep; they have not the same stress in climbing; in the next place the ventilation is better than the ventilation of the mines generally in Cornwall, and the mine is comparatively dry.

21,258. And it is not the custom to work such long hours?—No, and they don't work so hard; they do not strain the system as they do in Cornwall.

21,259. Taking the lodging of the miners here and the lodging of the miners in Cornwall, which is the best?—I think that the Cornish is the best.

21,260. By far the best?—By far the best. The cottages are bad here, and I have always told them so, they build them so low, and they are so ill-ventilated.

The witness withdrew.

Dr. THOMAS HUGHES, of Amlwch, examined.

21,261. (*Chairman.*) Are you the medical man appointed to attend this mine?—Yes.

21,262. And the Mona mine?—No only this mine.

21,263. How is the remuneration fixed?—I receive so much annually.

21,264. You look to the Company for payment?—Yes.

21,265. For that have you to attend the men and their families or only the men?—Only the underground men; it is only applicable to accidents.

21,266. There is nothing for sickness?—No.

21,267. Do you attend any miners for sickness?—Yes, most of them.

21,268. But they themselves pay for that?—Yes; they generally in fact become paupers; they have large families, and I am the Union medical officer, and they fall under my care in that way.

21,269. When they come to you do you find any men suffering from miners' asthma?—Not very frequently. There are cases of asthma, but I cannot say that they are very much more frequent than in other classes of people.

21,270. Then there is no disease peculiar to miners?—Bronchitis and consumption I have noticed to be the most frequent diseases amongst the miners.

21,271. Is there is any particular age at which you find them liable to that?—No, not particularly. They are generally advanced in years, about 35 to 40 before it shows itself.

21,272. Have you any cases of that now under treatment?—Some.

21,273. Do the miners from the other mine as well as this mine come to you?—As medical officer of the Union many of them do, because they are poor and have large families, and they have no resource but the parish.

21,274. Do they apply to the parish for relief?—Yes, after a time. There is no club provided in the other mine I believe, except for accidents.

21,275. Is there no club in this mine?—Only for accidents.

21,276. (*Mr. Holland.*) Have you practised among other persons besides miners?—Yes.

21,277. Is there decidedly more bronchitis among miners than among others?—I believe there is as well as a good deal of consumption.

21,278. Do a large proportion of the men above 40 suffer from bronchitis or some such disease?—Yes, a good many of the miners.

21,279. Do you think that more than half of the men above 40 suffer from it?—No, not so many as that I think.

21,280. Is it common for men to have this complaint who do not apply for medical assistance?—Yes.

21,281. They give it up as a bad job?—Yes, very often they go for medicines themselves; they go to druggists, they do not apply to a medical man.

21,282. And they do nothing?—And they do nothing. They very often apply to druggists and old women and quacks for herbs.

21,283. The conclusion from that is that a larger proportion may suffer than those you know, and that you do not see it?—Yes.

21,284. Do you think that the miners suffer more from rheumatism than the farm labourers do?—I believe not in this mine.

21,285. Are they more liable to dyspepsia than farm labourers?—A good many suffer from dyspepsia.

21,286. Is it a common thing among them?—Yes, rather common. It is due probably to eating slops and fluid food for dinner.

21,287. Do they eat differently from farm labourers?—I believe they do.

21,288. Have you noticed that they are more fond of tasty things?—I have not.

21,289. What is their general and ordinary food?—They take too much tea and coffee to the exclusion of animal food.

21,290. Is that from poverty or from taste?—Poverty, I think. The farm labourers are fed by the farmers in this country.

21,291. Do you think that they live better than the miners?—As a rule, I think so.

21,292. Can you distinguish a farm labourer from a miner?—I think so; old age, I think, comes on earlier in a miner.

21,293. How many years difference should you say there is?—10 or 15 I should say.

21,294. As much as that?—I think so decidedly; in underground men at least.

21,295. Do you think that a miner of 50 looks as old a labourer of 65?—I think so, as a rule. I mean labourers working for farmers, because they are generally very healthy, being always in the open air. That air of course is pure.

21,296. Do the miners crowd more together than the agricultural labourers; are there more in a house or is it much the same?—Much the same, I think.

21,297. There is no material difference?—I think not.

21,298. Are the houses much alike?—Very much alike.

21,299. We have been told that they are very small and confined?—They are very small all round the country here.

21,300. Like the ordinary Welsh houses?—Yes

21,301. Are they generally single rooms?—Yes.

21,302. Do they take lodgers?—Hardly ever.

21,303. Where do the unmarried miners lodge?—Generally with their parents.

21,304. Not with strangers?—Very seldom.

21,305. Are they generally natives of the district?—Almost all.

21,306. You do not think that the miners, as a class, are more crowded together in their bedrooms than the agricultural labourers?—I do not think so.

21,307. There is nothing marked in that?—Not to any marked extent.

21,308. (*Mr. Leveson Gower.*) Is there any consumption among the agricultural labourers?—Yes, very much; it prevails very much in this part.

21,309. Do you see any difference between the consumption which the miners have and the consumption of the agricultural labourers, or does it appear to you to be the same disease?—It is very much the same. There appears to be a little more difficulty of breathing, I think, in the miners.

21,310. To what cause do you attribute the ill health of the miners?—Impure air, from working underground.

21,311. Any other cause?—I cannot speak to any other cause. They generally get wet from working underground in wet places, and take cold and neglect it.

21,312. Do they change on coming up?—They generally change after going home in this mine.

21,313. Do you attribute their colds to their doing that?—To the impure air, and also to the particles of dust in the air. That often irritates the bronchial tubes.

21,314. Do you attribute anything to their going home in their wet clothes?—I think that that has to do with it as well.

21,315. How long have you practised among the men in this mine?—I may say six years.

21,316. Have you seen any change in the state of

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their health now from what it was when you came?—I do not see any at all. I was looking yesterday over what I have attended them for, and I do not see much difference during the last five years.

21,317. (*Mr. St. Aubyn.*) Are you the sole Union medical officer?—I am in this part.

21,318. (*Chairman.*) What is the parish?—The Amlwch district of the Anglesea Union.

21,319. (*Mr. St. Aubyn.*) How long have you practised in Almwch?—For six years.

21,320. You have already said that consumption is frequent among the miners?—Very frequent.

21,321. Is asthma also frequent?—Not particularly so, as far as I have discovered; bronchitis and consumption are the most frequent.

21,322. Are rheumatic affections frequent?—Not very frequent—not more than among other people.

21,323. You would not say that asthma and rheumatic affections were almost unknown among miners?—By no means.

The witness withdrew.

Mr. RICHARD LEWIS PARRY, of Almwch, examined.

Mr. R. L. Parry.

21,324. (*Chairman.*) You reside at Almwch?—Yes.

21,325. Are you surgeon to any of the mines in this district?—Yes, the Mona mine. Every man in the Parys mine used to choose his own surgeon till recently.

21,326. Now the surgeon is appointed by the mine?—Yes.

21,327. And at the Mona mine the men choose their own doctor?—Yes.

21,328. How long has the system been changed at the Parys mine?—About nine months.

21,329. And the doctor is now appointed by the company?—Yes, and not by the men, but it is the men's money.

21,330. The men pay?—The men pay and the company keeps the money.

21,331. Are you the doctor to the Union?—No, I had been for 10 years, but I gave it up.

21,332. How long have you given it up?—About three years.

21,333. How long have you practised in Amlwch?—About 15 years.

21,334. Had you much opportunity while you were the doctor of the Union of seeing many cases of miners?—Yes, almost all of them.

21,335. But now your experience is more confined to the one mine?—No; it extends to both as far as their families are concerned; anything but accidents.

21,336. For illness the miners come to you?—Principally; almost all of them.

21,337. Is there any affection which miners peculiarly suffer from more than others?—Yes, principally consumption and bronchitis and rheumatism.

21,338. They do suffer from rheumatism?—Yes; a great number from sciatica, especially when they get a little advanced in years, 60 years of age or something of that sort.

21,339. At what time do the miners generally become affected in their breathing?—Very early. You can hardly name 50 or 60 men under 30 who are not affected by it; if they keep clear of it till they are about 40 or 50, they get on pretty well after that, but the mortality is amongst the youg men principally, say under 30 or 40.

21,340. Have you any case at present under treatment?—Yes, a great number.

21,341. For this affection particularly?—Yes.

21,342. Do you see any difference between the two mines?—I think there is a great improvement in the Parys mine. There is a great deal of difficulty in the other mine, as far as ventilation goes.

21,343. But there has been an improvement of late years in the Parys mine?—Yes, but it is very lately.

21,344. Do you think that the state of the cottages is good or bad?—Very bad indeed.

21,345. Does that tend to produce this kind of disease in your opinion?—Yes, it does; you will find cottages with a single room, with about seven or eight or ten in family in it; they have a peculiar kind of bed here; it is more like a closet than a bed, and it separates the house into two compartments.

21,346. Do you find when they come to you in the early stage of this disease that you are able to cure them?—No, they very seldom come until they are almost in the last stage.

21,347. They do not apply to you when they are first affected?—No, they merely fancy that it is a common cold, and they hang on at their work, and they go underground and it aggravates it, especially where the mine is not properly ventilated.

21,348. (*Mr. Holland.*) I understand you to say that the miners are very much more liable to this disease than the general population?—Yes.

21,349. Are they much worse lodged than the general population?—Yes, decidedly.

21,350. In what respect?—As far as ventilation is concerned, and as far as regards the construction of their cottages.

21,351. Are they worse constructed cottages than the farm labourers have?—Yes, I think they are, generally speaking.

21,352. Are they more crowded?—Much more crowded.

21,353. How does that happen?—I do do not know how it is, but they are large in family.

21,354. Does it happen from the miners going as lodgers into other families?—No.

21,355. That is not the custom?—That is not the custom. The cottage is just one room, and then they divide it into two by their bed.

21,356. What is a common number of inmates in a room?—In a room, perhaps not half the size of this, you will find 10 or 15 persons living, and in others four or five or six, more or less.

21,357. Do you mean that several families live in one room?—No; it is daughters and sons and all.

21,358. Is it common for 15 to be in one room?—Not common; you will find them from 12 to 15, but the general average is about 7; the highest nnmber is from 10 to 15; they are composed of daughters and sons, and you will find two or three beds in that house.

21,359. Is not that a rare case?—No.

21,360. Are the miners decidedly older looking at the same age than the agricultural labourers?—Yes, decidedly.

21,361. What difference in appearance is there?—You may say that a man of about 50 years of age looks about 65.

21,362. Do you mean that he is like a man of 65 in constitution?—Some of them are. There is a very curious case with them, that if they pull through it pretty well till they are 50 or 55 they live to a good age, but the majority of them die before they are 50.

21,363. Do the miners complain much of bad ventilation in the mines?—Yes, very much.

21,364. Is that a very general complaint?—Yes.

21,365. (*Sir P. Grey Egerton.*) In which mine?—Both mines, but they say that the Parys mine is improved lately.

21,366. (*Mr. Holland.*) Judging from your own knowledge, is that a correct opinion?—Yes; I have been down both of them.

21,367. Is it your opinion that they are badly ventilated?—Yes.

21,368. From what do you draw that conclusion?—From the difficulty of breathing which I experienced myself when I was down.

21,369. You observed a distinct closeness of air?—Yes.

21,370. Did you notice that the candles burned badly in any part of the mine?—Yes, in some drifts.

21,371. (*Mr. St. Aubyn.*) Which mine are you now speaking of?—Both of them.

21,372. (*Mr. Holland.*) Have you been down both of them frequently?—Not very often.

21,373. Have you noticed a very perceptible closeness of air when the candle did not burn badly?—Yes, decidedly; so much so that in the Mona mine I had to go upon my knees to get through, and when I did get through, I found two men working there, and the candles were very dim.

21,374. Are you satisfied that that disagreeable feeling was the result of closeness of air, and not of unusual fatigue on your own part?—There was no ventilation whatever there excepting through the hole that I crawled through; there is no question about that.

21,375. Are the mines in any part disagreeably dusty?—No; there is too much damp in them to be dusty.

21,376. Do the men complain of annoyance or injury from dust in the working?—No.

21,377. Do they complain of powder smoke?—Yes.

21,378. Do you think that complaint just?—Yes, very just.

21,379. Have you been able to trace any ill effect from the breathing of powder smoke?—No, not particularly more than from foul air. I take the place altogether.

21,380. Have they complained of excessive fatigue from climbing?—No, I have not heard them complain much about that.

21,381. Do you think that there is any ground of complaint of that sort here?—I think that taking the construction altogether, it is anything but what it ought to be.

21,382. In what respect?—In timber for supporting the shafts and in coming upon the surface they get into rather a rotten state, and they do not look after them properly.

21,383. Do you consider them dangerous?—Accidents occur.

21,384. Have you had accidents?—Yes.

21,385. From falling from the ladders?—From falling.

21,386. Have you had many such accidents?—I do not know that I can say a great number, but still I have had some few.

21,387. Hurts or fatal accidents?—Not fatal.

21,388. Breaking limbs?—Yes.

21,389. Have you attributed them to the faulty state of the ladders?—Yes, in a great measure.

21,390. Have you had many accidents from gunpowder blasting?—Yes, a good many.

21,391. With what results generally?—Not fatal, but I have one case now under my care, where the accident occurred six months ago.

21,392. Is that a case of injury to the eyes?—All over the body.

21,393. Have you had any injury to the eyes from blasting?—Yes.

21,394. Have you had many cases of that sort?—Yes, a good many; some few of the men are alive now, blind of course.

21,395. Is it so much as to be remarked as common; is injury to the eyes a common accident here?—Not very common.

21,396. Have you many blind people under your care?—Not under my care now, but they have been under my care.

21,397. To what cause do you attribute the lung disease; except the bad air of the mines and the bad condition of the men's sleeping room, is there any other cause?—I cannot attribute it to anything else, unless it is hereditary about the neighbourhood.

21,398. Do they feed badly?—Very badly.

21,399. In what respect?—In not having sufficient.

21,400. Is that from their poverty?—From their poverty and bad pay.

21,401. We are told that they get about 13*s.* or 14*s.* a week?—Some of them. Sometimes a family of 10 or 12 get 14*s.*, or if they get 10*s.* or 14*s.* they are pretty well off, but sometimes they will not make 5*s.*, and then they run into debt, and if they exceed that then it is deducted out of their pay again. They may run into debt for months and months.

21,402. That is a better income than farm labourers usually get, is it not?—No.

21,403. Do farm labourers here get more than 14*s.* a week?—They get upon the average 8*s.* or 10*s.*, and then they are allowed the privilege of a cow, that is if they are married.

21,404. Do the farm labourers live better than miners?—A great deal better.

21,405. (*Mr. Kendall.*) Have you been underground in the Parys mine since it has been under the management of Messrs. Taylor?—No.

21,406. How frequently were you underground before it came under the management of Messrs. Taylor?—About three times.

21,407. In the Parys mine?—Yes.

21,408. Have you lately been underground in the Mona mine?—Yes.

21,409. Within the last two years?—Yes.

21,410. How many times have you been underground there?—Twice there.

21,411. Have you been underground frequently in other mines?—No, these are the only mines I have ever descended.

21,412. So that you have been down five times in your lifetime?—Yes.

21,413. Do you know any accident which has occurred entirely from the decayed timber-work, from a neglect to supply any defects on the part of the timber men here?—I do not know it of my own knowledge, but I have heard it from those who have been complaining, and I have attended accidents from that cause.

21,414. Where they have said that the timber has been giving way, and that the fall has been in consequence of the rotteness of the timber?—Yes.

21,415. Was that in the Parys mine or the other mine?—In the other mine.

21,416. How long ago?—I think it is only six or eight months ago, but they were told not to use that, they were warned not to do so.

21,417. Not to go up that way?—Not to go up that way.

21,418. I suppose it was a shorter way?—I suppose it was more convenient for the men.

21,419. But they were warned not to go that way?—Yes.

21,420. And they did?—They did so.

21,421. (*Mr. Leveson Gower.*) Are you acquainted with the nature of the miners' disease of the Cornish miners?—No, only from what I have heard.

21,422. But you have read about it, I suppose?—Yes.

21,423. Is there any distinction between the disease which these men suffer from and the Cornish miners' disease?—Yes, I think there is a good deal of difference between the two.

21,424. What is the difference?—The difference is that I do not think there is so much consumption amongst the men in Cornwall, according to what I have read.

21,425. Then you do not call miners' disease there consumption?—No; a good deal of it is hereditary here. Scrofula is very prevalent.

21,426. Do you attribute the illness of the men mostly to their mining or to the state of their cottages?—They are predisposed to it, and then when they get into the foul air and the close breathing, it certainly hastens the disease; it brings it to a crisis sooner than it would if they were labouring men about the fields.

21,427. You mean that they are predisposed to it from the bad state of their cottages?—Yes.

21,428. (*Mr. Holland.*) Can you explain why the miners' houses become much more crowded than the houses of the agricultural labourers?—Yes, the reason is that the miner's family work in the mines, and they stick to it till they get married in one way

ANGLESEA.

Mr. R. L. Parry.

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or another. The agricultural labourer's family, when they get about 8 or 10 or 12 years of age, are distributed to different farms, and they do not live at home.

21,429. Do the miners marry earlier that the agricultural labourers?—No, not so young.

21,430. As a habit the young members of a miner's family remain till they are 20 or 22 years of age?—Yes, until they get married; they are seldom married before that.

21,431. Whereas the children of the farm labourers go away at about 12 or 14?—Yes, as soon as they are able to handle a spade, or to feed cows, or churn, or anything of that kind, they are off directly; a farm labourer can get off his family in a moment, but a miner cannot do that.

The witness withdrew.

MONA MINE.

CAPTAIN GEORGE TREWREN, of Mona Mine, examined.

Capt. G. Trewren.

21,432. (*Chairman.*) Of what mine have you charge?—The Mona mine.

21,433. What is the produce of it?—Copper.

21,434. How many men have you working underground?—Men and boys, somewhere about 125.

21,435. What is the deepest level which you are now working?—60 fathoms under the adit.

21,436. How far are you driving any level from any shaft or winze?—From 20 to 30 fathoms: about 25 fathoms.

21,437. Do you use any artificial means of ventilation?—Yes, we have some air pipes and a machine.

21,438. How is the machine worked?—By manual labour.

21,439. Have you any air pipes without a machine? Yes, at the new shaft.

21,440. Do you find that answer?—Yes, very well indeed for the number of men that we have.

21,441. How long is the powder smoke getting out?—It does not stand perhaps a quarter of an hour.

21,442. How many shifts of men have you working there?—Three; at Carns they are only working two.

21,443. How many hours each?—Eight hours each.

The witness withdrew.

Mr. THOMAS EVANS, of Mona Mine, examined.

Mr. T. Evans.

21,444. (*Chairman.*) What allowance for candles per week have the men?—2lbs. per week.

21,445. What is the price which they are charged for them?—1*s.* 2*d.* per lb.

21,446. And how much for the powder?—1*s.* 6*d.* With regard to the powder and candles, the men get a certain price per ton for the ore, and they pay for the candles and powder nominally.

21,447. How often are the men paid?—Monthly.

21,448. Do you keep a month in hand?—No, we only keep a certain portion in hand. We give them subsist as far as we can at the end of the month, and then give them the balance at the end of the following month.

21,449. But there is a month in hand?—No; we give them a subsist.

21,450. But they are not settled up with for a month?—No, we are not able to do it.

21,451. Is there a doctor attached to the mine?—We have no appointed doctor.

21,452. What means have the men of medical attendance?—They choose their doctor, and the mine pays.

21,453. What do the men pay towards the doctor?—One penny per week per man.

21,454. Is that for attendance for sickness, or for hurt?—Not for sickness; we do not pay for sickness.

21,455. Only for visible hurt?—For visible hurt, or internal hurt; any hurt.

21,456. Is the sum which the men pay towards the doctor sufficient to meet the doctor's salary?—We do not pay a regular doctor's salary. The men have their choice of doctors, and we pay them their bill; there is no arrangement.

21,457. Who is the doctor?—Any doctor the men may choose. Sometimes it is Mr. Parry, who was examined by you to-day.

21,458. What other deductions are there from the pay of the men?—Nothing else, unless they have got into debt previously. If they get into debt, then we never deduct it until they have had 50*s.* per month of four weeks, and 3*l.* per month of five weeks.

21,459. What are they supposed to earn?—50*s.* per month of four weeks and 60*s.* for a five weeks' month.

21,460. What do the boys get?—From 20*s.* to 25*s.* and 30*s.* a month, according to their size and the arrangement made between them and the men; that is a thing which we know little of.

21,461. Have you any stipulation as to the age at which boys may go down?—We never take young boys below 10, 11, or 12; it depends more upon their size than their age.

21,462. What do the women earn upon the surface?—The women get from 5*d.* to 10*d.* a day. With regard to the allowances of the men there is one thing which I do not think is done anywhere but here; we pay the old miners a pension; we have a list of pensioners.

21,463. You have a provision for the men who are disabled?—We give them 5*s.* a week.

21,464. For how long?—Until they recover.

21,465. If they remain permanently disabled, how are they provided for?—If they remain permanently disabled by an accident here, they get that amount while they live.

21,466. You have them as pensioners?—Yes; we have several classes of them. One who is permanently disabled gets 1*l.* a month and the others 16*s.*; the old infirm miners, those who are disabled through old age, get 16*s.*

21,467. How many years work at a mine would entitle a man to become a pensioner?—I have never heard one refused. One who has any claim whatever is generally listened to, and a pension is given him; but most of the men who are here work all their lives. They generally work until they are 70 years of age, and sometimes longer than that. If they have a fatal accident, we provide a coffin and pay the expenses of the funeral.

21,468. (*Sir P. Grey Egerton.*) Do the pensions come out of the club money which the men subscribe?—They are paid by the general mine money.

21,469. (*Chairman.*) The men pay 1*d.* a week?—Yes. The club money is not nearly sufficient to pay it; it does not even pay the doctor's bill. There was an arrangement once made here by which the doctor got a stated sum per annum, but he was not found to be sufficiently attentive to the miners when that plan existed, and the system was altered.

21,470. Have you any accidents from blasting?—I have never heard of more than two or three; there has not been one since I have known anything of the mine.

The witness withdrew.

Adjourned to To-morrow.

Devil's Bridge, Cardiganshire.

Friday, 24th July 1863.

PRESENT:

The Right Honourable Lord KINNAIRD, K.T.
Sir P. GREY EGERTON, Bart., M.P.
NICHOLAS KENDALL, Esq., M.P.
P. H. HOLLAND, Esq.

The Right Honourable Lord KINNAIRD, K.T., in the Chair.

Captain RICHARD RIDGE, of Devil's Bridge, examined.

DEVIL'S BRIDGE, CARDIGANSHIRE.
Capt. R. Ridge.
24 July 1863.

21,471. (*Chairman*). Of what mines have you charge?—Rheidol is the mine in which I am chiefly engaged.

21,472. About how many men have you working underground there?—26.

21,473. What is the greatest depth at which you are working?—Our deepest level is about 160 fathoms.

21,474. Are you working there?—Yes, draining a level.

21,475. How far is that level from your shaft?—It is about 150 fathoms.

21,476. What are the other levels?—We have one level driven in the hill of a depth of about 160 fathoms, and another at about 140 fathoms; the lowest level is an adit level from the valley.

21,477. Do the men enter by the adit level?—Yes; that is driven in 300 fathoms.

21,478. Where the men are working now at the 150 fathoms, which is the nearest communication to any other level?—25 fathoms from it.

21,479. Do you require any artificial means of ventilation?—We have rises.

21,480. Have you any artificial means besides that?—No; some time back, before we put a rise, we had a waterfall, and I have the same now in driving the level up here; at 160 fathoms we have a waterfall.

21,481. You do not require it at the other level at present?—No.

21,482. What distance from a rise or a winze have you ever driven without a waterfall or other artificial ventilation?—About 40 fathoms.

21,483. When you come to that distance you think that it is necessary to put in air?—Yes.

21,484. And not before?—Yes, it would be better if you could put it in, but we generally run it on as far as we can, although it would be all the better to put it in at 20 fathoms.

21,485. Why do you not do so?—Because we try to save the expense to the Company, though in the end it is the worse for the Company, because I could get the ground driven much cheaper if the air was put in at once.

21,486. Are the company, do you suppose, aware of the fact which you have stated that it would be to their interest to put in air sooner?—Yes, they are a little aware of it; but they will say, "Yes; push on a little further; we will do as well as we can for a bit, and we can see if the ground turns out better, and we shall better afford it."

21,487. What is the name of the other mine with which you are connected?—East Haford mine.

21,488. How many men have you employed there?—I have six employed there in driving a level.

21,489. Is it a level from the day?—Yes.

21,490. How far have you gone in there?—160 fathoms.

21,491. What means of ventilation have you there?—There they were quite agreeable to my ventilating it in the commencement with a waterfall, because we calculated driving that level 300 fathoms. We have one of the best blasts of air that was ever given in Cardiganshire. We get zinc pipes of six inches in diameter, and you cannot keep a candle within ten fathoms.

21,492. How is the water applied?—Running water off the engine, a regular stream running and falling down about 50 feet through a pipe of about a foot diameter, and then it goes in through a tube, it runs out in the bottom. It is made like a clock case and there is a place where the water falls on a solid bottom of water; but above that a pipe goes out, and the air is obliged to go out through that pipe and cannot get through the solid water.

21,493. You find that the powder smoke does not hang there?—It is cleared out; the engineers belonging to the railway have been in to see it several times; I put in the same in Scotland; I have done a good deal of work in Scotland; I put three tunnels through the city of Edinburgh; I was employed under the sheriff of Edinburgh; I was Inspector for the safety of the public.

21,494–5. (*Mr. Holland.*) Did you ventilate those tunnels in the same way; Yes, in the very same way. I was employed under the head engineer, and he was employed under the Sheriff.

21,496. (*Mr. Kendall.*) You were what is called the clerk of the works?—I was Inspector.

21,497. (*Chairman.*) Are you acquainted with other mines in this district?—Yes, I have inspected the South Lisburne mine; it is not under the Messrs. Taylor.

21,498. (*Mr. Kendall.*) What did you go there for?—Inspecting for the Company; I have been there several times on the Company's behalf.

21,499. (*Chairman*). Are there many men working there?—About 30.

21,500. Is it well ventilated?—It is only middling.

21,501. Do they adopt any artificial means there? They are just like we are, pushing on; they ought to have air; it is a mine which will not pay its way, and they are trying to keep down the expense, and in the end it is the worse for all.

21,502. In your opinion, is that generally the case in the smaller mines in this district?—It is generally the case throughout the district; if you get a man to tell you the truth you will find it the case everywhere.

21,503. The poverty of a mine prevents the adventurers working it properly?—Yes.

21,504. Do the men suffer from working?—Yes; I have been underground this morning in some of our levels. When you go in about 20 or 30 fathoms, you will perceive a smell which will almost knock you back, a nasty, filthy, bad smell; that is what kills the miners.

21,505. How does it affect them?—It affects their lungs.

21,506. At what age do they die from it?—Generally about 25 or 30, or something like that. When a miner gets up about 40 years of age he is not worth the snap of a finger.

21,507. What are the earnings of the men?—On the average about 12*s.* 6*d.* and 15*s.* a week.

21,508. What allowance of candles have the men per week?—They are allowed 3 lbs. per man.

21,509. How many hours shift do they work?—Eight hours.

21,510. What are the men charged for the candles?—About 7*d.* a lb.

21,511. And what deduction is made for the doctor?—6*d.* per month.

21,512. Is that for illness or hurt?—Illness and hurt.

21,513. Do the men choose their own doctor, or is he appointed by the adventurers?—He is appointed by the majority of the men.

21,514. Does any difficulty arise in that mode of appointment?—No, scarcely ever.

DEVIL'S BRIDGE, CARDIGANSHIRE.

Capt. R. Ridge.

24 July 1863.

21,515. Have you any accidents from blasting?—No; I have been in this mine now about 12 years, and never had any accident happen, not so much as a broken finger, which is a thing I suppose hardly ever known in this neighbourhood.

21,516. Do the men reside near the mines?—Some of them have about four miles to walk, and three miles, and two miles.

21,517. Is the Rheidol mine wet at all?—It is quite dry.

21,518. Do the men change when they come to the surface, or change at home?—They change at home generally.

21,519. Is there any provision at the mine for their changing when they come to the surface?—No; they generally come in the clothes which they wear, and go back in the same; it is generally the case in our mine, because it is generally a dry mine.

21,520. Should you say that that is the case generally in the smaller mines with which you are acquainted?—Yes; it is the general case in this neighbourhood, but not through Shropshire.

21,521. (*Mr. Holland.*) You have told us that it costs a great deal more to drive at the end of the level than at the beginning of the level?—Yes.

21,522. What is the difference?—I should think about 1*l.* in a fathom if the level is a very long one.

21,523. Is the cost of the blowing machine which you have described considerable?—No; it is not a very considerable cost; it is a fall of water.

21,524. Would it not very soon pay itself, by saving 1*l.* a fathom in the driving?—Yes.

21,525. Are there many cases where you could not get water to work it?—Yes; there are many cases where you cannot get water enough, and there it must be done by a machine; we have machines to blow when we cannot get water sufficient.

21,526. Would it not always pay to use a machine to drive air in rather than pay 1*l.* extra a fathom for driving?—I daresay that it would be as well, generally speaking.

21,527. You have told us that the smell of a close level and the feeling of oppression is very great?—Yes.

21,528. In that case, does the candle show a bad burning as soon as you feel an oppression?—No, not in lead mines.

21,529. You feel bad air before the candle shows to burn badly?—Yes.

21,530. Is that a general rule?—Yes; wherever there is mineral you will get a taste of it sooner than where there is no mineral.

21,531. (*Mr. Kendall*). The richer the vein the greater the smell?—Yes.

21,532. Did you ever try it in copper mines?—No; I am not accustomed to copper mines; in lead mines I have.

21,533. Were you a miner before you were an agent?—Yes.

21,534. You worked your way up?—Yes; I was a miner when I was able to walk, in Shropshire.

21,535. You have generally been in lead mines?—Yes.

21,536. What end were you in to-day when you experienced the smell to which you have referred in the Rheidol mine, where you said that it was very bad?—In the 12 fathoms level.

21,537. How far are you in there from the rise?—We are in from the shaft there about 30 or 40 fathoms.

21,538. Without any blast at all?—We have a blast, but it is not powerful enough to drive it back quick enough.

21,539. It is a poor blast?—Yes.

21,540. The machine is poor?—The pipe is not large enough.

21,541. It will not throw in air enough?—No; I would never recommend a wooden pipe, but I would always recommend a metal pipe.

21,542. You spoke of the ill health of the miners; which do you think that it arises most from, checked perspiration, or bad air?—Bad air; I am quite certain of it.

21,543. Yours is a dry mine, you say?—Yes.

21,544. Do you blast much?—Yes, it is all blasting ground.

21,545. Do you bore above, and below, and sideways, and all ways?—Yes, every way.

21,546. Do you think that the miners suffer much from dust in the boring?—Not so much as from bad air.

21,547. But do you think that they suffer at all from dust?—Yes, a little.

21,548. Have you seen them in other mines suffer much from dust?—Yes.

21,549. More than here?—No, I do not know that I ever did.

21,550. It must depend, I suppose, upon the nature of the rock?—Yes.

21,551. Am I to gather from you that from your experience you find that when a mine is poor and will not pay cost, the ventilation is generally poor?—Yes.

21,552. That is the result of your experience?—That is matter of certainty.

21,553. That if you are driving on and the ventilation is bad, and you would have to pay for a winze, the parties, looking at the expense, say "Push on; we may come into richer ground"?—Yes.

21,554. And then the men suffer?—Exactly so.

21,555. (*Sir P. Grey Egerton.*) How is your ore brought to surface, by shafts or by adit level?—By adit level.

21,556. Do you dress it on the spot?—We carry it by horses about 300 fathoms, on pails; there are two horses doing that.

21,557. They carry it to the dressing sheds?—Yes.

21,558. How many men have you employed in dressing?—We have about 20 boys and girls.

21,559. At what age do you employ the boys and girls?—We employ the boys at about 13, 15, and 16, and the women perhaps at about 20 or 25.

21,560. What wages do they get?—The women get about 1*s.*, and the boys get about 8*d.* and 10*d.*

21,561. You have sheds for them to dress the ore under?—Yes.

21,562. They are protected from the weather?—Yes, there are not better in Cardiganshire; and there is not better machinery in Cardiganshire than I have.

21,563. (*Chairman.*) Are the men paid regularly?—Regularly every month.

21,564. How much do you keep in hand?—A month is kept in hand; when they are paid one month there are two months pay due, but they get cleared off with one.

The witness withdrew.

Captain JAMES RAW, of Cwm Ystwith, examined.

Capt. J. Raw.

21,565. (*Chairman.*) Of what mine have you charge?—Cwm Ystwith.

21,566. Have you charge of any other mine?—None.

21,567. How many men have you working underground?—About 150.

21,568. How do the men enter the mine?—Mostly by levels.

21,569. What is your longest level?—I suppose the longest level which we have is nearly half a mile; about 800 yards.

21,570. About how many other levels have you?—We have a great quantity of levels; I suppose we have something like eight or ten adit levels.

21,571. What is the greatest depth?—We are 40 fathoms below the bed of the river.

21,572. Do those levels all communicate?—They are all communicated one to another.

21,573. Where are you working principally now?—We are working in different levels; we are working from the adit level down to the 40 in different levels.

21,574. Are you sinking at all?—Not at present; we are driving three adit levels at present, and a 35 and two 10's. I think that we are driving five or six adits at the present moment.

21,575. In any of these levels what is the longest distance which you are driving from any rise or winze?—I think that at one of them we have not any communication the whole length of it; it is 400 fathoms, but we have a machine blowing in air with a water wheel.

21,576. You are supplying air to the extreme point of that level now?—Yes.

21,577. What pipes do you use for the purpose?—The air pipes made of zinc.

21,578. What is the size of the pipes?—Four inches.

21,579. Whereabouts is the water power?—At the end of the level.

21,580. So that the air is driven from the end of the level?—Yes.

21,581. Is it a water fall?—No, it is turned by a water wheel and a fan; we can drive it a mile, with this air; it is splendid.

21,582. (*Mr. Kendall.*) It is driven from the tail of the adit?—Yes.

21,583. What is the diameter of the wheel?—Six feet.

21,584. (*Chairman.*) Is the blast sufficient to get rid of the powder smoke at the end?—It will clear it out of the end in two minutes after a blast.

21,585. Is there anything particular in the fan?—No; it is going, I suppose, 500 revolutions in a minute; it is with cog wheels.

21,586. Have you any boys working underground?—Yes; we have, I suppose, about 30 boys out of the 150 men.

21,587. What do the boys do?—They are learning to mine; they are turning the borer and wheeling stuff.

21,588. What are the ages of the boys;—They do not go underground till they get to 14 years of age; they are kept on the surface until they are of that age.

21,589. Is it all water power on your mine, or have you boilers?—It is all water power.

21,590. Have you any accidents from blasting?—We have never had one; I have been connected with mines now for 41 years and we have only had five men killed in all that time in the mine; not one of them was killed by blasting; a storm came and killed two of them in the shaft, the pitman was one of them; that is six years ago, and we have not had an accident since.

21,591. Do the men reside near the mine?—Yes, they are close round about in the neighbourhood, none of them are above a mile off, I suppose.

21,592. Is yours a dry or a wet mine?—It is dry mining generally.

21,593. Do the men change when they come to the surface?—No, they go home mostly; we have a changing house, but they mostly go home; they live very close in the neighbourhood.

21,594. What allowance of candles have the men per week?—We give them 1½ lb. each week.

21,595. What shifts do they work?—Eight hours.

21,596. What is the charge for the candles?—7*d.* a pound.

21,597. And what for powder?—8*d.*

21,598. Is there a doctor attached to the mine?—Yes.

21,599. Is he appointed by the men?—He is appointed by the miners themselves; they pay 6*d.* a month towards him.

21,600. Is that 6*d.* for illness as well as hurt?—It is for everything.

21,601. Does it include their families or only themselves?—Only themselves, but they mostly have families who are working on the surface, and the doctor mostly attends the whole family for it.

21,602. What are the gettings of the men per month?—The average is about 3*l.* a month.

21,603. Do you pay the men in notes or in silver and gold?—In silver and gold.

21,604. You have resided for a long time in the locality; do you know many of the mines in the neighbourhood?—I have known them all in this part, within 10 or 12 miles or almost 20 miles; I have resided in this part of the country now for 41 years.

21,605. Are there a number of mines worked by small companies?—Yes, a great number now more so than there used to be; very few were working when I first came into Wales, but there are now a great quantity in the neighbourhood.

21,606. Do you think that they are well worked?—I think that they are generally; some very good companies are laying out a good deal of money; some of them are fortunate in finding lead, and some are not.

21,607. Do you think that they attend to the proper ventilation of the levels?—I think that they do; I have not heard any complaint.

21,608. Do you think that the men suffer at all from working in the mines here?—No we have not a sick man in the list; we had one surface man on the list for one week, complaining of rheumatism in his limbs or something of that sort.

21,609. They do not suffer in their breathing at all?—No, except that when they come to get old I think that they get short of breath a little.

21,610. At what age do they become affected?—I do not think that they are affected until they are from 50 to 60.

21,611. You say that the air is blown into the level and blows the smoke out in two minutes?—Yes.

21,612. It blows it back?—Yes.

21,613. Is the cloud of smoke which is blown back annoying to the men at all?—No, it dies away immediately; you can hardly see in ten minutes or a quarter of an hour that there has been a blast there.

21,614. It is so fused with the air as not to be annoying at all?—Not at all annoying. That is the only level of that kind which we have; the other levels are all communicated at about every 20 fathoms.

21,615. How is the air in the other levels which have no blast?—Very good; we have communications from one level to another.

21,616. What is the greatest length which you go before you communicate?—Not more than 20 fathoms.

21,617. Do you carry good air for 20 fathoms?—Very good; there is no difficulty at all for 20 fathoms, and then we put up a rise.

21,618. Can the men do as good a day's work at 20 fathoms as they can at the commencement of the level?—I would not say that it is quite as good as at the commencement, but it is quite good enough; the candle will burn.

21,619. Can the men do as much work in a day at 20 fathoms?—I think that they can.

21,620. There is no difference?—No.

21,621. There is no difference in the price of driving?—None whatever.

21,622. Have you no lung disease among your men?—No.

21,623. Have you never had any?—I have never seen any.

21,624. Do you consider your men as healthy as the farm men in the district?—I think that they are; they live to about the same age; we have very little farming, they are almost all miners in our neighbourhood; Cwm Ystwith is a very barren place.

21,625. Do your miners of 40 look no older than the farm labourers at 40?—I do not think they do.

21,626. You have farm labourers in the country?—Yes, and I do not see much difference; I think that the miners live as long as the people in general about the neighbourhood, I do not believe that they look worse.

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Capt. J. Raw.

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21,627. Does a miner at 50 look an old man, or not?—No; we have some very fresh men at 50; there is a difference, of course; but some of our miners look remarkably well even at 60.

21,628. (*Mr. Kendall.*) You have been 41 years on these mines?—Yes.

21,629. Have you been all that time an agent, or part of it a miner?—All that time an agent; I was brought here by Sir George Alderson.

21,630. Have you ever worked as a miner?—Yes; —I was brought up as a miner from eight years old; I worked at eight years old on the floors, and worked till I was 21 in Yorkshire. I shall be 63 in August.

21,631. Out of the 150 men and boys working underground, how many do you think are above the age of 40?—I should say above 40.

21,632. How many do you think are above the age of 50?—Not more than from 15 to 20.

21,633. Have you any above 60?—We have 3 above 60; those are the only men that I can ascertain are above 60, that is underground.

21,634. Are you ever called on to inspect other mines in this country?—Yes; I have inspected a great many.

21,635. Are there any small ventures here put on by the small men, who have not much capital?—They are generally strangers who try the mines, often gentlemen; I cannot tell what they are.

21,636. Have you any mines worked by the poor men?—No; there are none here that I know of.

21,637. They will not give a grant I suppose to poor men?—I do not know; very few I think are able to speculate here.

21,638. Taking the average of the mines which you are called upon to inspect, how is the ventilation?—Pretty good; I have only been inspecting mines just starting, and not in general, mines of a long standing.

21,639. You have not inspected any deep mines?—No.

21,640. (*Sir P. Grey Egerton.*) The men pay 6*d.* a month to the doctor?—Yes.

21,641. And for that he attends to accidents as well as illness?—Yes.

21,642. Suppose that two of a family are employed in the mine, do they each pay 6*d.*?—Yes; father and son, if he is working underground.

21,643. If any of the children are working, do they pay 6*d.*?—3*d.* a month on the flooring.

21,644. And for that the doctor attends both the men and their families?—He attends the whole family for that.

21,645. How many have you employed on the surface?—I should think that there are about 140 or 150 young persons on the flooring besides carpenters.

21,646. How many have you employed above ground altogether?—Something like 150; we have nearly 300 on the mine altogether.

21,647. Do you employ boys and girls?—Yes.

21,648. At what age?—They go from nine years old up to I suppose 12, on the floorings, and after 12 or 13 the boys go underground.

21,649. Of what age are the women?—Of all ages.

21,650. What wages do they get?—10*d.* a day the best of the women, and the boys in general get from 8*d.* to 1*s.*, just according to their age and strength.

21,651. The women pay 3*d.* to the doctor of whatever age they may be?—Yes.

21,652. Have you sheds for them to work in?—Yes; we have very good sheds in our mine; they can work on a wet day every bit as well as on a fine day.

21,653. Taking your miners as a body, do you think that they are temperate men?—Very; in the last eight or ten years, very few of them have drunk anything at all, except a few of the young men of 20, and so on; almost every one of our miners is a teetotaller. It is a great place for teetotallism.

21,654. (*Chairman.*) You are acquainted with the smaller mines; is the pay of the men regular in the smaller mines?—There are some complaints that they do not pay the miners very well; they miss a month or two, and something like that sometimes in some of the smaller mines.

21,655. You think that the men complain of that?—They do rather.

The witness withdrew.

Mr. HENRY THOMAS, of Aberystwith, examined.

Mr. H. Thomas.

21,656. (*Chairman.*) You are general manager of the mines under the charge of Messrs. Taylor?—Yes, general superintendent.

21,657. How long have you been so?—I have been here about 2½ years. I have been in Spain for them for many years, and down at the Parys Mines in Anglesea.

21,658. How many mines altogether are there in this district which you manage for the Messrs. Taylor?—Eight, taking the group of the Lisburne Mines as one.

21,659. But there are several other mines worked by small companies in this district?—There are.

21,660. Do you know anything of them?—But little. I have been called in once or twice, but I have not had an opportunity of seeing many of them.

21,661. In the mines under your charge is the pay of the men always once a month, with a month in hand?—Yes.

21,662. Do you know anything about the cottages where the men live?—I have been in some of them.

21,663. Of what description are they?—They seem generally very poor indeed.

21,664. Do they generally belong to proprietors or to the men?—The men build a great many themselves, and there are a great many also held by proprietors.

21,665. Do the captains under your charge represent to you when the ventilation of a mine is not good?—Yes. We generally discuss the various bargains which are set, and all these points arise in the discussion of the workings, and we make the arrangements accordingly.

21,666. What kind of machine do you generally recommend to be adopted for ventilation?—We always use, and find them effective, fan blasts attached to pipes for forcing the air into the levels; but there is rather a difference of opinion about that, whether the air should be extracted or forced in. Many people like the one more than the other. I rather like exhaustion best myself, but there is no specific plan. We find that the one which we generally use is very effectual, which is that of forcing the air in. We take care to keep the pipes very tight.

21,667. What sized pipe do you use?—We generally use 4-inch pipes.

21,668. Of what material?—Galvanised iron or cast iron pipes when we have a stock of old pipes on the mines, but all the new pipes which we apply are galvanized iron pipes. They are very thin and light.

21,669. Which are about the deepest mines that you are working in this district?—One of the deepest mines is Frongoch. It is nearly 103 fathoms from the surface. It is now idle from the scarcity of water to work it.

21,670. Is the water now in?—Yes.

21,671. You depend upon a water wheel to pump it out?—Yes. We have it in contemplation to erect a steam engine there. East Darren is quite as deep; that is 116 fathoms down. There we are more regular in the work. We have a steam engine.

21,672. (*Mr. Kendall.*) I find that under the head of Lisburne Mines there are six mines named?—Yes.

21,673. You said that there were eight mines of Messrs. Taylor in this neighbourhood?—Yes.

21,674. Then the Lisburne group must count as one ?—Yes.

21,675. In all the Taylor mines that you have anything to do with you have the same system of pay ?—Precisely.

21,676. And also great attention is paid to the ventilation ?—As much as we possibly can.

21,677. I suppose you find that although ventilation is a very costly matter yet in the end it is a more economical mode of proceeding ?—Yes, unquestionably. The power of the miners is so much improved by it. You cannot get half the work from a man working in an ill-ventilated place.

21,678. Before you went to Spain did you at all superintend mines or work in mines ?—Yes.

21,679. Were you brought up as a miner ?—No, but I was always attached to mines. I was brought up at Penzance in tin smelting.

21,680. Are you a Cornish man ?—Yes.

21,681. When you were in Penzance were you mixed up with mining matters ?—No. I was with tin smelters there. After that I had a good deal of experience more, in Ireland and with London Companies working mines in Cornwall.

21,682. When in Cornwall did you pay much attention to the tin miners there and observe their state of health at all ?—Only generally.

21,683. Can you give an opinion as to the relative state of health of the miners there and of the miners here; which do you think are the healthiest class, those in this district or in Cornwall ?—I have not compared them, and therefore cannot say; we want statistics here, we are very short of sanitary statistics.

21,684. As far as the miners go in this district, are they a healthy looking class of people ?—They are not a healthy-looking class of people at all.

21,685. Can you distinguish as you go along the difference between a miner and an agriculturist ?—Not always, for the agriculturists do not look very healthy themselves.

21,686. What do you think that arises from ?—I attribute it to their imperfect cottages, they want more ventilation in their homes; most of the people in this country get a very sallow look.

21,687. Their habitations are poor ?—Most of them.

21,688. And very confined ?—And very confined; they only live in one room, or one room is divided by partitions of linen.

21,689. Have you ever gone into any of the miners' cottages ?—Yes.

21,690. Do they sleep many in a room ?—Yes, they do in many cases, divided in that way.

21,691. By simple sheets ?—By simple sheets; by blue and check cloth, which is very common.

21,692. You can see that their mode of ventilation is very imperfect ?—Extremely so.

21,693. Perhaps more so than underground ?—I fully believe it; I have a strong opinion on that matter. In many of the houses the windows only consist of one small pane or two or three small panes and without any means of opening them; they are completely built in.

21,694. Are any of the bed rooms up stairs without chimneys ?—I do not know. I am afraid there are very few bed rooms up stairs; there are some little lofts and some bed rooms up stairs.

21,695. What are the floors of the cottages ?—They are more often than otherwise of clay, and a sort of bog; sometimes you may sink into it if you sit down on a chair. I was in a bed room the other day of that kind where the agent of a mine was living.

21,696. Are these cottages built by the miners or let out by the proprietors ?—The miners build when they can, whenever they can get a little money to do it.

21,697. Do they build on leases for lives or on long leases ?—I think very often on long leases, and sometimes merely as yearly tenants at rack rent.

21,698. What do these cottages cost to build in your opinion, take a cottage 16 feet long by 12 fee wide ?—Perhaps 40*l.* or 50*l.*

21,699. Will they build such a cottage as that at their own cost without a deed ?—Not always; they sometimes get an allowance from the landlord as well, in the shape of timber; the landlord frequently supplies the timber and stone, they paying the carriage and doing all the labour of building; that is frequently done, but it is generally under some agreement; I do not apprehend that it is very often on lease.

21,700. However, be that as it may, the cottages are very bad, and the ventilation in them is very bad ? Yes; a better class of cottages is springing up now, the new cottages which the men are building.

21,701. (*Sir P. Grey Egerton.*) You are the general superintendent for Messrs. Taylor's mines in this district ?—Yes.

21,702. Have you captains under you for each mine ?—Yes.

21,703. Do you often visit the mines yourself ?—Yes, very often.

21,704. Do you go underground ?—Yes, occasionally.

21,705. Supposing that you are driving a new level, do you trust to the captain of the mine to inform you if the air is getting bad in that level, or do you satisfy yourself upon that point ?—It becomes a matter of general discussion; we always take the plans before us, and we consult as a body on those matters; we generally do it by a full examination of the plans and the distance of one winze from another, and they generally mention it in the first place; but when I go underground if I saw that the air was bad I should make a point of mentioning it myself, and we should talk the question over. Sometimes the necessity occurs to them, and more generally to them, and sometimes to myself, but I believe it is never omitted to be mentioned.

21,706. Supposing you are yourself satisfied that the air in a certain working is bad, have you the power of remedying it without applying to your superiors ?—Yes, certainly.

21,707. Are there cases where you do give an order for applying artificial ventilation where you think it necessary ?—It would be so if there was any question between me and the captains.

21,708. I am supposing that the air is bad ?—I should not generally interfere in that proceeding individually; it would become a matter of discussion and of general agreement with the captains themselves; we generally work in that way.

21,709. But as general superintendent, is it in your power to order an apparatus to be put up ?—Yes, I could do it.

21,710. (*Mr. Kendall.*) Without consulting the adventurers ?—Yes. I speak of such machinery as we are in the habit of applying in this country; I do not mean to say steam engines, and large water wheels, and those heavy things; but I mean a small apparatus, air pipes, and so on.

21,711. Is it the general system of Messrs. Taylor to have working plans kept up at all their mines ?—Yes.

21,712. So that you can consult them at any time ?—Yes; you can refer to them at any time you like.

21,713. (*Mr. Holland*). Are the miners' cottages much like the agricultural labourers' cottages ?—Very much the same, I think.

21,714. Which do you think are the best; is there any difference ?—I do not think that there is much difference.

21,715. Have they generally two rooms or not ?—Sometimes only one, I believe; generally two, I think.

21,716. Two or one imperfectly divided ?—Yes; I have seen that.

21,717. Have they fire-places or chimney corners with a large chimney ?—Yes; that is their best means of ventilation, sometimes so much so that it is extremeyl cold.

21,718. Are the cottages generally weather tight ?

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—No, I think not; that is to say the exceptions are very numerous.

21,719. Are they generally thatched or slated?—They are now more generally slated.

21,720. (*Sir P. Grey Egerton*). What provisions are there for the education of the children; are there national schools or private schools?—There are private schools which are attached to the mines; they are paid for by a sort of subscription from the miners, themselves. At Lisburne mines we retain 1*d.* per month from the miners, which is handed over to the schoolmaster in the ordinary way; and the schoolmaster gets that, and gets paid by other people in the neighbourhood, so that he makes a small living of it; he is not one of the certificated masters.

21,721. Is any support given by the owners?—Yes; the mine subscribes something.

21,722. Messrs. Taylor subscribe in addition to the penny subscriptions of the men?—Yes.

21,723. So much a year?—So much a year.

21,724. To the salary of the master, or do they nominate a certain number of children?—To the salary of the master. We can supply all these data accurately.

The witness withdrew.

Captain THOMAS BALL, of Level Vawr, near Aberystwith, examined.

Capt. T. Ball.

21,725. (*Chairman.*) Of what mines have you charge?—The Lisburne mines.

21,726. Does that include the group?—Yes.

21,727. About how many men have you working altogether in that group underground?—Somewhere about 300 miners; the number varies; it is sometimes more and sometimes less.

21,728. Are there any boys amongst them?—Yes; some.

21,729. What is the youngest age at which you allow them to go underground?—I do not know that we have any general rule for that; they go down to the little fan machines, but they walk in; and the parents take down their children very young now; we have some at 10 years of age, and I think that there are some under; I am not certain as to that.

21,730. Are most of the men working now by tribute or tut work?—The greatest number are on tribute, but we have increased our tut work lately.

21,731. What is the principal work which you are doing, are you driving?—We drive our levels and sink our winzes, and then stope the valuable ground.

21,732. At what ground are the largest number of men working at Level Vowr?—The principal part of the men are working away in the sides above the 60 fathoms level.

21,733. What is the deepest part?—130 fathoms.

21,734. Take the 103 fathoms level, namely Glog Fach, have you any artificial means of ventilation?—Not at that level.

21,735. At what level have you to use artificial means of ventilation?—We had a fan machine at the 73, and for the last two or three days before your Lordship came there, we threw it away, and put in a trap-door for ventilation, but it failed; we had to apply the machine again.

21,736. Have you done anything with respect to the shaft where the men complained of the air when sinking the shaft?—Yes, there is plenty of air there.

21,737. How have you remedied that?—We have fixed a blast machine, and when there is any wind there is plenty of air, and when there is no wind they put the fan machine to work.

21,738. What distance is Level Vowr driven?—700 fathoms from the mouth, but 240 from the point of ventilation.

21,739. How do you ventilate the end of that?—With a fan blast.

21,740. How is it worked?—With a 12 feet water wheel.

21,741. Whereabouts is it placed?—About 30 fathoms east of Addy's shaft; the current comes in, it is at the side of the level.

21,742. And you find that that gives plenty of ventilation?—Yes, it gives plenty of ventilation for the men to work, and we generally find that it clears the smoke.

21,743. What do the men pay for candles?—9*d.*

21,744. And what for powder?—8*d.*

21,745. What allowance of candles have they per week?—2 lbs. per man.

21,746. What number of hours shift do the men work?—Eight.

21,747. Have you any women working on the mine?—Yes.

21,748. Who is the doctor attached to your mine?—Dr. Rowland.

21,749. Is he appointed by the company?—He is appointed by the men, it is the men's choice.

21,750. What deduction is made from the men for the doctor?—Sixpence per man per month.

21,751. Does that include sickness as well as accident?—It includes the family.

21,752. Who keeps the account of the collection of the sixpences?—It is kept in the cost book, it is deducted from the men's wages and handed over to the doctor. It is 6*d.* only, nothing extra for attendance of families.

21,753. Is the account kept at the mine?—Yes, and it is deducted the same as any other material.

21,754. (*Mr. Kendall.*) How long have you been under Messrs. Taylor here?—I have been under Messrs. Taylor all my life, but I came here in 1839.

21,755. Where did you work before you came here?—I worked in Wheal Betsey and Wheal Friendship; I worked at a mine from boyhood.

21,756. You worked your way up to your present position?—Yes.

21,757. How long have you been an agent?—About 27 years.

21,758. Was Wheal Friendship a very well ventilated mine or not?—It was considered so then.

21,759. What depth did you ever work there?—To the 210; I only worked very little in Wheal Friendship; Wheal Betsey was my spot.

21,760. Did you ever work as deep as the 210?—Yes.

21,761. Do you recollect how long it took you to get up or down there?—No, I am not prepared to answer that, but we used to follow up the machine waggon; the lode lay pretty flat there, we could run as fast as the waggons; about a quarter of an hour, I should think.

21,762. The lode is very much inclined there?—Yes.

21,763. The underlay of the lode is very rapid, how many feet in a fathom?—I do not recollect.

21,764. You could run up?—Yes, pretty easily on the ladders.

21,765. Were the miners there a healthy class of men?—I do not know that there was much complaint about their state of health.

21,766. Can you draw a comparison between the men there and the men here; which are the healthiest men?—I think that the men here are the healthiest.

21,767. Do the men here work as long as they did there?—I do not think that the men here work as hard as the others did nor as many hours; I have never seen such hard working men out of Cornwall or Devon as I have in it.

21,768. You mean the Cornish men?—Yes.

21,769. Did you ever work in Cornwall?—I did work for two months at the Great Fowey Consols. That is all my experience in Cornwall.

21,770. (*Chairman.*) Do you know anything of the other mines in this district, the smaller mines?—I do not know much about them; I have been out in Spain six or seven years, and I have been up in North Wales also.

The witness withdrew.

Captain Robert Northey, of Bwlch Consols, Goginau, examined.

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Capt. R. Northey.

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21,771. (*Chairman.*) Of what mine have you charge?—I have charge of Gelley Riern and Bwlch Consols and Bwlch Stylleu.

21,772. About how many men altogether have you working under ground at these different mines?—I have about 18 or 20 at Gelley Riern, and about 35 at Bwlch Consols, and six at Bwlch Stylleu; we are doing nothing there but sinking a shaft.

21,773. What is the depth of the shaft which you are sinking now?—It is now sinking under the 24.

21,774. Have you any means of ventilation there for the men?—I have a duck machine 12 feet long which will give air enough for any 500 men in the world; the men can work there as well as they can out in the street.

21,775. What is the longest level which you are driving in Gelley Riern?—About 200 fathoms.

21,776. How far is it driven from any winze or rise?—There are only two men working in it. It is driven I should think from 70 to 80 fathoms from any winze or rise.

21,777. They only work eight hours in the 24?—They only work just as they please; they never stop there after the blast; they do not complain a bit of the air.

21,778. They only work a few hours there?—Just so.

21,779. There are no artificial means used there?—No.

21,780. Do you think that the men suffer at all from working in bad air?—I do not think they do in this county; in Cornwall they do; I have suffered from it, and suffer from it to this day.

21,781. Are you affected in your breathing?—No, but I am dreadfully rheumatic in consequence.

21,782. Where did you work?—In the Great Consols about seven years, and I worked in East Wheal Rose, and I worked in Wheal Penrose.

21,783. How long is it since you worked in Cornwall?—I have been to America since then; I should say that it was 22 years ago, but I have been an agent in Cornwall since then.

21,784. At what mine?—The Allemanner mine in Gowl Sithney Parish, for a very short time; I did not like it.

21,785. Do you think that the men working in Cornwall are more affected than those in this district?—Yes, the mines are a great deal deeper and hotter where I have been; I have also worked in Devonshire under Dartmoor, and in the Polberrow Consols, and elsewhere.

21,786. Have you had anything to do with any of the other mines in this neighbourhood?—I am opening a little mine, but I am not doing anything underground, I am only working upon the surface.

21,787. Are you working by tutwork principally?—Principally.

21,788. How is the pay of the men, is it a month in hand?—A month in hand.

21,789. Are they paid regularly every month?—I never missed a day in my life; I would not have anything to do with the mif the Company did not forward me the month's pay.

21,790. (*Mr. Kendall.*) What is your age?—I was born in 1818.

21,791. You worked in East Wheal Rose mine and in the Great Consols; at what depth did you work in the Great Consols mine?—I worked in the Great Consols mine down to the 210.

21,792. While you were there was the heat too great before they connected with the shaft and got air?—I worked in the sumpt shaft as we term it, the engine shaft. Th y always sank two shafts there, about 15 feet one from the other, and they would go down both together, and there is always ventilation there.

21,793. Was it very hot there or not?—I often worked without a shirt.

21,794. Did you catch cold when you came up to the surface, did you suffer from it?—I suffered from it as to rheumatism, and I do so to this day.

21,795. In consequeuce of the change of atmosphere, and so on?—Yes.

21,796. You had good changing houses there, had you not?—Yes, and a good fire; but, doing the best we could, we suffered in that way.

21,797. How deep did you work in East Wheal Rose mine?—About 160 fathoms.

21,798. That is a lead mine?—Yes.

21,799. From your experience is the air different in a lead mine from what it is in a copper mine?—I am certain that the atmosphere is much more cold in a lead mine.

21,800–1. But how is it as far as the air goes?—I do not know that there is a great deal of differenee, I should rather take a lead mine if I was going to work in a mine, because it is cooler.

21,802. At the same depth?—At the same depth.

21,803. With regard to air, from your experience can you speak as to the smelling of bad air?—Yes.

21,804. Can you detect it?—Yes.

21,805. I do not mean the air from the powder smoke?—No, I can detect bad air, I could not detect air a little impregnated.

21,806. Can you detect bad air before the candle begins to detect it by burning dimly?—Yes, you can tell it by the exertion of your body, if you are working in it.

21,807. Your body feels languid?—Yes; I can hardly describe the feeling.

21,808. And then you at once know that there is bad air?—Yes, I can tell it in a minute.

21,809. With the candle burning well?—Not well, you could not move the candle with the dexterity that you could in good air, without its going out, but still it would burn.

21,810. Could you at all detect the bad air before you could see any difference in the candle?—We should say that the air was close; we should not call it bad.

21,811. The air is close even before the candle begins to show any signs of it?—Yes.

21,812. (*Mr. Holland.*) Do you feel a diminution of strength from the air being bad before the candle shows it?—Not in youth; I should now, I suppose.

The witness withdrew.

Captain Nicholas Bray, of Llwynmalees Mine, Tregaron, Cardiganshire.

Capt. N. Bray.

21,813. (*Chairman*). How long have you been in Wales?—From 10 to 12 years.

21,814. Of what mine or mines have you charge?—Llwynmalees mine, and one in Pembrokeshire.

21,815. How many men have you working underground in Llwynmalees?—Until the last fortnight or three weeks I had about 24 miners; but we are now suspended in consequence of being short of water.

21,816. You depend upon the water for pumping?—Yes, altogether.

21,817. What is the lowest level?—46 fathoms from the surface.

21,818. Do you go in by the day level?—No; we descend by shafts.

21,819. Before a water stopped you, were you driving or sinking?—Driving.

21,820. Are the men principally on tut-work?—tut-work and tribute, six are on tribute.

21,821. How far were you driving from any winze or shaft?—We have two shafts down to the bottom level; the 46 fathoms level; they are about 40 to 45 fathoms apart, but our furthest winze for ventilation is about 30 fathoms.

21,822. Are you obliged to employ any artificial

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means, or can you do without it?—We can do without it; we have ample air, because we have a current of air passing from one shaft to the other; at the fore breast the air is as pure as it is here.

21,823. What do the men pay for candles?—I charge them 6*d.* per lb.

21,824. And how much for powder?—The same; it does not make any difference, because if we charged more for candles, we should have to give them so much more per fathom, to allow the men to have their wages.

21,825. What are the gettings of the men?—From 3*l.* to 3*l.* 5*s.* a month, perhaps 3*l.* 10*s.* sometimes. I dare say that our men will average from 3*l.* to 3*l.* 10*s.*; we generally set the work at about 15*s.* a week, a little over rather than under.

21,826. Have you any boys working below?—Yes.

21,827. With their fathers or alone?—I really cannot say as to that.

21,828. What age is the youngest?—I should say that our smallest boys are from 12 to 15.

21,829. (*Mr. Holland.*) Do you work chiefly levels from one shaft to the other?—Yes; we have ventilation from one shaft to the other.

21,830. Have you any close air from one to the other?—No; I had a machine to push in air from the 36 to the 46.

21,831. Does that machine enable you to keep pure air the whole time?—Yes, it will drive the smoke back.

21,832. Is one shaft up-cast and the other down-cast?—No, it depends upon the wind; sometimes you see the smoke going up the lowermost one, and at other times up the highermost one; one is a little higher than the other.

21,833. (*Mr. Kendal.*) Have you worked in Cornwall at all?—For many years; I served my apprenticeship there.

21,834. Where did you work?—In the United Mines, Wheal Buller and the Great Consols, in Gwennap.

21,835. You have been in some of the deep mines in Cornwall?—Yes; I suppose the United is one of the deepest in Cornwall.

21,836. Can you say at what heat you were working?—I cannot say; we had a hot level, and one day the thermometer stood at 106°.

21,837. Did you work without your shirt?—I never worked there. It was very cold where I was working.

21,838. How many years have you been mixed up with mining matters, both as agent and otherwise?—From 10 years of age up to the present time.

21,839. How old are you?—I am about 38 now.

21,840. Then you have had nearly 30 years experience?—Yes, and not only that but my father before me. I can say that I was bred a miner.

21,841. Is more attention paid to ventilation now than there used to be when you began?—I think there is on the average. Miners now, I think, will not work in places where they worked formerly.

21,842. They are sharper?—They are not only sharper but they have more means now. Persons can emigrate to some other place.

21,843. They are better off?—Yes.

21,844. They are more independent?—They are more independent than they were in my younger days, I think. When I was a lad if you did not work there you might go, and you would find some difficulty in getting a situation elsewhere.

21,845. Ventilation is forced on the adventurers more than it used to be?—I think the mines are better ventilated on the average.

21,846. Taking the Cornish men and the men here, as far as health goes, do you see any difference?—I see but very little difference, except that I do not think that they live quite as well in this country as they do in Cornwall.

21,847. Which men work hardest?—If you lay out a bait for a Cornish man, I think he will work a little harder than a Welchman will on the average.

21,848. But he must be paid better?—He must be paid better, certainly.

21,849. You have not been in Cornwall for a long time, have you?—I think it is about five years since I was down there.

21,850. Which is the most temperate miner of the two, the Cornish man or the Welchman?—I do not think there is much difference.

21,851. Wages are lower here than in Cornwall, are they not?—I cannot say what are the average wages in Cornwall.

21,852. (*Mr. Holland.*) Are men more awake to the necessity of ventilation now than they were when you were a youth?—That I really cannot say. If the air is a little impure, men complain, and then of course we rectify it as soon as possible; and not only that, but there cannot be a better mine than ours is at the present moment, because we have two shafts down drawing from one shaft to the other.

The witness withdrew.

Mr. ROWLAND ROWLAND, of Strata Florida, near Tregaron, examined.

Mr. R. Rowland.

21,853. (*Chairman.*) Are you the appointed medical man to any of the mines in this neighbourhood?—I am to nearly the whole of the mines on the south side of the river Rheidol.

21,854. What arrangement is made with you for attending the miners?—I am paid 6*d.* per man per month.

21,855. Are the company responsible to you, or do the men pay you?—The company pay me.

21,856. They do not guarantee you a certain sum?—No.

21,857. How are you elected?—I was appointed by the company in 1841, and I have continued to attend the mines ever since.

21,858. Are there any other doctors resident in this district besides yourself?—There is no doctor resident in this immediate district but myself. My brother has the north side of this river, and this river is our boundary. My son assists me; he is a qualified practitioner.

21,859. By that arrangement do you attend the miners in case of sickness as well as accident?—Everything.

21,860. And their families?—Their wives in every case but midwifery, and I am paid only half a guinea for midwifery, because I am in the pay of the company.

21,861. Do you attend others in the district besides miners?—Yes.

21,862. Do you see any difference in the health of miners and others?—I think I do.

21,863. In what way should you say the miners are affected differently from others?—I think that it is in consequence of inhaling air containing particles of matter. I think that that is the cause of it, and the effect is that they are pale and more subject to coughs, and they decay sooner than agricultural labourers.

21,864. Do they come to you in an early stage of the disease?—Yes, they come directly.

21,865. Have you had any cases under treatment where you have been able to give entire relief?—Yes, a great many—when they come early I very often give, when they work underground a great deal, an emetic or ipecacuanha, not that I think it will evacuate anything from the lungs, but still it has the effect of causing a discharge from the numerous membranes of the lungs, and I give them expectorants, and they throw off the foul matter which has been inhaled by working in foul air.

21,866. Do you consider that their digestion or the organs of the stomach are affected by their work?—I think that the lungs are more affected than even the stomach.

21,867. But does it show itself in any way by an

affection of the appetite or in their general state of health ?—Yes, I think that they do not eat so heartily as the agricultural labourers.

21,868. Do you ever recommend them not to work at the mines ?—Very often; I am obliged to tell them that, and they know it now themselves. When they are beginning to be affected underground they say, "what do you think about my working underground ?" I reply, well really I think you have now worked for many years underground and your breath has become short. I recommend you to try to have something to do on the surface or to go out to work with the farmers; and if they do that the recover themselves a great deal, but if they go back to the mine they very often die in less than 12 months.

21,869. Should you say that the life of the miners is shortened by their work ?—Decidedly; I think from my observation of the last 20 years or more, that 10 years would be taken from the life of a man of 60; a man of 50 as a miner would be as old as another man of 60.

21,870. Do you think that there is any difference from a man beginning as a miner at a more mature age ?—Yes, I think that the agricultural men will stand it best. I do not think that being accustomed to it like an apprentice is a good thing. I think that they die sooner if they go earlier, that is my observation. I have no particular statistics, but I know that people who have been in agricultual labour till they grow up pretty strong stand it best; that is may experience.

21,871. You have been here 20 years; do you see any improvement or otherwise with regard to the health of the miners ?—The mines are worked a great deal more extensively now than they were 20 years ago, and the mines have been only in working about 25 to 27 years, and then there were fresh people coming, and the effects of working were not so apparent then as they are at present. I think that it is progressing rather if anything, because people have been more underground, more at it; mining was fresh in those days.

21,872. Have you ever been underground yourself ?—Yes.

21,873. Have you ever yourself perceived where the air has been bad ?—Yes, very much.

21,874. From the sensation which you experienced there, should you say that it was likely to affect the men there ?—Yes, certainly. If the air was rather confined without plenty of circulation, it would be very unpleasant indeed to go to an end for an hour or two.

21,875. Do you think that the impurity of the air arises from any deficiency of oxygen, or from the powder smoke and other impurities in the mine ?—I think that the sulphurous acid would be the principal thing. I do not think that they are so confined as you are when breathing in a public room. I think that the mischief does not arise so much from the oxygen being consumed as from the deleterious effects of the powder smoke and the dust.

21,876. Do you think that there is much dust in these mines ?—Yes, a considerable deal.

21,877. And you think that likely to affect the men ?—I think it is very likely to affect the lungs, and to bring on bronchial affections.

21,878. Do you think that they are more likely to get cold on coming to the surface ?—It is their own fault. I think that they do get cold; I have known many instances where they have done so. The mines provide a changing room for them, and from the smith's shop there are large pipes to throw their clothes over, but lately the people have wanted to throw something over their wet clothes and go home as they are; they would rather change at home. They have not attended to that as much as they might have done.

21,879. And therefore the state of their health predisposes them to cold if they do not take care ?—Yes, if they do not take care.

21,880. (*Mr. Holland*). Are the men often hot as well as wet when they come up from the mine ?—No, these mines are not hot.

21,881. There is not much climbing in them, is there ?—Not as a rule; our mines are not worked deep or hot.

21,882. Have some of the mines the reputation of being more unhealthy than others ?—I think that Cwm Ystwith on the whole, may be, if anything, rather more unhealthy.

21,883. How does it differ from the others; what makes it more unhealthy ?—I think it is rather deeper I do not know why it should be so.

21,884. Is it more dusty than the others, or the same ?—About the same, I think. Cwm Ystwith is a little narrow valley, and people do not go out of it; and they marry one another from generation to generation; nearly all of them are Howells or Burrells, and they are rather weak people.

21,885. Have a large proportion of the miners who survive 40, the disease which you speak of ?—A great many die under 40.

21,886. Of those who survive 40, are a large proportion affected in their lungs ?—Yes, a good many from 40 to 50.

21,887. With cough and expectoration ?—With cough and an expectoration of a bluish substance from the lungs; bluish phlegm.

21,888. Have you ever been able to detect solid particles in the phlegm; have you looked for them ?—Yes, I have looked with a microscope. I do not think that I have discovered any particles of lead at all.

21,889. Have you discovered any particles of grit ?—Yes, I have.

21,890. And of carbon ?—Yes; sometimes they spit quite black for days after coming out of the mine.

21,891. How long will they spit that particular sort of black spit after leaving the mine ?—For days and sometimes weeks; but the sputa of people who have been working in mines even for two years is rather darker than usual. From that kind of bronchitis which they have, there is a darker sputa than we have in other people. I think that it is from some affection of the lungs. I have not had many opportunities of a post mortem examination, but it is a darker secretion.

21,892. Do you think that the cottages of the miners are materially different from those of the agricultural labourers ?—No.

21,893. Are they generally very small ?—They are generally very small and very dirty too, I must say; there is not sufficient care for cleanliness.

21,894. Is it common to have the window fixed in the wall so that it will not open ?—It is common to have the windows without any opening, but the doors are very often very bad, and the chimney is big, so that they have a ventilation. There is only one room generally, and the door is almost always open.

21,895. Is it common for the whole family to live in what is really one room, that is to say in one room only partially divided ?—No, not very often; they generally have two or three rooms; they have a door to go into one room, and then there is a little room at the other end, and then a little loft thrown over the building for the children to sleep in.

21,896. There are three compartments ?—Yes, that is the general average of the houses.

21,897. When those cottages are closed at night, does the air get very bad ?—No; I have seen in towns, really in large respectable houses, the air a great deal worse.

21,898. When you have attended at night have you been annoyed by bad air ?—No, not much; there is cold air coming in through crevices.

21,899. (*Sir P. Grey Egerton.*) What is the general health of the population of this district apart from the mining population ?—The health is pretty good.

21,900. What are the prevalent diseases ?—We have all diseases. Sometimes we have epidemics, such as scarlet fever; many years ago we used to have more fevers than we have now; we do not have many fevers now. We had a very bad epidemic, the

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scarlet fever, at Cwm Ystwith a few years ago; I think that it was entirely from contagion, it came from another place; one family went to a funeral and brought it home and got ill, and then it followed from one side of the river to the other, and then one family came from the hill a long distance to this side, and it spread.

21,901. Did it spread among the mining population as much as among the other inhabitants of the district?—Quite as much.

21,902. Have you much phthisis among the poor people here?—Yes, we have a good deal of phthisis.

21,903. Do you find that miners are as subject to tubercular disease as the people who work upon the surface?—Quite as much. We cannot always distinguish; there is a bronchial ulceration of the lungs, with difficulty of breathing, and cavities forming, so that we do not know exactly whether it is from original phthisis or whether it is from ulceration from particles.

21,904. Would not that rather be called emphysema of the lung?—Emphysema would be from ulceration and wind getting into the vesicles.

21,905. Have you ever seen a case of miners' asthma graduating into phthisis or terminating in phthisis?—Yes, I have.

21,906. Is that common?—No. I have had it in people from 40 to 45. I have seen some cases of it.

21,907. Have you ever seen such a case where tubercular disease has not been constitutional in the family?—Yes; I have had a case lately, where a man died. He was a miner, and I think that he was very healthy till he worked in the mines, and then he became phthisical; he was a Cornish man.

21,908. Did any of his family die of tubercular disease?—I did not make much inquiry as to that. It is almost impossible to decide whether they are phthisical or asthmatic; for a long time they feel as if they are asthmatic, but from that they get phthisical.

21,909. Would not an examination by the stethoscope give you the diagnosis of the two diseases?—Yes, but not distinctly enough; we cannot trace it now; any consolidation of the lung would be very nearly the same as tubercles.

21,910. But you could distinguish between hepatization of the lung and abscess of the lung by the stethoscope?—Yes, that would be nominally.

21,911. Do you ever find the miners disease complicated by heart disease?—Yes, in some cases we do.

21,912. Of what description is the heart disease—is it hypertrophy of the heart or valvular ossification?—We have a good deal of rheumatism, and therefore have valvular disease in miners in consequence of it. They are exposed to cold, and then their hearts get affected; but I know that we have the diagnosis also of hypertrophy in the miners' consumption, but I do not think that we have many cases of it. I think that ventilation in the mine is the great thing which we want. If we have sufficient ventilation, I think that that is the thing which we particularly require.

21,913. (*Mr. Holland.*) How would you guard against the dust?—It would blow the dust away.

The witness withdrew.

Mr. EVAN ROWLAND, of Goginau, near Aberystwith, examined.

Mr. E. Rowland.

21,914. (*Chairman.*) How long have you been in this locality?—About six years.

21,915. What mines do you attend as medical man?—Goginau, Cwm Erfin, Cwm Sebon, Bron, Floyd, Bwlch, and other mines.

21,916. Do you make the same arrangement with all?—Exactly the same with all of them.

21,917. Will you state what the arrangement is?—My arrangement with them is 6*d.* per head per month; that is my pay.

21,918. The company secures that to you?—Yes; I get it from them every month.

21,919. Does that apply to attendance for sickness as well as hurt?—It is for sickness as well as hurt; for the man who is working, but I am obliged to supply medicine for the wife and family, but no attendance.

21,920. Do other patients come to you besides miners?—Yes, a good many.

21,921. Agricultural patients?—Yes, a great number.

21,922. Have you an opportunity of comparing the different classes?—I have, so far as my experience goes.

21,923. Do you think that the miners are subject to any peculiar disease?—They are subject to a cough which I believe is brought on through damp and foul air at times.

21,924. Do you find it prevail to any extent?—Not a great deal.

21,925. Do they come to you in the earlier stages of the disease?—They come when they begin to cough.

21,926. Are you able to relieve it?—Yes, in a great measure.

21,927. Do you ever find cases where you recommend them to give up working?—Very few; at Goginau and that neighbourhood, they are more birds of passage; they are not the same as they are on this side, brought up in the neighbourhood, and living here; very few people live at Goginau now who were living there 20 years ago.

21,928. Are they Welsh?—Most of them are Welsh, a good many are Cornish.

21,929. Do you see any difference between a man going to work there young, being trained up to it from a boy, and one who begins it at a mature age?—Not a great deal in our mines, most of them are very well ventilated.

21,930. Have you ever been down yourself?—Yes; I have been down Goginau, and Cwm Erfin; sometimes when they are going to hole a shaft, there may be a little foul air.

21,931. In coming to you, do the men ever state what they believe to be the cause of their illness?—No, I have never heard any one say that it was the foul air which caused it; I believe that the mines with us on that side are very well ventilated.

21,932. (*Mr. Holland.*) Is there an excess of lung disease among the miners, as compared with other men?—They are more subject to cough than the agricultural labourers.

21,933. Is that cough more obstinate than with the agricultural labourers?—Yes, a great deal.

21,934. Does it come on at any particular time of life, or is it at all ages?—It comes at all ages, but I find that it comes most frequently about 40 years of age.

21,935. Do those who get to the age of 40 have habitual cough?—Yes, they are very subject to cough.

21,936. Do you think that a large proportion of the men above 40 are quite free from cough?—I believe about one half at an average.

21,937. They are not permanently ill?—No.

21,938. Do they often die of the cough?—Very seldom. I have had a little to do with different districts, and I find that the mines on our side are a great deal better ventilated taking them altogether, than in any other part of the country, I believe.

21,939. Do the men complain much of dust?—At times they do, not a great deal; there is no sulphur in the mines about here, so that they do not complain so much of it.

21,940. You know the disease which is commonly called miners' asthma or miners' consumption?—Yes, very well; I have seen it in Cornwall, but I have not met with it once in my neighbourhood.

21,941. Where have you seen it?—I saw it when

I was visiting a friend of mine in Cornwall, he showed me several cases of it there.

21,942. You have never seen the disease here?—Never, not an instance of it.

21,943. (*Chairman*). Do you know a man of the name of John Evans Roos; is there any patient of yours of this name?—I know a young man of the name of Roos, he is living at Goginau.

21,944. Is he at all affected in his breathing?—I do not know, he is only living there; I have never been called to him.

21,945. Do you know another man of the name of William Ishmael?—No; I believe that there is a man of that name living here about.

21,946. Do you know a man of the name of Evans?—No.

21,947. Persons of those names have not been under your care?—Never. The mines in our neighbourhood are very well ventilated.

21,948. (*Sir P. Grey Egerton*). How are the dwellings of the poorer classes in your neighbourhood?—Very poor. I was going to suggest whether we could not get them to clean their houses better; I tell them that it is very unwholesome that they should keep their houses in the way they do. All that I can get from them is, "That is the way I have seen my father do; my father lived to old age, and I do not see why I should make any difference."

21,949. But they are habitually cleanly in their habits?—Yes, very much so on the hills here.

21,950. Are the cottages small?—Very small.

21,951. How many rooms have they, generally speaking?—About a couple.

21,952. Are they properly ventilated?—No, they are very badly ventilated, and the cesspool is close to the house, as are also dungheaps.

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21,953. Do you find that the families of the miners suffer much constitutionally from these habits of dirt?—I find them in a great measure causing fever in the houses. The miner is better off than the family. During the last six years that I have been living here there has been a constant fever, typhus and typhoid and scarlet fever, upon the hills from Goginau up to Stelvagerrig.

21,954. You attribute that in a great degree to the uncleanly habits of the people?—Yes, and the dampness of the cottages.

21,955. And their contracted dimensions?—Yes.

21,956. From your general knowledge of mankind, do you think that if they had better houses they would take a pride in them and be induced to keep them more cleanly, or do you think that it is an inveterate habit of untidiness?—As a general rule it is what they have been used to, but some are building new houses now, and they keep them clean when they get new houses. If there was a possibility of it I should like to get an Inspector, or some law.

21,957. (*Chairman.*) There is a sanitary provision?—We cannot get it put into force here. I have tried all that I possibly could with the Board of Guardians.

21,958. (*Mr. Holland*). Do miners at 50 look older than other men at 50?—They will look more pale and sallow.

21,959. Do they look decidedly older or not?—I am sure I do not know.

21,960. You have not noticed that?—No, I have never noticed that.

The witness withdrew.

Adjourned to To-morrow at Aberystwith.

ABERYSTWITH.

Saturday, 25th July 1863.

PRESENT:

The Right Hon. Lord KINNAIRD, K.T.	NICHOLAS KENDALL, Esq., M.P.
Sir P. GREY EGERTON, Bart., M.P.	P. H. HOLLAND, Esq.

The Right Hon. Lord KINNAIRD, K.T., in the Chair.

Mr. JOHN GRAHAM WILLIAMS, of Gloucester Hall, near Aberystwith, examined.

21,960. (*Chairman.*) I believe that you are agent for some properties in this neighbourhood?—I am agent for the Gogerddan estate, belonging to Mr. Pryse Loveden.

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21,961. Are you acquainted with the circumstances of the miners residing in that neighbourhood?—I am, generally.

21,962. I believe there was a petition presented to Parliament this year from that district?—There was. There were several petitions.

21,963. They were from miners complaining of the non-payment of the sums earned by them in working in the smaller mines?—The complaint, I believe, was of the great difficulty in obtaining their wages.

21,964. I believe you also wrote to Lord Palmerston and to the Home Office?—I did. Last year I wrote to Sir George Grey; last June, I think it was.

21,965. Does that state of things exist generally throughout the mines, or are there exceptions?—There are exceptions.

21,966. What are the exceptions?—The exceptional mines are all those worked by the Messrs. Taylor; they are most regular and punctual to the hour, and as far as I have ever heard, they have never missed one payment since they commenced working the mines in this part of Cardiganshire.

21,967. Then I suppose it is the smaller companies whose payments are so irregular?—It is the smaller companies.

21,968. Where this has happened, have the mines been worked for some time, or are they very recent?—They are very ancient mines.

21,969. And they have been working?—Continually working, the lessees changing occasionally.

21,970. Has the system of non-payment or irregular payment been a general practice, or is it a new thing which has arisen lately?—I believe that it has increased considerably within the last 10 years.

21, 971. I believe you can bring witnesses before us from amongst the men who can speak to that point?—I can.

21,972. Have any means been taken to recover the wages by the men?—Yes, there have.

21,973. Have they succeeded?—In some instances, and in many instances at a loss; in fact, the opposition on the part of the directors has been very great, they throwing themselves into bankruptcy, and saying, "We are too poor."

21,974. (*Mr. Holland.*) The opposition would be on the part of other creditors, would it not?—Yes, as well as the directors throwing themselves into the Court of Bankruptcy.

21,975. (*Chairman.*) Is there any particular case where you know that large sums have been due to the

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Mr. J. G. Williams.

25 July 1863.

men and yet they have not been able to recover them?—Yes, particularly in respect to a mine called the Darren mine. It is one of the oldest mines which we have in this country. It was worked by Sir Hugh Myddleton and Sir Humphrey Mackworth. This is a list which was furnished to me by Mr. Hugh Hughes, the Solicitor of Aberystwith, in whose hands these poor people have placed themselves, to try to recover their money. Some of these men I can produce before you.

21,976. What is the total amount due?—According to the list now in my hands, it amounts to 508*l.*

(*The Witness delivered in the following Paper.*)

BALANCE of WAGES due to the Miners of the "Great Darren Mine," July 1862.

	£	s.	d.
William Vaughan and partners	24	17	8
David Vaughan and partners	38	6	2
William Edwards and partners	5	6	3
David Edwards and partners	16	14	4
David Edwards, labourer	5	0	10
John Jenkins and partners	43	13	2
John Lewis and partners	15	12	4
John Morgan and partners	6	7	2
John Edwards and partners	11	5	11
Jenkin Edwards, labourer	0	14	0
Joseph Greavies, labourer	1	13	8
John Nicholls, miner	17	4	7
William Lewis, miner	8	0	8
James Lewis, miner	10	6	8
Jonn Vincent, miner	15	3	8
Evan Lewis and partners	37	12	0
James Lewis and partners	20	16	0
David Mason, labourer	2	5	0
Isaac Mason and partners	15	0	0
John Jones and partners	11	2	9
Thomas Jones, labourer	2	2	0
Richard Evans, miner	6	10	0
Thomas Rodenett, miner	7	15	2
Thomas Allen, miner	2	2	11
Ann Thomas, ore washer	1	1	3
John Oram, miner	6	13	0
John Lewis, smith	16	8	4
Lewis Samuel, carpenter	15	1	4
Evan Jones, carpenter	6	7	0
John Owens, carpenter	2	16	8
John Hughes, cooper	7	0	0
Elizabeth Morgan, widow, horses drawing at the whimsey	28	5	6
Ann Evans, widow, for drawing timber to the mine	30	19	6
Isaac Jones, ore carrier	16	7	6
Morgan Morgan, ore carrier	9	7	2
Boys and Girls, washing ore in the months of March, April and May	42	2	11
	508	3	1

21,977. These men have no means of recovering in the county court?—The expenses incurred in the county court are so heavy that it deters them from taking proceedings.

21,978. Are you aware whether these men are induced to work nothwithstanding the uncertainty of payment, by the offer of higher wages?—That I cannot say, further than at the expiration of the month they ought to be paid, but no money comes down. The agent says, "Carry on for another week or fortnight; the money is sure to come down."

21,979. And so they are induced to work on?—Yes; and perhaps instead of 100*l.* or 150*l.* coming down, they will send 20*l.* and it must be be distributed in shillings amongst the men to keep them quiet.

21,980. (*Mr. Holland.*) To keep them alive?—Just to keep them alive.

21,981. (*Chairman.*) Can you state anything with regard to the cottages in this district?—I know most of them.

21,982. Do you think that they are convenient and conducive to health?—I cannot say that they are.

21,983. Do the cottages generally belong to the miners or to the proprietors?—In some of the mines which are up in the mountain, there are what are called barracks erected for perhaps 100 men; they come up on Monday morning and leave on Saturday evening. Those barracks are very healthy. Then at other mines the proprietors have erected a row of cottages. Those are kept in very nice order; but it is the cottages down in the lowlands, if I may use the expression, which are in a bad state.

21,984. Do those in the lowlands belong to proprietors, or are they built by the miners?—They are mostly leaseholders.

21,985. Do the proprietors grant a long lease?—60 years.

21,986. (*Mr. Holland.*) Is the leaseholder a leaseholder of a large piece of property?—No; we grant we will say enough for a cottage and a garden.

21,987. The cottager himself is the leaseholder?—Yes. Mr. Loveden we will say is the lessee, and he grants a series of cottages and enough for a garden to each cottage.

21,988. (*Chairman.*) When they rent a cottage by the year, what rent do they pay?—It varies. Perhaps 12*s.* a year, but seldom above 20*s.* a year.

21,989. That is for the lease of the ground?—Yes.

21,990. What would be the cost of erecting one of the miners' cottages?—It would depend upon circumstances, from this cause—most of the miners' cottages are erected of mud, because we have no building stone in this country. We are very badly off for building stone, and very badly off for slates and lime. We have neither slates nor lime, nor good building stone in this part of the country at all, and therefore they are obliged to erect the cottages of mud.

21,991. (*Mr. Holland.*) Are they roofed?—They are roofed now. I do not now allow any mud cottages to be erected upon the Gogerddan estate; so that in selecting ground for the miners' cottages, I get them as near to the mine as I possibly can, in order that they may have stones taken up from the mines.

21,992. What is the annual value of the cottages in which they usually live?—Supposing the leaseholder was to let the cottage out to another party, it would be about 2*l.* 10*s.*

21,993. What remedy would you suggest for the evil which you have described as to the recovery of the wages?—I have had a great deal of conversation with several parties in this neighbourhood and one or two of our Attornies upon the subject, and the most effectual way which they can think of is this, that when a mine is wound up in the Court of Bankruptcy the first call should be to pay off the wages of the working miner.

21,994. The wages in full before any other claims?—Yes, inasmuch as the other claims are generally put in by the wealthy merchants who supply we will say timber, &c. They get great profits upon the articles which they supply, particularly if it is a doubtful mine, because they charge so much more; they can afford to wait a little longer than the poor working miners, who depend entirely upon their daily labour for their wages.

21,995. Would you also propose that they should have the power of the recovery of their debts before a magistrate before winding up, as domestic servants have?—If the law would enable them to do so, it would be a beneficial thing.

21,996. Domestic servants have that power up to 5*l.*, would you propose that also?—If the law could be so altered it would be very beneficial to them, because now it is not the directors of these small mines who are working the mines, it is the small shopkeepers in the country, of whom I can bring before you one or two, who have been ruined. They have suffered to such an extent that instead of being shopkeepers they are now working miners themselves.

21,997. Are there many of these sufferers on the parish?—There are a great many.

21,998. To such an extent as to be a real burthen to the parish?—We feel it very much. We have seldom a meeting of the Board of Guardians without some poor miner or his family coming for relief.

21,999. (*Sir P. Grey Egerton.*) The case which you have brought before us is a case of bankruptcy?—Yes, of winding up in the Court of Bankruptcy.

22,000. Can you give us any instances of solvent mines where the wages are in arrear to such an extent that the men have complained?—Yes; the mines worked by Mr. Murchison, what are called Nanteos and Penrhiw.

22,001. To what extent of arrears do they run there; I do not mean in money merely, but in time?—Three or four months.

22,002. In the cases of solvent mines have not the miners a remedy by going before a magistrate for the recovery of their wages?—If they have, we are not aware of it in this neighbourhood; it has never been tried.

22,003. (*Mr. Kendall.*) Are you aware that so far as the recovery of wages goes, there is a distinction between miners who work on tribute and tut work and those who work by the day?—No difference has been made in this neighbourhood which has come under my knowledge.

22,004. You are not aware that if a miner has daily wages he can recover before magistrates in Petty Sessions as far as 5*l.*; but that if he works on bargain work he cannot recover?—I am not aware of that.

22,005. (*Chairman.*) Do you consider that there is any difference in the health of the miners and of the farm labourers?—Many of the miners are labouring under sickness.

22,006. Of what form?—Generally consumption.

22,007. Disease of the chest?—Disease of the chest.

22,008. (*Mr. Holland.*) Is there any marked difference between the lodging of the two classes of men—the cottages which they inhabit?—In Goginan which is quite a new town, when the Goginan mines are in full operation, there are as many as six men living in one house.

22,009. That is a common lodging house?—Yes.

The witness withdrew.

Note added by the witness.—If a rider is allowed to be added to the above, I beg respectfully to inform you that the poor miners at the Great Darren mine have not received one shilling of their wages to this day.—14th October 1863.

[*For Questions Nos.* 22,019 *to* 22,082 *see Appendix A.* (8*vo.*) *p.* 21.]

GOGINAN, NEAR ABERYSTWITH.

Mr. William Henry Paull of Goginau mine, examined.

22,083. (*Chairman.*) What is the produce of the Goginau mine?—Silver lead.

22,084. How many men have you working underground?—About 50.

22,085. Are you driving or sinking?—We are driving the 100 fathom level, and we are sinking from the 60 to the 80, to get a communication, and we are putting up a rise against this part (*pointing to the plan*).

22,086. How far is the breast of the 100 fathoms level which you are now driving, from the nearest shaft orwinze?—About 160 fathoms.

22,087. Have you any artificial means of ventilation?—Yes.

22,088. What?—What we term a duck machine, worked by a wheel.

22,089. How is the air taken?—In iron pipes.

22,090. How many men are working?—Six men.

22,091. Do they work eight hours shifts?—Yes. We are rising from the 80 fathoms level, and we are sinking from below the 70 fathoms level.

22,092. Have you any artificial means of ventilation there?—No, not at present.

22,093. How long shall you be before you get a communication?—We are just upon the point of holing.

22,094. (*Mr. Kendall.*) How is the air there now?—It is very good in the winze but not very good in the rise.

22,095. (*Sir P. Grey Egerton.*) How do the men get there?—They come down an inclined plane; then walk into the 60 fathoms level, and then go down this shaft.

22,096. (*Chairman.*) How long is the powder smoke getting away from that end (*pointing to the plan*)?—Not long.

22,097. About how long?—A quarter of an hour.

22,098. Do the men prefer coming down the incline to climbing?—Yes.

22,099. About what distance have they to walk underground from the end of the incline?—About three quarters of a mile.

22,100. (*Mr. Holland.*) And how much would the climbing be?—It is 120 fathoms.

22,101. They prefer walking three quarters of a mile underground to climbing 120 fathoms?—They do.

22,102. (*Sir P. Grey Egerton.*) What is the height of the levels?—They are 8 feet high and 5 feet wide.

22,103. (*Mr. Kendall.*) Do the men adopt that course to avoid climbing or to bring them nearer to their homes?—To bring them nearer to their homes.

22,104. Supposing their homes were equally near from the surface as at the commencement of the incline, which would they rather do?—They would rather go up the shaft. One of the men went down there a little while ago when he was working there; he was nearer the top.

22,105. (*Chairman.*) What allowance of candles have the men per week?—2 lbs. a man.

22,106. What are they charged forthem?—8*d.* a lb.

22,107. And the same for powder?—Yes.

22,108. (*Mr. Kendall.*) Have you any men who are working from the 80 fathoms level up to the 70?—No.

22,109. Have you been underground much yourself?—Yes.

22,110. Lately?—Yes, almost every day.

22,111. You are now sinking a winze from the 70 fathoms level and rising from the 80 fathoms level, in order to make a communication?—Yes.

22,112. Is that the worst air in the mine at the present moment?—Yes, I think it is.

22,113. How many men work in the rise?—Two.

22,114. In the 24 hours?—Yes.

22,115. It is very desirable that you should have a communication?—Yes.

22,116. If that be the case why do you only work two men?—On account of the air being too bad for them to work more.

22,117. How many hours do those men work?—Eight hours.

22,118. Have you seen them when they have come up?—Yes.

22,119. Have you seen them whilst they have been there?—Yes.

22,120. Are they exhausted much while they are there?—No.

22,121. Do they complain?—No.

22,122. How does the candle burn there?—Pretty well.

22,123. Does it burn uprightly or are you obliged to put it on an inclination?—It burns upright.

22,124. (*Sir P. Grey Egerton.*) How many men are working in the winze?—Six.

ABERYSTWITH.

Mr. W. H. Paull.

25 July 1863.

22,125. (*Mr. Kendall.*) Will it be holed in a few days ?—Yes, we expect so. This point was holed in a few days where there is now good ventilation.

22,126. That end is the worst end ; have you any any other end ?—We have only this end and the 100 fathoms level driving.

22,127. Then you are 160 fathoms from a shaft or winze at the 100 fathoms' level, and you use a duck machine to throw in air ?—Yes.

22,128. What pipe have you ?—A 6-inch iron pipe.

22,129. How many men are there working in that end ?—Six.

22,130. Eight hours each ?—Yes.

22,131. Do they complain of the air at all ?—They do complain sometimes.

22,132. Is not the duck machine powerful enough to throw in air ?—Yes, there is good air there.

22,133. Then why do they complain ?—I do not know ; they do complain a little sometimes.

22,134. Have you been in there yourself frequently ?—Yes.

22,135. Is the air dead there ?—No.

22,136. How far is the pipe in from the end ; how close up is it ?—Within about a couple of fathoms.

28,137. There is no leakage to the pipe at all ?—No.

22,138. What size is your duck machine ?—Five feet wide and eight feet long.

22,139. You have gone 160 fathoms in, and the men complain at times ; how much further in do you intend to go before yon communicate with the 80 fathoms level ?—I cannot say that.

22,140. Are you extending your 80 fathoms level ?—We are extending the 80 fathoms level west, but not at present ; not till we get this communication.

22,141. The moment you communicate you will do so ?—Yes.

22,142. If I understand you rightly, you will be driving your 100 fathoms level east, and you will be driving your 80 fathoms level west till you can communicate ?—Yes.

22,143. In driving west on your 80 fathoms level, is there anyore ?—A little.

22,144. Driving east is there any ore ?—There are spots.

22,145. Am I to understand that at whichever end it will pay best for driving, that end you will drive on ?—Yes.

22,146. I see that your 70 fathoms level is suspended ?—Yes.

22,147. Why ; is it because there is no ore ?—Yes.

22,148. Your 80 fathoms level is suspended going east ?—Yes.

22,149. Is that because there is no ore ?—Yes.

22,150. How does your ore dip ?—It dips westward a little.

22,151. You have suspended your 140 fathoms level ?—Yes.

22,152. You have suspended your 130 fathoms level west ?—Yes.

22,153. (*Sir P. Grey Egerton.*) Is it a wet mine or a dry mine ?—It is not particularly wet.

22,154. How do you get rid of your water ?—By pumping.

22,155. Not by an adit level ?—It is drawn up to the adit level.

22,156. Where does your water accumulate ?—In both shafts, from the 140 up to the 120, and then it goes back to the next shaft.

The witness withdrew.

Mr. JAMES GARLAND, of East Darren Mine, examined.

Mr. J. Garland.

22,157. (*Chairman.*) What is the name of the mine of which you have charge ?—East Darren.

22,158. How many men are working under ground ?—We have at this time 74.

22,159. Are any of those boys ?—They are all men ; about 18 is the age of the youngest. I am prepared with a list of them.

22,160. How many tutwork men and how many tributers have you ?—We have somewhere about 60 tutwork men.

22,161. Are you sinking or driving ?—We are now principally driving and sinking winzes ; at the 116 fathoms we are driving.

22,162. How many men are working there ?—Six men are driving east from the 116 fathoms.

22,163. Do they work eight hours shifts ?—Yes.

22,164. (*Mr. Kendall.*) Is it on the course of the lode ?—Yes.

22,165. (*Chairman.*) Where is the next place ?—The next is driving 104 fathoms west.

22,166. Have you any artificial means of ventilation there ?—Nothing but the winze.

22,167. How far is it from the winze ?—40 fathoms.

22,168. Do you think that the air is close there ?—Not very close ; four men are working there ; we give one third of the time.

22,169. When the air is close you generally diminish the number of men working ; you leave a longer time ?—We leave a longer time between.

22,170. What is the next point ?—The next point is a stope at the back. We have four men at that stope.

22,171. What is the next point ?—At the 92 fathoms.

22,172. Are you driving or sinking there ?—We are sinking there with six men.

22,173. (*Mr. Kendall.*) How far off a winze are you ?—From 30 to 35 fathoms. We are only 2 fathoms from a winze at the 92 fathoms east, and the winze is only 2 fathoms deep.

22,174. (*Chairman.*) What is the next place ?—A level driving east, somewhere about 7 fathoms east of the winze.

22,175. What is the furthest point where you are driving from any winze ?—At the 68 fathoms going west ; there are two men working there ; they are driving a cross-cut.

22,176. Is there not a good deal of moisture in your mine ?—Yes, in places.

22,177. Do you consider that the small streams and drippings of water assist ventilation ?—Yes, greatly.

22,178. You are aware that a petition was presented from this quarter from men who had not been paid their wages ?—Yes.

22,179. Do you know that to be the case ?—Yes. I have a list (*producing the same*). Those are the names and here are the bills and everything to correspond.

22,180. The list which you give in contains the names of men who are owed money, and the names of the mines are also given ?—Yes.

The witness delivered in the following paper.

Court Grange Mines' Pay for May 1855.

	£	s.	d.
To Evan Evans, for stoping, &c. - -	2	10	8
To Evan Evans, ditto, for June month -	6	17	6
Llely Evanhen Mine.			
To David Morfans, for 4 months' labour	13	7	0
Abernant Mines Company.			
To Richard Pearce - - -	2	17	6
Great Darren Mine.			
To John Vincent, for 5 months' labour -	15	3	8
To Thomas Roderick, for 84 days' work -	7	15	2
To John Morgans, for 2 month's labour -	6	7	2
To Ann Thomas, for labour -	1	12	3
To Thomas Allen, for 2 months' labour -	2	2	11½
Blaen Ceilan Mine.			
To Isaac Jones Smith, 1 month - -	1	10	3
To Richard Jones - - -	4	7	10
To Edward Jones, 1 month - -	2	15	7½
Willow Bank Mine.			
To John Mason - - - -	0	10	0
To Edward Edwards - - - -	0	10	0
To Evan Evans, for 7 days' work at 2*s.* -	0	14	0
To Richard Davis and pair, January 1859, for driving - - - -	28	0	0
	£97	1	7

22,181. Do you know any mine where on the last pay day there was no pay ?—There was a mine, but it has paid since your lordship was here ; it was a fortnight after the time ; 97*l.* 1*s.* 7*d.* is the amount of money owing at the mines in the list which I have handed in.

22,182. These mines are still being worked ?—They are now working, but the pay has not been regular.

22,183. You have heard complaints from men on that subject ?—Yes, since 1855.

The witness withdrew.

Capt. John Williams, of Cwm Erfin Mine, Goginan, examined.

22,184. (*Chairman.*) What is the produce of the Cwm Erfin Mine ?—Silver lead.

22,185. What number of men are working under ground ?—We have 100 men underground ; there are 110 men including trammers ; we have 98 pick men, what we term miners.

22,186. Are they principally on tut-work or tribute ?—Principally on tut-work.

22,187. What is the lowest level at which you are now working ?—The 32 fathoms under the adit.

22,188. What is the lowest level in the mine ?—69 fathoms.

22,189. Is there water there ?—No, it is clear of water. This part of the mine, the 69 fathoms, has been tried, but it is poor.

22,190. How far is the breast of any end from the nearest winze or shaft ?—It is 22 fathoms, from where the rise is, going up.

22,191. How do you consider that the air is there ?—Very good The smoke lies a little.

22,192. How long is the smoke getting away ?—20 minutes. This (*pointing to the plan*) is 7 fathoms from the present end ; and this (*pointing to another part*) is 23 or 24 fathoms to this stope which is now being put up.

22,193. (*Mr. Kendall.*) On the 20-fathoms level, where you are sinking a winze, you are 22 or 23 fathoms from a rise ?—Yes ; but in eight weeks this will be communicated. [The rise and winze have since been communicated.]

22,194. Is that the worst part of your mine ?—That is the only place where any smoke lies.

22,195. Every other part of the mine is well ventilated except that part ?—Yes ; the smoke lies here about a quarter of an hour or 20 minutes, and no more. That is in the 20-fathoms level and the 32-fathoms, sinking from the 20-fathoms and rising from the 32.

22,196. You think that a communication in eight weeks will remedy all that ?—Yes, I am quite positive of it.

22,197. How many men work in the 32 fathoms rise ?—Four.

22,198. And how many men in the winze at the bottom of the 20 fathoms ?—Four.

22,199. (*Chairman.*) That leaves eight hours rest at night ?—Yes ; there is no one working in either of those places at night.

22,200. Why is that ?—If they worked by night in all probability it might cause smoke ; it would not be so clear in the morning.

22, 201. (*Mr. Kendall.*) It is in order to collect a little good air ?—Yes. That is the only place where we have any smoke.

22,202. You are working in slate ?—We are working on the course of the lode.

22,203. The country is slate ?—Yes, quite a clay slate.

The witness withdrew.

Adjourned to Monday next, at Snailbeach Mine, near Shrewsbury.

SNAILBEACH MINE, SHROPSHIRE.

Monday, 27th July 1863.

PRESENT :

The Right Hon. Lord Kinnaird. K.T.	Nicholas Kendall, Esq., M.P.
Sir P. Grey Egerton, Bart, M.P.	P. H. Holland, Esq,

The Right Hon. Lord KINNAIRD, K.T., in the Chair.

Mr. William Eddowes, of Pontesbury, near Shrewsbury, examined.

22,204. (*Chairman.*) Have you practised long as a surgeon in this district ?—Since 1835.

22,205. Do you attend the miners at any of the mines in this district ?—I attend the Snailbeach mine.

22,206. What arrangement is made with you as to payment ?—They pay me so much a man.

22,207. Is the appointment made by the company ?—Yes ; it was, with the consent of the men at the time ; the men had their own choice.

22,208. What is the amount which is paid by each man ?—It was 8*s.* a year formerly, but now it is 12*s.*, including the family. The distance from here to the mine is about four miles ; some of the miners live seven miles away from here ; some families live at that distance and I attend them. The men without families pay just the same ; boys pay rather less, but I do not know what it is now.

22,209. Have you any cases under your notice where the men were affected differently from other labourers ?—Not the miners, but the smelters.

22,210. Then you do not come across cases where the men are at all affected with pulmonary disease ?—I see scarcely any more than in common labourers, I think. I do not see that there is any difference.

22,211. Is the district healthy ?—Yes.

22,212. Are there any cases of phthisis ?—Just the same ; I do not see any difference.

22,213. Are the smelting works in the neighbourhood ?—The smelting works have been removed within the last 12 months from Pontesford to the mines ; since then there has been a good deal of illness amongst the men.

22,214. Amongst those employed in the smelting ?—Yes, lead colic.

22,215. These works are at the mine ?—They are, or at least within half a mile ; a tramway runs from the mine down to them.

22,216. And the men working there are affected ?—They are affected with lead colic. They used to be so at the smelting house at Pontesford occasionally. Since I came to Pontesbury there was one mine which was then the Gravels, and Grit, but which is now called the Roman Gravels. That company failed some years ago, that would be about 24 or 25 years ago. A good many of the men at that mine were affected with lead colic, and that is scarcely ever the case here.

22,217. (*Mr. Kendall.*) You mean at the mine itself and not at the smelting works ?—Just so.

22,218. (*Mr. Holland.*) Were they near the smelting works ?—No, they were eight miles from the smelting works, in fact there was no connexion with them at all ; a good number of them had it at one particular time.

22,219. (*Chairman.*) Is that the case at present ?—It is not that ; that was at the White Grit mine, they were all one mine then but now they are two

Snailbeach Mine, Shropshire.

Mr. W. Eddowes.

27 July 1863.

mines. No doubt it was owing to the work being dusty; it is very loose, and there was a good deal of carbonate of lead found at that time in the mine. They either inhaled it or they took it in from their fingers when eating, as they often take something to eat in the mines, and of course they have no means of washing themselves, or if they do wash themselves it is of course in water impregnated with lead.

22,220. (*Mr. Holland.*) They took it with their food?—No doubt of it, or they may have inhaled a little.

22,221. Has that ceased now?—Yes. I have not known anything of the kind for more than 20 years.

22,222. (*Chairman.*) Do you attend any men from those mines?—I did until latterly; I have given them up.

22,223. (*Mr. Holland.*) Can you explain the cessation of that disease?—I do not recollect now, it is so long ago. I did not attend the miners then, but I was called in in a number of cases. I know that it ceased about 20 years ago.

22,224. Are they still working in carbonate of lead?—They are still working in the same mine, but I do not think that they find carbonate of lead now.

22,225. You said that there was no particular excess of lung disease among the miners?—No.

22,226. Do they live as long as other men?—Yes.

22,227. Are many of them above 50?—Lots of them are 60 and 70.

22,228. Are the men above 50 in fair health?—Yes; there is one man now who has become infirm within the last few months, who has worked on the mine between 50 and 60 years.

22,229. Do they look as young as other men of 50?—I do not see any difference in them, excepting perhaps in a few; but they all look very well.

22,230. Are they ruddy as other men?—Yes, I see little difference.

22,231. Would you know a miner from an agricultural labourer if he had his Sunday clothes on?—They are rather smarter fellows.

22,232. (*Mr. Kendall.*) You would not know him by the colour of his skin?—Not at all.

22,233. (*Mr. Holland.*) Do you know any other lead mines but these?—I know all in this neighbourhood.

22,234. Do you know any in Flintshire?—No, except by name.

22,235. (*Mr. Kendall.*) Have you been underground?—Yes.

22,236. (*Mr. Holland.*) In what respect do these mines differ from other lead mines?—I think the difference is that they are in rock. This mine is in a solid rock, and the ore being large if you go down it is like going into this room.

22,237. They are very large excavations in solid rock?—Yes.

22,238. Have you been frequently down the mine?—Only once.

22,239. Did you get well through it?—Yes, very well.

22,240. What is the usual size of the excavation?—It is so long ago that I forget—it varies very much—it is upwards of 20 years ago.

22,241. (*Sir P. Grey Egerton.*) In the course of your practice have you ever seen a case of true miners' asthma?—No, I do not recollect that I ever have.

22,242. Are you acquainted with that disease by reading?—You mean such as cutlers get from very fine particles?

22,243. It is a bronchial affection passing on to the lungs and ending generally in death after a few years.—We get none of it here.

22,244. Are you acquainted with it elsewhere?—No, only so far as seeing an account of asthma, and the different causes.

22,245. Are you acquainted with the symptoms of true miners' asthma by reading or by practice?—Do you mean in miners working in lead mines or copper mines, or tin mines, or what mines?

22,246. All mines. There is a peculiar disease to which all miners are subject, whether it is in lead or copper, or zinc or coal?—I have seen it in coal, and where the expectoration is perfectly blue.

22,247. Then you are acquainted with that particular disease which is called miners' asthma?—Yes; but I do not think that it is miners' asthma. I know that some writers call it so. I have seen two cases of that kind of asthma, but never in a miner; they were both colliers.

22,248. Are you sufficiently acquainted with the disease called miners' asthma to state positively that you never attended a case of it in the miners employed in the Snailbeach mine?—Yes; and I have attended perhaps as many as 500 miners in a year; but I have seen it in the colliers here.

The witness withdrew.

Mines Commission.

Asthma.

My Lord,

The only cases of asthma in any way connected with the Snailbeach mine, that I have attended since my examination on 27th July 1863, are the following:

James Chalenor, aged 34 years, a bricklayer; he never works underground.

John Jones, aged 50 years; he is the carpenter on the mine.

Ann Cadwallader, housekeeper to Richard Edwards, a miner.

And a boy, aged 10 years, who attends the national school, son of Samuel Evans, a miner.

I have, &c.,

The Right Honorable Lord Kinnaird, K.T.

Wm. Eddowes, Pontesbury, Salop.

Mr. John Hughes, of Worthen, near Minsterley, Salop, examined.

Mr. J. Hughes.

22,249. (*Chairman.*) Have you practised long in this district as a medical man?—No, I have only removed from Bishop's Castle here within the last two months. When I was living in Bishop's Castle I was surgeon to the Gravels mine; but I found it was so far to go, that I came nearer.

22,250. You have had the charge of the Gravels mine?—Yes, for about the last year and a half.

22,251. Do you find that there is any difference in the general health of men working as miners from that of other labourers?—I certainly get more cases than I have done in another appointment which I held as medical officer to a parish; but I have never had one serious case since I have attended the mine.

22,252. What are the sort of cases; are they pulmonary?—Generally speaking they are connected with pulmonary disease. I have had a good many cases of dyspepsia. The men say that the air is not very pure, and they have a good deal of pain after eating, and that sort of thing. I give them a little medicine and they get right; but I never had any serious case of illness consequent upon having worked in a mine.

22,253. But you think that the men are somewhat affected by the work?—Yes. If I had a lot of miners to examine for a life assurance society, and a lot of agricultural labourers; my opinion is that the majority of the agricultural labourers would be better lives than the miners.

22,254. What number of years should you say?—I should not like to say much more than 50 or 55 years for a miner.

22,255. (*Mr. Holland.*) About five years difference?—Yes, I should think so.

22,256. (*Chairman.*) You have had no cases which have not yielded to treatment?—No, I have never had one.

22,257. Are the cottages where the miners reside good?—No, not at all; generally speaking they are anything but healthy; they are mostly mud huts.

22,258. Are the families affected?—No, not particularly so.

22,259. (*Mr. Holland.*) I think that you are surgeon of the Grit mine ?—Yes.

22,260. Is that mine so called because it is working in a gritty stone ?—I do not know.

22,261. Is it a peculiarly gritty mine ?—Yes, it is a loose soil.

22,262. Do the men complain much of the dust of it ?—I never heard them complain. I have only been appointed to that mine two months, and I do not think that I have had more than two cases of illness.

22,263. Do you see anything of the miners who are not ill ; is it a part of your duty to do so ?—No.

22,264. You merely see them when they are actually ill ?—Merely when they are actually ill. I attend twice a week at the Gravels and the Grit mines; and anybody who wants to see me, can do so.

22,265. (*Chairman.*) How are you paid ?—I am paid per head, 8*d.* per month for each man ; and if the families are able to pay, I have 1*s.* a month and attend them, because they would come into my poor-law district if it were not for that.

22,266. (*Mr. Holland.*) For that you attend them whether they are hurt or ill ?—Yes.

22,267. Have you been accustomed to a mining population before this ?—Never.

22,268. Does it strike you that the mining population are decidedly weak in their lungs ?—Yes, I think so.

22,269. As compared with others ?—As compared with agricultural labourers.

22,270. Where have you practised before ?—I have been at Bishop's Castle for the last four years.

22,271. Where is that ?—About 10 miles from here.

22,272. Is it an agricultural district ?—Yes, quite so. While I was there I had charge of the Gravels mine.

22,273. Are the miners and the agricultural labourers lodged much alike ?—I think so.

22,274. Which are the best lodged ?—I think that they are much of a muchness.

22,275. Which do you think feed the best ?—I should say the miners decidly.

22,276. Do they feed as judiciously as the agricultural laboures ?—I think that they do.

22,277. Are they more fond of tasty food ?—You do not find the mining population eat salt meat so plentifully as the agriculturists do. All the farm labourers live upon bacon, salt meat, from the beginning of the year to the end ; and those diseases which we generally meet with amongst agricultural labourers, we do not meet with amongst miners. I think that they have more fresh food.

22,278. Do the miners eat fresh meat nearly every day ?—I think they do.

22,279. Do they live decidedly better than the agricultural population ?—A great deal better. My reason for saying so is, that the butcher who supplies me supplies most of the miners in this locality, and he has told me the quantity which they buy of him ; in fact he has a very good trade through them.

22,280. Do you consider the miners a steady class of men ?—Anything but steady.

22,281. Are they inclined to drunkenness ?—Yes ; generally on a pay day you will see the majority of them quite drunk before eight o'clock at night.

22,282. Is that once a month ?—Yes.

22,283. On other occasions are they steady ?—Yes, I think they are generally steady, but once a month they break out.

22,284. (*Chairman.*) At the Gravels mines do they pay the men in the vicinity of a public house ?—Yes, at the next house but one, and the men always go in to change.

22,285. Do they get notes ?—Sometimes, and gold.

22,286. (*Mr. Holland.*) Have you seen much of the disease which is called miners' asthma ?—No, I never had more than, I should think, five or six cases of it.

22,287. Have you formed a clear opinion of its nature ?—No ; I do not see any very great difference between it and cases of asthma which are met with independently of working in mines.

22,288. Do you think that it partakes more of the nature of bronchitis or of emphysema ?—Sometimes I have imagined it to be more emphysema than bronchitis.

22,289. Are the mines deep ?—The Gravels are not very deep.

22,290. Is the Grit mine deep ?—The Grit mine is nearly 300 yards, I think.

The witness withdrew.

Captain THOMAS HENWOOD, of Snailbeach Mine, examined.

22,291. (*Chairman.*) What is the description of ore raised in this mine ?—Lead.

22,292. Is there any silver ?—There is very little silver ; about two ounces in a ton, but I do not know exactly.

22,293. Have you charge of any other mine ?—No.

22,294. How many men have you working underground ?—203.

22,295. What is your lowest level ?—Our levels are numbered from the old shaft, and not from the adit, which is 112 yards from the surface ; the new shaft is 38 yards above the brace of the old shaft, so that the real depth of that shaft is 440 yards from the surface.

22,296. Do you always count in yards here ?—Yes.

22,297. What is your principal working now ; are you sinking or driving ?—We are stoping and driving.

22,298. What is the lowest level in which your men are working ?—402 yards at the old shaft ; that would be 440 yards from the brace of the new engine shaft.

22,299. How many men have you working there ?—12 ; 6 in the east end and 6 in the west.

22,300. How many hours shift do they work ?—Eight hours.

22,301. Have you any places where you have less than six men working in the ends ?—No, not in the ends.

22,302. In sinking or putting in a rise, have you any fewer number than six men ?—We have seldom less except in a tribute pitch.

22,303. Are the greater proportion of the men tribute or tut workmen ?—I should say tribute, but I am not prepared to speak exactly.

22,304. What allowance of candles do the men have ?—Two pounds a week each.

22,305. What is the charge ?—8*d.*

22,306. And the same for powder ?—Yes.

22,307. Do the men pay the doctor ?—Yes.

22,308. Is there a club for visible hurts ?—Yes.

22,309. Is there club money as well as the payment for the doctor ?—Yes.

22,310. There are two charges ?—Yes.

22,311. What is the amount of the club money ?—Club is 9*d.* and the doctor 1*s.* per month.

22,312. Does the doctor attend the families for that ?—Yes ; but not confinements, for which he charges extra.

22,313. Is your power steam power or water power ?—Steam power.

22,314. How many steam engines have you ?—One 60-inch cylinder pumping engine and four others.

22,315. Have you any water-gauge ?—They call them gauge-cocks. We have a glass water-gauge on one of our winding engine boilers.

22,316. How many engine boilers have you altogether ?—We have six on the mine, one to a new engine which we are putting up, and one at the lead works.

SNAILBEACH MINE, SHROPSHIRE.

Capt. T. Henwood.

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22,317. On one of those you have a water-gauge? Yes, but on the others we have only the gauge taps.

22,318. Is the mine wet at all?—Not very, our engine only works six hours in the 24, on an average.

22,319. Do the men reside near the mine?—Not very many of them; the greater portion are scattered over the hills.

22,320. Do they change when they come to the surface?—Yes.

22,321. Where do they change?—In the cabins or barracks near the shaft.

22,322. Do they ever change in the boiler-house? No, that is strictly prohibited.

22,323. Are your smelting works near here?—Yes, about a quarter of a mile off.

22,324. Do the smelters reside in their own cottages near, or do they come from a distance?—They come from a distance, and have bed-rooms in the melting-house yard.

22,325. What are their hours of work?—Six to seven hours, I think.

22,326. How many shifts do they work?—I think they call six hours a shift; but that is out of my department.

22,327. (*Sir P. Grey Egerton.*) Have you a code of rules for the observance of the miners?—Yes.

22,328. Are they strictly enforced?—Yes.

22,329. How do you enforce them, by means of fines?—Fines. Each shift lost subjects a man to a fine of 2*s.* 6*d.*, and if absent from work three days in any one month he is liable to dismissal.

22,330. How is that money disposed of?—It goes to the sick-club.

22,331. How often do you pay the men?—Once a month.

22,332. Do you keep a month in hand?—About a fortnight in hand. We set generally for two months; we subsist them one month, and balance them off at the end of the second month.

22,333. Where do you pay the miners?—At the office, near the mine.

22,334. Is it near a public house?—No, it is half a mile from a public house.

22,335. Do you pay them in notes, or in gold and silver?—In gold and silver generally, to avoid the men going to the public house.

22,336. (*Mr. Kendall.*) Did you work in Cornwall before you came here?—Yes, I worked under Capt. Puckey from my boyhood up till I came here.

22,337. Did you ever work in the Fowey Consols?—Yes.

22,338. Did you ever work in the deep levels there? Yes, in the 220 fathoms level.

22,339. It was very warm there, was it not?—Yes, very hot. I used to work naked.

22,340. Did you suffer much there?—Never, except when I was aged about 17; I was working at the 210 before the circulation changed at Botterills, and I had a heart disease.

22,341. Do you think that that was from going up and down the ladders, or from cold?—From going up and down the ladders.

22,342. Have you quite recovered?—Yes.

22,343. Taking the miners in Cornwall and the miners in this district, which are the more healthy of the two?—They are more healthy here.

22,344. Do they work as hard here as they do in Cornwall?—Yes.

22,345. To what do you attribute the difference of health, both being deep mines?—I do not know further than that the mine here is cooler.

22,346. Is this mine better ventilated than the deep mine at the Fowey Consols?—Yes.

22,347. Do you think that the ventilation is more cared for here than it was there?—I do not know whether it is better cared for, but the runs of ore are more extensive, and consequently the ground is beaten away.

22,348. There is more room for air to circulate?—Yes.

22,349. There are larger shafts?—Yes, and larger levels here.

22,350. What is the average level here?—Our average size for the levels is 6 feet by 7 when we drive.

22,351. Seven feet high and 6 feet wide?—Yes.

22,352. Do you recollect, upon the whole, what was the average in the Fowey Consols?—About 4 feet 6, by 5 feet 6.

22,353. Therefore, on that head, you are better off here than you were at the Fowey Consols. I will now take another ground: Take the average size of the lodes in the Fowey Consols and here; what is the average range here above the Fowey Consols, when you get out of the simple driving, and get into the veins?—The vein in Fowey Consols seldom exceeded 12 feet in the widest places.

22,354. And it is was generally what? would it average 3½ feet?—About that I should say.

22,355. To what extent do you go here sometimes?—20 feet.

22,356. Will it average 9 feet here?—Yes, and above in the bearing parts.

22,357. Will it average 10 feet?—About that.

22,358. (*Mr. Holland.*) Have you any ends here where the candles will not burn freely?—No.

22,359. Have you any ends where the powder smoke hangs for an hour?—No.

22,360. What is the longest time that it hangs?—From twenty minutes to half an hour.

22,361. Are there many ends in the Fowey Consols, where the powder smoke hangs for an hour or more? Yes, more than two hours; it is seldom clear from one end of the week to the other.

22,362. What disease have the Cornish miners more than the miners here have?—They are generally attacked with disease of the heart and bronchitis in Cornwall.

22,363. Have they that here?—Seldom, I believe.

22,364. Do you know the disease which they call miners' asthma, in Cornwall?—Yes.

22,365. Is that a common disease here?—I do not know that it is.

22,366. Below what level are your main workings?—Our principal workings are below the 252 yards level.

22,367. Then the majority of your miners climb 100 fathoms?—Yes.

22,368. Your miners have very much more climbing than the Fowey Consols miners have?—Yes. They have a man-engine now at the Fowey Consols.

22,369. Had they a man-engine there in your time?—Yes, and there has been a man-engine spoken of here. The men climb faster in Cornwall than they do here.

22,370. Does climbing 100 fathoms hurt a healthy man if he climbs slowly enough?—It is very laborious work; I should think that it would hurt him more or less.

22,371. How much of his day's work does it take out of a miner to climb 100 fathoms; does it take out as much as one third; how long would it take him to go up and down 100 fathoms?—Perhaps 50 minutes.

22,372. How much ordinary work is that climbing equal to; is it equal to as much as three hours?—It is fully equal to one hour and a half.

22,373. What mode of signalling have you down the shaft?—We have a signal wire.

22,374. Have you any other method? A gutta percha pipe runs 38 yards from the surface to the landing level.

22,375. Is that gutta percha pipe a great convenience?—Very great.

22,376. Is it a serious expense? No, it is not expensive; the inch pipe is about 10*d.* a foot.

22,377. (*Chairman.*) What are the gettings of the men; what do you allow the tutwork men to get generally?—From 20*s.* to 22*s.* per week.

22,378. Is it the same with the tribute men?—Rather below; they are less able men on the whole.

22,379. Has the amount been raised within any short period ?—No.

22,380. Has it been always the same since you have been here ?—Yes.

22,381. Have you any women working at the surface ?—No.

22,382. Do you think it desirable not to have women working ?—I do.

22,383. In what respect ?—I think that their morals are taken care of more at home ; they become better wives.

22,384. Do any of the wives and daughters of the men work at agricultural labour ?—I do not know that they do ; they generally go to domestic service.

22,385. (*Mr. Kendall.*) Then you suppose that if they go into domestic service, they get to understand the management of household matters better, and that when miners marry then they are better and more careful wives than they would be if they were to work here and not to know anything about domestic arrangements ?—Yes, that is my meaning.

22,386. With respect to your wages, are they higher than at the mines generally in this district ?—Yes.

22,387. As far as you can learn, what is the average at the mines generally in this district ?—15*s.* per week.

22,388. For this extra pay do you require more at the hands of your men than is required in other mines ? do you require your men to work harder or more hours ?—Our men work harder and the mine is deeper.

22,389. Generally speaking you exact your eight hours ?—Yes, we call it an eight hours shift, but the men, on the average, do not spend 6½ hours in actual work.

22,390. You work longer here than they do in other mines ; when did that begin ; under Captain Eddy's management ?—Yes.

22,391. When you first came here ?—Yes.

22,392. Did the men like it at first ?—They did not like it at first.

22,393. Still you allowed them good wages ?—Yes.

22,394. Was there a strike ?—Yes.

22,395. How long did it last ?—A fortnight.

22,396. What did they complain of ?—They complained of the eight hours shift instead of six.

22,397. Did they say that it hurt their health ?—Yes.

22,398. What did the doctor say ?—He said that none of the men had applied to him for any medicine or drugs of any sort more than previously to the eight hours shift.

22,399. Did you go into a history of their wages at the time of the strike ?—Yes.

22,400. What did you find that their average was when they struck ?—The tributers would average 29*s.* 5*d.*, and the tutwork men 22*s.* 7*d.* per week.

22,401. When that was proved, had it the effect of quieting the men or not ?—Yes.

22,402. What induced them to go back to their work again, your being firm or what ?—It was owing to Mr. Eddy, the manager, being firm.

22,403. Have you had anything of the sort since ?—No, they have been very decent men since.

22,404. (*Chairman.*) What were their earnings before ?—I am unable to answer that question.

22,405. (*Mr. Kendall.*) Your pay-day is once a month ?—Yes.

22,406. On Friday ?—Yes.

22,407. What becomes of the Saturday ?—We always allow the men the Saturday to go to market to lay out their money to the best advantage.

22,408. They have a whole holiday once a month ? Yes.

22,409. Supposing a man has any particular business which he wishes to transact, or any family matters, that he wishes to stay at home to attend to, do you allow him to stay at home ?—Yes, provided he asks leave.

22,410. What has he to pay the man who takes his place, provided he is in a corps ?—3*s.* per shift.

22,411. How frequently do you permit that, once or twice in the year, or more ?—Occasionally.

22,412. According to the emergency, I suppose ?—Yes.

22,413. If they make out a good case you at once grant them this privilege ?—Yes, according to the case.

22,414. (*Chairman.*) You have stated that you have had few accidents by blasting, what precautions do you use ?—I do not know that we use any precautions more than in other mines.

22,415. Do you use cartridges ?—Yes.

22,416. Do you use the fuze or the straw ?—The straw.

22,417. Do you use a copper or an iron pricker ?—Iron.

22,418. What do you think accidents in blasting arise from ?—Through neglect, generally.

22,419. In what way ?—In charging the ramming, tamping the hole, drawing pricker, &c.

22,420. Not using proper tamping ?—Not using proper tamping.

22,421. What tamping do your men use ?—Principally lead ore and carbonate of lime of the bes quality.

22,422. Have they always that at hand when they are boring in the country ?—They would procure it if it was not at hand. Occasionally we use brick dust.

22,423. How many accidents have you had by blasting ?—None for at least eight years, and only two for at least 24 years.

22,424. How many other accidents have you had ?—I am not prepared to say, but I only know of two in the last eight years, and four in the 24 years.

22,425. (*Sir P. Grey Egerton.*) Were the fatal accidents of the last eight years from blasting ?—No, one was from a fall of a stone out of the shaft, and the other fell into a sump.

The witness withdrew.

SAMUEL JONES, of Snailbeach Mine, examined.

22,426. (*Mr. Holland.*) Are you a miner ?—Yes.

22,427. How long have you worked as a miner ?—I have worked for 22 years here and 4 years elsewhere.

22,428. Are you aware of any disease to which miners are more liable than other men in this district ?—No, not that I know of particularly.

22,429. Have you heard of a disease called miners' asthma in other districts ?—No.

22,430. Do you consider that miners are more liable to cough and similar diseases than other men ?—No, not more than other men that I know of particularly.

22,431. What depth are you working at ?—372 yards.

22,432. About how much time does it occupy you in going up and down ?—It occupies us an hour and a half.

22,433. That is about 60 minutes coming up and 30 minutes going down ?—Yes.

22,434. That is very hard work, of course ?—Yes, it is hard work to come up ; we can go down middling.

22,435. Does it take as much out of you as two hours' work in the mine ?—Yes, when we come up fast ; it is easier a good deal to work for a longer time than it is to climb for an hour.

22,436. Does it make you sweat very much ?—Yes, to climb up.

22,437. You are in a great sweat when you come up to the top ?—Yes.

22,438. About what distance is it from the top of

SNAILBEACH MINE, SHROPSHIRE.

S. Jones.

27 July 1863

the footway to the change house ?—About 15 yards.

22,439. Are you of opinion that the miners generally have better cottages than farm labourers ?—Yes ; about here.

22,440. What is the usual rent for a miner's cottage ?—Some get them at 4*l.* a year and some at 5*l.* ; some are better than others, and there are more rooms in them.

22,441. Do they ever go as high as 6*l.* ?—Yes.

22,442. How many rooms will such a cottage contain ?—Some contain two and some perhaps three.

22,443. And a pantry ?—Yes.

22,444. Do you mean two bedrooms ?—Yes.

22,445. And a living room ?—And a living room.

22,446. And sometimes three bed rooms and a living room ?—Yes, and sometimes a pantry and sometimes another place built by the side to keep milk, and to bake, and wash, and all that.

22,447. Is it customary for the miners to have gardens to their cottages ?—Yes.

22,448. Is it nearly universal ?—Yes, all round here.

22,449. About what size is the garden ?—Sometimes five or six roods.

22,450. What is your rood ?—We call eight yards square a rood.

22,451. Do any women work on the mines in this part of the country ?—Not upon this mine.

22,452. What class of women do miners generally marry ?—They do not all marry the same sort.

22,453. Have a large proportion of miners' wives been in service before they marry ?—Yes ; when they begin to grow up their family send them off to service.

22,454. Of course, such women must be better household managers than those who have worked in mines or factories ?—Yes, because they have seen more of it going on.

22,455. Do you think that miners live better than agricultural labourers ?—Yes.

22,456. Should you conceive them to be as a class a steady class of men ?—Yes.

22,457. Have they always a blow-out on pay day ?—No, very seldom ; some do. I got one last pay day. I got a good lot of drink then ; but it is only sometimes.

22,458. Is it a customary thing to have a little jollification on pay day ?—They most generally go and have a pint or two on that day.

22,459. Do they get a gallon or two ?—No.

22,460. Pay day is not a scene of riot ?—No.

(*Capt. Evans.*) We have not had a scene of riot for a great number of years.

22,461. (*To Jones.*) Is the mine dusty ?—No, not very dusty.

22,462. Is it damp ?—Yes.

22,463. There is sufficient [illegible] to keep down the dust ?—Yes.

22,464. Is there any annoyance from dust which annoys you ?—No.

22,465. Are you ever seriously annoyed by powder smoke ?—When we fire fi[illegible] in for a little bit, perhaps 10 minutes or s[illegible] go out, and the smoke goes off afterwards.

22,466. Do the miners keep out of the smoke until it has cleared [illegible] do they rush back to see what they have don[illegible] times they go in, but not to stay ; they go [illegible] out of it to wait till it is over.

22,467. Do not they all [illegible] soon as the shot is fired run in to see what is [illegible] No.

(*Capt. Evans.*) That is [illegible] failure among the men on this mine ; when [illegible] the holes they are anxious to see whether th[illegible] xploded well, and they go right into it.

(*Jones.*) After we hav[illegible] we stop till it has settled a bit, and then go [illegible]

(*Capt. Evans.*) If they [illegible] only to see just for a minute and then the[illegible]

(*Jones.*) We know very [illegible] it will do us an injury if we go in as soon [illegible] is fired.

22,468. Do miners here [illegible] their employment an unhealthy one ?—No. [illegible] think that they do. It is certainly more [illegible] than being on the top of the land working.

22,469. But you are not [illegible] it is particularly unhealthy ?—No.

22,470. Which work we [illegible] efer, underground or above ground ?—Unde[illegible]

22,471. Why ?—Becau[illegible] rk eight hours underground and twelve [illegible] e surface.

22,472. Do you get ab[illegible] ne earnings ?—We have it set undergrou[illegible] ometimes we get more than at other times. [illegible] lve hours on the surface we have an hour [illegible] llowed for breakfast and dinner.

22,473. You are not [illegible] ht hours at work underground, are you ; i[illegible] allowance out of that ?—Yes ; we have th[illegible] and down in the eight hours.

22,474. Do you not eat [illegible] w, too ?—Yes

22,475. What time do [illegible] upy ?—We take 20 minutes to half an hou[illegible]

22,476. Then in fact y[illegible] is 7½ hours underground and 10½ abovegr[illegible] underground, including eating time, &c., [illegible] bove ground.

22,477. And you hav[illegible] of making more money underground ?—Y[illegible] ve it set. Sometimes we get more and so[illegible] s ; it is according to how our bargain turns [illegible]

22,478. Are you not [illegible] to work harder aboveground than unde[illegible] — No, we work harder underground than [illegible] face.

The witness withdrew.

Mr. JOHN JOB, of Snailbeach Mine, examined.

Mr. J. Job.

22,479. (*Mr. Holland.*) What is your office ?—I am agent and accountant.

22,480. Do you consider the miners a steady class of men now ?—Yes.

22,481. Are they more steady than they were some years ago ?—Yes, from what I learn. I have only been here the last six years.

22,482. They are more steady now than they were reported to be some years ago ?—Yes.

22,483. To what do you attribute that change ?—Formerly the payment was partly by notes, and when we saw an evil created by paying the men in notes through their having to go to the public houses to get them cashed, we adopted the mode of payment by gold and silver. For the last three or four years we have not paid the men a single note that I am aware of.

22,484. Have you had any riotous behaviour on the pay day since you adopted that plan ?—Not that we are aware of amongst our own men, but we have found that some [illegible] liers have mixed themselves with our men [illegible] ed riots, which I believe our men have [illegible] at all willing to engage in.

22,485. (*To Captain J*[illegible] o you confirm that opinion ?—Yes. There [illegible] derful change in this country compared w[illegible] there used to be formerly.

22,486. Is there muc[illegible] in adopting that principle of paying every [illegible] l man in gold and silver ?—

(*Mr. Job.*) We do not [illegible] ry man separately; but every taker of a ba[illegible] we give him gold, silver, and copper, and th[illegible] es and settles with his partners in that barg[illegible] since having paid them in coin we find th[illegible] majority of our men settle with each other o[illegible] ones ins ead of going to the public houses as o[illegible] rly to get their notes cashed.

22,487. Are you alwa[illegible] to give them [illegible] ch

money as they can easily change among themselves ?—Yes, we endeavour to have it from the bank.

22,488. Is it a matter of much trouble to you to accomplish that ?—No, it is merely an arrangement at the bank.

22,489. Does it involve any expense to you ?—No.

22,490. It is no expense and but little trouble ?—Just so.

22,491. Are you aware of any reason why that plan should not be universally adopted ?—Not otherwise than that it may create a little objection on the part of the banking companies to offer gold and silver at the time of pay, because they prefer issuing their notes. But if an arrangement can be made there cannot be any difference.

22,492. The banks which issue local notes might object?—I cannot say that they would object, but they might prefer issuing their notes.

22,493. On the part of banks which do not issue notes there would be no reason to object at all ?—No.

22,494. Would it not give some trouble to the banks to provide the mines with such large quantities of small money ?—We have not heard of anything of the kind.

22,495. They make no objection to it ?—None whatever.

22,496. And they make no charge for doing it ?—No.

22,497. And you consider the practice of very great advantage to the working classes ?—Yes, and if it was universally adopted it would be better.

(*Captain Evans.*) This plan of paying in small money is one of the great reasons of the men's improved sobriety.

SNAILBEACH MINE, SHROPSHIRE.
Mr. J. Job.
27 July 1863.

The witness withdrew.

Adjourned to To-morrow at Shrewsbury.

SHREWSBURY.

Thursday, 28th July 1863.

PRESENT :

The Right. Hon. Lord KINNAIRD, K.T.	NICHOLAS KENDALL, Esq,, M.P.
Sir P. GREY EGERTON, Bart, M.P.	P. H. HOLLAND, Esq.

The Right Hon. Lord KINNAIRD, K.T., in the Chair.

The Commissioners met at Shrewsbury, and then adjourned to the Roman Gravels Mine.

Capt. RICHARD HENRY VIVIAN, of Roman Gravels Mine, near Minsterley, Salop, examined.

SHREWSBURY.
Capt. R. H. Vivian.
28 July 1863.

22,498. (*Chairman.*) What description of ore is raised in this mine ?—Potter's lead and blend ; we have a good deal of blend, commonly called black jack.

22,499. About how many men have you working underground ?—There are 84 underground-men.

22,500. Are there any boys among them ?—There are three boys underground, blowing a fan blast into a place where we want to communicate to another part of the mine ; we are obliged to blow a blast ; we are working for a communication, but we cannot work unless we have a fan blast to keep the men working.

22,501. In what level is that ?—Six fathoms.

22,502. What is your deepest level ?—60 fathoms below adit.

22,503. How many levels are you driving ?—We have six fore breasts driving.

22,504. Are you sinking ?—We are sinking a winze, but no shaft.

22,505. How many shafts have you ?—We have two shafts.

22,506. To the surface ?—Yes, from our day level, but not all the way continued ; but we have winzes sunk between the different levels ; we have two levels, but we call one the day level and the other the adit. The level does not take away the water ; the adit takes away all the water.

22,507. What is the depth of your adit level ?—20 fathoms.

22,508. Have you more than one fan machine at work ?—Only one, and that we want to keep only as short as possible ; we are doing that just in a case of emergency to hole places to ventilate properly.

22,509. And the proper ventilation would be by communicating ?—By a communication between the level and the winze.

22,510. Is either of the shafts an upcast and the other a downcast ?—Yes ; it is not always the same ; sometimes the draught goes down one shaft and up the other, as the wind changes it changes ; the draught sometimes goes in at the day level and sometimes it comes out ; it just depends upon the way that the wind is.

22,511. How long is the smoke hanging in any breast or level where you are working ?—In the worst place that we have got I should think that it might be somewhere about a quarter of an hour before it is thoroughly cleared out ; that is only the very worst place that we have.

22,512. How many men are working ?—Four men in a fore breast with the exception of one.

22,513. How many hours shift ?—It is called eight hours, but it is never more than $7\frac{1}{2}$ hours ; we allow them to come up at half past 1.

22,514. Do they change at the surface ?—Yes.

22,515. There are eight hours clear ?—Yes. When the men fire half an hour is allowed for the place to get cool a bit before the other men go in.

22,515. In 8 hours of the 24 there are no men working ?—Just so. That is the case with the exception of one fore-breast where we are wishing to push a little.

22,517. What allowance of candles have the men ?—We give a man 2 lbs. a week.

22,518. What is the charge to the men per lb. for candles ?—8*d.*

22,519. And how much for powder ?—8*d.*

22,520. Have you any accidents from blasting ?—We never have had one yet. We never had one accident in the mine.

22,521. Do you use cartridges ?—No, we do not require it ; the ground is dry ; we use the safety fuze.

22,522. What do you tamp with?—Generally with the softest material we can get—carbonate of lime or a skaley stuff—a sort of decomposed place in the vein.

22,523. Any thing that the men can find there ?—Yes, there is plenty of tamping material. Of course the miners do that for their own safety. We have never had a single accident since we began the mine,

SHREWSBURY.

Capt. R. H. Vivian.

28 July 1863.

with the exception of one on the surface, where a man fell.

22,524. Have you any women employed on the surface ?—Yes, we have four women.

22,525. What are the gettings of the men. What do you allow them ?—We allow them about 15*s.* a week.

22,526. Have you many tributers ?—We have about 33 tutwork men out of the 84 men. There are about 50 tributers.

22,527. Where are the men sinking ?—In the first north vein, from the 20 to the 40, to make a communication right over the fore-breast there.

22,528. Are the other men rising ?—No, that would be rather difficult. The air is very good, because the candles burn easily; but the smoke takes some time coming out. We are sinking to come down before it gets worse. Nine men are sinking there, and that will then be as good for air as it is here.

22,529. Where the fan is, it is not good air ?—Where the fan is is in the six fathoms level.

22,530. (*Mr. Holland.*) How long have you been here ?—I have been here four years the first of next month.

22,531. In what other districts have you mined?—Cumberland.

22,532. In what part ?—Smithergill Head, six miles from Alston Moor. My father and I were agents there.

22,533. Have you mined in any other district ?—Yes, in Northumberland, close to Hexham.

22,534. In any other?—Yes. I have been engaged in mines in Cumberland West, near Eskat. I was also agent in mining in Argyleshire, Scotland.

22,535. You have had opportunities of observing the miners in all those districts ?—Yes; and I have been a working miner nine years in Cardiganshire, South Wales.

22,536. Of course you have seen the disease commonly called miners' asthma ?—Yes.

22,537. Have you any of it here ?—No ; I do not think that we have a single case here.

22,538. Have you seen it in this immediate district ?—No, I think that we are as clear from it in this district as anywhere at all. I think that the mines are generally speaking more healthy here than in any other district, because they are not deep.

22,539. Have your miners any excess of disease of the lung over other labourers ?—No, I think not a single one.

22,540. And there has not been any excess of that disease, in your experience ?—No.

22,541. To what do you attribute their exemption from that disease ?—To the good ventilation of the mine ; nothing else. We have men here working who are between 70 and 80.

22,542. Have you as much climbing here as you have been used to in other districts ?—No, we have only 80 fathoms here altogether, and I have been used to climbing 190 fathoms.

22,543. Do you attribute the exemption from the disease partly to the less climbing ?—Yes, because the deeper the mines go the air gets more impure.

22,544. Do you think that that is the only cause, or is it the absence of climbing, too ?—I do not think that the effect of climbing has much to do with the constitution, because miners generally take their own time. It is the bad air that I think kills the miners, and brings on these diseases.

22,545. Does 190 fathoms climbing not hurt a healthy man ?—Certainly, to a certain extent, but I think nothing to equal the working in bad air and in places which are not properly ventilated ; it is the working that does the harm, and of course the climbing in the deep levels in Cornwall must be injurious as well ; but I would rather climb than ride at any time.

22,546. Why ?—Because there are so many accidents, and you cannot warrant a chain or any other machinery, because sometimes they are put up to test, and they may have been tried, and another party may have broken them.

22,547. (*Chairman.*) Have you ever been in a coal mine ?—No.

22,548. Are there no accidents from falling away from the ladders ?—Yes, there have been some, but nothing to compare with accidents from riding up and down the shafts.

22,549. How do you judge of that ?—We see so much of accidents in the papers in coal districts every week ; and in lead and copper and tin mines we seldom see of accidents of any men falling away.

22,550. Are the accidents put into the public prints, when men fall away from the ladders ?—Yes. I have had relations of mine who have fallen away, and it has been put into the papers.

22,551. Do you think that it is always put into the papers ?—I cannot be bound to say that.

22,552. Where were these relations of yours ?—In Cornwall, near Camborne. I am a native of Camborne.

22,553. (*Mr. Holland.*) Did you mine in Cornwall at all ?—No, I was not 10 years of age when I left Cornwall. My father has been agent there.

22,554. Have you any other objection to riding except the supposed danger of it ?—I have no objection to it excepting from the danger, but I have no objection to riding in certain sorts of ways. I do not object to the Cornish plan of riding with a man-engine. I do not consider that dangerous ; that is very good, but I mean riding in the skips, as they do in coal pits.

22,555. (*Chairman.*) Were you ever on a man-engine ?—No, I have only seen them.

22,556. (*Mr. Holland.*) Where you ever in a colliery cage ?—No.

22,557. (*Chairman.*) Have you a changing-house ?—No.

22,558, Where do the men change ?—Over the boiler.

The witness withdrew.

Mr. JOHN VIVIAN, of Roman Gravels mine, examined.

Mr. J. Vivian.

22,559. (*Mr. Holland.*) How many years have you been acquainted with mining ?—My father is agent, and I have been accustomed to it all my life. I am 28 years of age.

22,560. What mining districts do you know ?—Cardiganshire and Alston Moor, and Shropshire.

22,561. Are the miners of this district much more healthy than those of Cardiganshire ?—Perhaps they may be a little. I was rather young then, and I did not know much about them in Cardiganshire, but I know that the miners here are very much healthier than those in the north of England.

22,562. What is the great difference between the miners here and in the north of England ?—It consists in the system of mining, I should fancy, in driving the levels under the mountains.

22,563. The levels there are very much longer than they are here ?—Yes, some of them go a mile and a half in and there are very few shafts.

22,564. Those very long levels are ventilated artificially, are they not ? Yes, with blasts chiefly.

22,565. Is that an effective mode of ventilation ?—No, but it is obliged to be done sometimes ; for the sake of economy they put blasts into certain places at times.

22,566. You know the disease called miners' asthma, in the north of England ?—Yes, I have seen many cases of it. I have seen men at 40 and 43 years of age completely knocked up at Alston Moor.

22,567. Have you seen any cases of it here ?—I cannot say that I have seen exactly that kind of thing.

22,568. Do you consider the miners here free from

any particular affection of the lungs ?—Yes, I should fancy so.

22,569. They are not much more liable to it than other men ?—Not at all, I should say.

22,570. Do you consider that the miners at Alston Moor are better lodged and fed than the miner here ?—Yes, far better.

22,571. And yet, nothwithstanding that the miners here are much more healthy ?—Yes, on account of the different system of mining.

The witness withdrew.

Adjourned.

DOUGLAS.

29th February 1864.

PRESENT:

NICHOLAS KENDALL, Esq., M.P., in the Chair.

Sir PHILIP DE MALPAS GREY EGERTON, Bart., M.P.
The Hon. F. LEVESON GOWER, M.P.
RICHARD DAVEY, Esq., M.P.
P. H. HOLLAND, Esq.

PHILIP ELLIOTT, Esq., 25, Atholl Street, Douglas, Isle of Man.

23,236. (*Chairman.*) You are the surgeon, Mr. Elliott, of Laxey Mine ?—I am, sir ; I attend that mine.

23,237. Do you reside there ?—I do not, sir, but live in Douglas.

23,238. What distance is the mine from here ?—Between 7 and 8 miles.

23,239. How are medical men elected for that mine ; by the men or by the proprietors ?—By the miners themselves.

23,240. How are the medical men paid ; are they paid by subscription from the shareholders ?—I get 50*l.* per year, whatever the men may pay. I did it for 10 years for 20*l.* per year. I found hundreds of men in medicine, too.

23,241. Do you practice amongst the Manx people ?—I do.

23,242. Amongst the agriculturists ?—I do.

23,243. Do you see any difference in regard to health between the people of the town, the agriculturists, and the miners ?—When the miners work in wet places they are subject to swelling of the legs ; that seems to be the prevailing complaint amongst them.

23,244. Have you ever seen anything of what is called "black spit ?"—I have seen men when they have been working in very close places, where there has been a very insufficient supply of air, come up to me and spit in their hands, and then show me a quantity of black saliva or spit.

23,245. How many years have you been medical man to this mine ?—Going on 20 years.

23,246. Can you recollect the depth of the mine when you first went there ?—I cannot.

23,247. Do you observe any difference now in the health of the miners from when you first went there ?—I do not find much difference, but there is a little.

23,248. To what do you mainly attribute this difference of health ?—I attribute it to standing in cold water, in the majority of cases.

23,249. Powder smoke, do you think much of that ?—Very little, indeed, and that only in places where the mine is ill-ventilated ; only where I hear them complaining that the place is badly supplied with air.

23,250. Do you find that they get ill very soon or not ?—No, I do not. I met a man coming from the mine some time since in his shirt sleeves ; he was as able-bodied as any of ourselves.

23,251. Do you think the miners are as healthy as the agriculturists ?—My opinion is that the miners are quite as healthy as the agriculturists of the island.

23,252. Are the health tables in this island as favourable as those in England ?—I should say more so, as far as my experience goes.

23,253. Then you opinion is that the Manx people are, as a class, healthier than other people, and that the health of the miners is nearly as good as the health of the agriculturists and the residents in the town ?—I do think so.

23,254. Are the miners steady men ?—They are not so bad as they used to be. They used to be far worse ; but since teetotalism has come up it has had a great effect upon them.

23,255. Are there changing houses for them ?—They have a house with a fire in.

23,256. Where do the miners who work at Laxey principally reside ?—Some of them live at Agneash ; some at Minorca ; and some of them miles away. There is one that lives at the Cloven Stones, about three miles from Laxey.

23,257. In case of a severe accident, what do they do ?—They send a man on horseback for me.

23,258. Is there an hospital at Laxey ?—No, sir ; there is not one nearer than Douglas, which is the only one we have in the island.

23,259. (*Hon. F. L. Gower.*) Are there any medical men living in Laxey ?—None at present. They have had several there, but the country around is so poor it never would support one. They have tried the experiment ; and have had clever men there.

23,260. Have you known cases of black spit in Laxey and Foxdale ?—I have known cases in both places.

23,261. Which place most of the two ?—I only met with a few cases once now and then.

23,262. Do you know cases of permanent "black spit"?—I am only mentioning those cases where it is not permanent. I never found permanent cases of it.

23,263. Which is the dryest mine ?—I do not know now. They are neither of them very wet.

23,264. Do you attend the Foxdale Mine ?—I am not at present medical attendant at Foxdale ; but I have been going there for years. The men belong to one club or another ; and they think that, because they have a club doctor, that one is sufficient. When I was medical attendant at Foxdale, I had 50*l.* per year. We had men working two miles beyond Ramsey ; one of them got injured and I had to attend him. There was another man at Glenmaye, about 15 miles from Douglas, and I went every day in my life for nine months to attend him. They said I must take his leg off, but I was unwilling to do that as I thought he could be cured without doing so ; and I did make a perfect cure of the man without taking his leg off.

DOUGLAS.
P. Elliott, Esq.
29 Feb. 1864.

23,265. (*Mr. Holland.*) How many men work at Laxey ?—I believe about 600.

23,266. How many are ill at this moment ?—There are a few complaining at this moment of influenza.

23,267. What is about the usual number of sick amongst these 600 ?—Taking it on an average, about 20.

23,267*a*. Is that a fair average ?—Yes ; I think it is.

23,268. What complaints are they generally suffering from ?—Generally from colds and coughs ; and if there is a peculiar tendency in the system these turn into consumption.

23,269. At what age do these men generally become liable to symptoms of consumption ?—It depends on the constitution of the person ; at perhaps five or six and twenty, but generally before thirty than above.

23,270. Do you find amongst Manxmen who are not miners, that more are affected by consumption above or below 30 ?—I would rather say below ; it is not decided as so, but is half and half.

23,271. What do you think it arises from ?—Generally speaking it comes on from colds.

23,272. Are the miners decidedly more liable to chest diseases than other men ?—I do not see it.

23,273. Is this "black spit" you speak of common among them ?—No ; it is not common.

23,274. Does it cease after a short time ?—I never heard any of them making a complaint about it. They never came to me and required medical treatment for it.

23,275. What do you think this "black spit" is ?—I have have seen them come to me and complain ; but they attributed it to the powder. I regard it as incidental.

23,276. You said that some of the miners were liable to dropsy ? — No ; dropsy in the legs, or œdema.

23,277. You said something about their urine ?—It was retention of urine ; they cannot pass it.

23,278. Has that any collusion with dropsy ?—This was one particular case.

23,279. Is this œdema of the legs common amongst miners, or occasional ?— Only occasional. If cold was applied to us we would be liable to the same thing.

23,280. (*Mr. Davey.*) Do you think the climbing of the ladders affects them in any way ?—I don't see that it affects them ; unless there is any thing like asthma.

23,281. Do they ever complain of the heart ?—The complaint is not general.

23,282. What number of accidents have you generally in that mine ?—Very few indeed.

23,283. What kind are they ?—I have had cases of fractured legs. I had one case of a man who fell down into a sump, and a bucket fell on his spine. He has never been able to pass his water since without a catheter.

23,284. How is the 50*l*. a year which you receive raised ?—The men subscribe it. I receive it from the Superintendent. I know it is subscribed by the men, but I do not know in what proportion ; I think one shilling per month is the sum.

23,285. (*Sir P. de M. G. Egerton.*) Have the miners at Laxey any clubs they belong to ?—They mostly belong to two clubs, the parish and "The Miners."

23,286. What do they receive during sickness ?—They get seven or eight shillings per week out of the parish clab ; but those belonging to the "Miners' Club" get six shillings per week.

23,287. Have those clubs medical attendants ?—They have not.

23,288. Do the miners follow any other trade or occupation ?—Most of the men in Laxey are shoemakers, tailors, or agriculturalists, and they sometimes work in the mines, and then do what they can at home.

23,289. Are there persons employed on the surface ?—Yes, there are some.

23,290. Are there any boys employed ?—Yes.

23,291. Are there any females employed ?—Yes.

23,292. Do they all contribute to the doctor to the same amount ?—Not to the same amount. The boys pay sixpence ; but I am bound to attend all the cases that attend either below or above ground.

23,293. (*Chairman.*) Are you bound to attend in midwifery cases ?—Oh no ; they pay that themselves.

23,294. You are not quite sure how this 50*l*. are raised ?—I think it is raised by contributions of one shilling per month.

23,295. (*Hon. F. L. Gower.*) Do you supply medicine for this 50*l*. ?—Yes ; the attendance and everything.

23,296. (*Chairman.*) Do you go there periodically or only when you are called upon ?—I go there every week and whenever I am wanted.

23,297. Have you ever been underground ?—I have been underground in both Laxey and Foxdale.

23,298. Have you been in any of "the close ends ?"—It is some time since, but I do not know.

23,299. I gather from you then that you don't know such a thing as is called a miner's disease ?—I have not seen these cases ; but I have heard them tell me stories about it.

23,300. (*Hon. F. L. Gower.*) There is no permanent disease from this black spit ?—None whatever.

23,301. (*Mr. Davey.*) Do the miners ever complain to you of impure air in the mines ?—They have complained that the candle would not burn, but that is very rare.

LAXEY MINE.

29th February 1864.

PRESENT :

NICHOLAS KENDALL, Esq., M.P., in the Chair.

Sir PHILIP DE MALPAS GREY EGERTON, Bart., M.P.,
The Hon. F. LEVESON GOWER, M.P.

RICHARD DAVEY, Esq., M.P.
P. H. HOLLAND Esq.

LAXEY MINE.
R. Row. Esq.
29 Feb. 1864.

RICHARD ROW, Esq., manager of the mines, Laxey Glen, Isle of Man, examined.

23,302. (*Chairman.*) Mr. Rowe, you are manager of the Laxey mines ?—Yes, sir.

23,303. How long have you been connected with mines, as miner and agent ?—I have been twenty-five years as a miner and agent ; and was fifteen years of age when I commenced mining duties.

23,304. Out of the twenty-five years, how long have you been agent ?—I have been manager of

mines twenty-three years, and a miner before that from twelve years of age, when I first went underground.

23,305. When you were a miner did you work most by tut-work or by tribute ?—On tut-work.

23,306. Did you ever work in a deep mine ?—Never.

23,307. Did you ever work in a bad end ?—I never worked in a bad end.

23,308. Were you the agent in any place before you came here ?—I was.

23,309. Where ?—In the Chiverton mines.

23,310. Do you see any difference in the miners as regards their health there or here ?—I think they are just the same.

23,311. Do you see any difference here in point of health between the miners and the agriculturalists ?—I see no great difference here between the health of the miners and the agriculturalists.

23,312. What depth was this mine when you came here ?—100 fathoms.

23,313. What depth is it now?—210 fathoms.

23,314. You say when you first came, the mine was 100 fathoms, and now it is 210 fathoms ?—Yes.

23,315. Then do you think the health of the miners is worse now than it was when the mines were shallow ?—I gave the question my grave consideration, and I think it is not.

23,316. As you have gone deeper have you paid more attention to the ventilation than formerly ?—I have, sir. I attribute to this the fact that the health of the miner is kept up to the same extent by the improved and careful ventilation.

23,317. Are you ends pretty good ?—They are, the majority of them.

23,318. Which do you call your worst end ?—We call the 145 end our worst at present. In other portions of the mine the air is better in consequence of artificial means being used.

23,319. What artificial means do you use ?—Forcedocks and the water-blasts.

23,320. How far is the end off from any winze ?—It is 200 fathoms from any winze in a straight line. That is the nearest in a straight line, but there are various windings that will give it more.

23,321. Is the air good ?—Notwithstanding it is 200 fathoms the candles burn well and the air is good.

23,322. What is your test ?—The opinion of the men and the candle. The men are satisfied, and the candles show no marks of bad air.

23,323. Have you any other means of testing ?—No ; if the candle burns well we think that the best test.

23,324. How soon after a blast can the men go to work again ?—With a degree of comfort, in ten minutes.

23,325. Take that which you say is worst now—the 145 end—where you have no artificial means now, what depth is it ?—It will be 100 fathoms.

23,326. Is the air good there ?—The air is bad there.

23,327. How many men work in the 24 hours there ?—Eight men. They are divided into two parties and are expected to work eight hours each. That will make 16 hours, and the other 8 hours are left idle. We allow the men to leave when it is intolerable.

23,328. How long has the air been so bad as it is now ?—It is increasingly bad as we get away from the shaft.

23,329. How long have you hitherto put in the stopes ?—That level was pointed and is now resuming. It was pinned in, and we have just resumed it, and we are about to apply the jet.

23,330. How long will it be before you have artificial ventilation there ?—We have a blast laid out there. We will use artificial means until we make some discovery, and then we will have ventilation from above.

23,331. What per fathom are you making now ?—12 tons per fathom at the 145.

23,332. And what at the 110 ?—I think 13 per fathom.

23,333. Do the men suffer much from climbing up and down ?—That is the principal thing, I think, if they suffer at all.

23,334. How do they suffer ?—If the disease is anything at all it is asthmatic.

23,335. Do the young men only go down to the bottom levels, or do old and young go together ?—They go just as they happen to be arranged. We keep one of the old men down as well as the young, but the old men go down.

23,336. Do the old men seem distressed when they come up ?—No, not at all.

23,337. Are you in favour of man-engines or skip ?—I have had no experience in them.

23,338. Do you work by tribute or stoping ?—Where we work by tribute we work an easier end.

23,339. Is there any difference in the health of your tut workmen or your tribute workmen ?—No difference.

23,340. What is the average wages ?—About 18*s.* per week.

23,341. Are the bills made out in the same way as in England ?—Yes, in the same way.

23,342. With regard to the clubs, what do the miners pay ?—The miners pay 1*s.*, and the labourers 6*d.* per month. They get for that, 6*s.* per week when ill, and the doctor's attendance.

23,343. Are the families attended for that sum ?—They are, I believe, in every case, except their wives' confinement.

23,344. Do you keep a separate account of your club money ?—We do not ; it is done by a committee of the men. The men have the distribution of the money themselves. We look over them to see that nothing is improperly done. If there is any dispute they refer to us. The money is in the hands of the men ; and the balance, if any, in the banker's hands in their names.

23,345. If any, you say ?—Yes ; I think they appeal to the club in little sicknesses, and they appeal to it often.

23,346. And do you think there is more imposition in the club being managed by the miners themselves or by the agents ?—I do.

23,347. Then would it not be better for the agents to have the management of the money ?—They are better pleased by the way they are.

23,348. Does the club pay its engagements ?—It is never unable to pay, for if they should be short of funds they make a double levy, and pay two shillings instead of one shilling.

23,349. How is the doctor paid ?—He is paid so much per year, which is handed over to the doctor by the committee when due.

23,350. How are the men's wages paid ?—They are paid by the treasurer, and if paid once a month they have no subsist. We have decided to give no subsist at all.

23,351. If the man came in today, would he get his pay this day month ?—The fact is, we have two months' pay in hand.

23,352. How does he subsist in the meantime ?—He trusts to the shops.

23,353. How are the men paid ?—In local notes or gold.

23,354. In what proportion of each ?—That depends on what the banker sends us.

23,355. Do they go to the public-house or not to change it ?—They do ; but I should say that the majority of the men go to the shops and cash their notes.

23,356. Taking the men as a class, do you think they have improved ?—Decidedly, sir.

23,357. Do you visit their houses ?—I do.

23,358. Do you consider them improved ?—They are much improved.

23,359. Do they sleep too many in the same bedroom ?—They do that still too much.

LAXEY MINE.

R. Rowe, Esq.

29 Feb. 1864.

23,360. How many do you know of?—I know one case of six sleeping in a room.

23,361. What size is the room?—12 feet by 12 feet.

23,362. Do they appear to suffer from it?—No; but that is an extreme case.

23,363. Do you supply powder and candles to the men?—Yes, but they pay for them.

23,364. Do you charge them more than cost price?—Yes, we do.

23,365. Why?—Because it is the custom.

23,366. How much are they allowed per week?—Two and a half pounds.

23,367. (*Mr. Holland.*) I think you said the miners pay one shilling and the labourers sixpence per month to the club?—The underground men of the mine consist of younger men coming on to the mines. The labourer gets less wages, but receives an equal amount of pay from the club.

23,368. Does the club lose by the labourers and gain by the miners?—I think that the young men, having less cause to appeal to the club, make up the difference.

23,369. Have you ever seen miners in Cornwall suffering from miners' consumption?—I have seen one or two cases of decline; but I have not seen half-a-dozen cases of miners' consumption here since I came here.

23,370. How many underground men have you under instruction?—About 300 underground men.

23,371. Have you made any estimate of the money profit and loss of ventilation?—No, we have not.

23,372. Has the cost of this artificial ventilation been considerable?—You will understand, we have regularly ventilated as a means of getting the mine worked, so the expense has never been valued, as it has been part of the working expenses.

23,373. Have you any means of judging whether the ventilation brattice put up has paid its cost?—It has more than paid for any outlay or cost.

23,374. (*Hon. F. L. Gower.*) Do you consider the mine you worked in in Cornwall more healthy than the generality of Cornish mines?—Yes, I do. Our lead mines in the district I was brought up in were more healthy than those in the southern part of the district. In Chiverton the miners were more able-bodied.

23,375. Then you think the miners here are finer men than the Cornish men?—I do, sir; than those working in the deep Cornish mines.

23,376. In Cornwall you knew more disease?—I did, sir.

23,377. Then in Cornwall are they less healthy, and what makes the difference?—I attribute the difference to the peculiar character of the Manxmen. They are tougher and stronger, and their longevity is greater than among my own Cornish men. Talking of their individual health, I think the rate of health would be about the same; but I am of opinion that taken collectively the Manx are a stronger lot of men.

23,378. But do they work at the ladder much more here than they do in Cornwall?—They do.

23,379. Are they all Manxmen here?—The majority are.

23,380. Do the men complain of the badness of the air before the candle is affected?—They will complain before the candle is affected.

23,381. At what age do the boys begin to work underground?—The majority from 17 to 18.

23,382. What age is the youngest there?—From 15 to 16.

23,383. (*Mr. Davey.*) If you take your own parish of St. Agnes, what is the difference of the disease?—I have encountered more disease here.

23,384. Have the miners little farms or anything?—They have just the little plots they cultivate for themselves.

23,385. In using your water blast, is it done by the hand or by the wheel?—The water blast is naturally conveyed running down to the adit level, and acts in the box to where it is applied. The water blast is from the adit shaft to the adit level.

23,386. Will you describe how you use the water blast?—The water blast consists of a fall from the top to the adit level, distant 30 fathoms. The water, after accomplishing this work, goes into the level, and comes to the surface. The air so created is then carried to the shaft by wooden pipes. These pipes are three inches within, and thus the air is sent down to the different levels.

23,387. What is the rate of the air?—It is constant, as the water flows regularly.

23,388. What other means have you?—By a duck engine, worked by a large wheel. The size of the duck is three feet square, and it is attached to the main rods. Its rise and fall is seven feet, and it gives four strokes per minute, and 252 feet per minute.

23,389. Which is the most powerful, the blast or the duck?—The duck is the most powerful.

23,390. (*Mr. Holland.*) Where does the duck get the supply of air from?—From the shaft.

23,391. (*Mr. Davey.*) What distance will the duck engine throw the air into that particular end?—It will do it for 250 fathoms.

23,392. How many men have you working in the end of 110?—Eight at a time.

23,393. (*Chairman.*) How many men were working in the end before you put on the water-blast?—We had four at a time; now there is eight.

23,394. The duck would not have been enough for eight alone?—It might have been; but we intend ourselves to leave it there.

23,395. Were they rather short of air with the duck alone?—We would be afraid to put it in.

23,396. (*Sir Philip Egerton.*) Do the men employed in this mine live pretty well?—They do.

23,397. Do they take their meals at home?—They take a small portion in the mine; the other meals they take at home.

23,398. What distance do they live from the mines?—Some about half-a-mile, and others about three miles.

23,399. Have you any place provided where they can change their clothes?—There is.

23,400. Is there attached to that place a dryer?—There is.

23,401. And do you find that since these accommodations have been provided they make use of them?—Yes, they do; but there is some little exception.

Mr. JOHN KITTO, Laxey Mines.

Mr. J. Kitto.

23,402. (*Chairman.*) How long have you been agent here?—A little more than two years.

23,403. Is this the first time you were agent?—I was agent before I came here.

23,404. How long did you work as a miner?—I worked as a miner seven years underground, and was a boy on the dressing-floors at ten years of age.

23,405. What mine did you work in before you came here?—I was an agent at Swanpool mine.

23,406. Is it a deep mine?—Eighty fathoms.

23,407. Did you ever work anywhere in impure air?—In Abergowden, in the seventy fathoms.

23,408. Did you suffer?—I did not suffer, for I did not work long.

23,409. Did you see the men very different to what they are here?—I agree generally as to that, with what Captain Rowe has stated to-day.

23,410. Is there any suggestion you wish to make?—None whatever.

23,411. Is there anything we have omitted to ask?—Nothing, except as to accidents.

23,412–13. Are accidents rare here, or not?—(*Captain Rowe.*) Very rare indeed. We had a severe accident from blasting within the last week, which is the only one we have had within nineteen years.

23,414. How did that arise?—It arose while the man was tamping.

23,415. Was the man much injured?—His sight was injured.

23,416. Does he know how it occurred?—He stated he cannot tell; but it arose when he was using the tamping bar.

23,417. What straw do you use here?—Oat straw.

23,418. Do you find there is much loss of time from descending by the ladders?—It is rather important.

23,419. Have you had the matter under consideration?—Yes, we have talked about it.

23,420. Would not a skip do better?—It might.

23,421. (*Mr. Davey.*) Suppose you were to recommend anything to the directors that would be for the benefit of the mine and the miners, would they object to it, or cavil at the expense?—They support me always, and have never cavilled.

FOXDALE MINE.

1st March 1864.

PRESENT:

RICHARD DAVEY, Esq., M.P., in the Chair.

The Hon. F. LEVESON GOWER, M.P. | P. H. HOLLAND, Esq.

JOSEPH LEE THOMAS, Esq., Associate of the Institution of Civil Engineers.

23,422. (*Chairman.*) You have the management of this mine?—I have.

23,423. How long have you been here?—Five months.

23,424. What is the depth of the mine?—It is 100 fathoms below the day level.

23,425. How many men have you employed?—We have altogether 214 underground men.

23,426. Do they work by tribute or by tutwork?—The ore is all done on tribute; the ends are done on tutwork. If the ground is poor we give them tutwork.

23,427. How do you estimate your tribute; by so much in the pound, or by so much per ton?—By so much per ton.

23,428. Do you make any distinction when there is any difference in the valuation of the ore?—Yes, sir.

23,429. Have they any fixed standard?—No, we dress it ourselves.

23,430. How do you descend the mine?—By means of ladders.

23,431. What kind of steps have you, wood or iron?—Iron; occasionally they are wood.

23,432. What is the distance between each?—Ten inches.

23,433. Do you find the men complain in climbing the ladders?—Oh, no.

23,434. Is there any peculiar disease belonging to the men?—Oh, no, I never heard of any.

23,435. Do you know what they call a miner's disease in Cornwall?—I have not seen anything of that since I have been here. I have heard of men dying from bad air.

23,436. Is there any asthmatical complaint?—I do not know of any.

23,437. Of what age do you call an old miner?—We have miners here over 70 years of age.

23,438. From what you have heard, are you aware that there has been a great improvement in the working of the mine during the last 20 years, so far as regards ventilation?—I think there has. You will find that poor mines will be worse ventilated than good mines. You will find that these good mines must be worked in a good way, or left altogether.

23,439. I suppose there is a limit to the quantity of powder and candles delivered to the men?—Yes, we give them what we think enough for them.

23,440. What do you charge them?—We charge them cost price, as near as possible.

23,441. Are your men naturally strong men?—I think they are.

23,442. Are they steady?—I think they are. There is only one public house in the village. We have nine men working in our engine-shaft, and they are all teetotallers.

23,443. Do you make any profit by supplying the men with any materials that they may require?—I believe we make no profit. We calculate the price to cover the articles, so as to cover our own cost upon them. Supposing we made a profit, we should lose another way, for we should injure ourselves. Any profit made by the sale of materials would be apparent and not real.

23,444. What is the rate of wages?—The rate is 17*s.* 6*d.* per week, after all deductions.

23,445. (*Hon. F. L. Gower.*) Were you connected with any mine before you came here?—Yes, I have had the management of some large establishments. I had the management of the Linares and Fortuna mines in Spain.

23,446. Did the miners suffer there in their health?—Yes; occasionally. We had the same compiaints as regards bad in these mines.

23,447. Was the ventilation worse there?—I think it is more difficult to get more air there. If not bad, the ventilation is painful.

23,448. Do the miners suffer from what is called "miner's disease"?—I never heard any of them complaining.

23,449. Have you ever been in Cornwall?—I never managed any mines there.

23,450. Have you ever managed any mines in Great Britain besides these?—No, but I have been over most of them.

23,451. Have there been any accidents in this mine since you managed it?—Yes.

23,452. What nature?—There was an accident from two parties of men who were driving levels to meet each other. They had not warned one another, so three of them were injured. The fourth man was badly injured, and may lose his sight.

23,453. Was that accident due to the carelessness of the men?—Yes, sir.

23,454. Was that from the want of giving a signal?—Yes. The usual way is that they should rap, and be answered. They omitted rapping. They were so near that they took to speaking to one another, but their voices were not heard, and they fired their blast and it went out the other way. It might have killed them; but providentially it did not.

23,455. Have you any changing houses for the men to change their clothes in?—Yes, sir; within one hundred yards of the shaft.

FOXDALE MINE.

J. L. Thomas, Esq.

1 March 1864.

23,456. Do the men always change their clothes before they go home ?—Invariably.

23,457. Do the men live near the mines ?—Generally speaking near; but some live within three or four miles off.

23,458. Have the men any club ?—Yes ; they have.

23,459. Does that include doctor's attendance ?—It does not ; we find doctors for them in case of dangerous illness, and the medical apparatus and sticking plaster. We found it difficult to arrange for the men to be attended with the same doctor. Some were in favour of a doctor from Douglas ; others from Peel ; but now, in casesof accidents of any kind, we allow the men to choose their own doctors, and we pay them.

23,460. Do the men pay anything towards the doctor ?—The men pay a certain amount towards their club ; and that money is restored to them by instalments of so much per week when they are ill, and by their having the doctor in case of accident. The doctor is paid from the club money ; and we generally manage to keep our club with a small balance in hand to meet cases of accident.

23.461. Is the money paid to you, or have they a committee themselves ?—No ; the money is paid to us. There was a commiteee of themselves, but they managed it badly, and so it was thought better to put the matter into better hands than theirs.

23,462. (*P. W. Holland, Esq.*) What amount do they subscribe to the fund ?—1*s.* per head per month by the men underground, and 6*d.* by the men and boys on the surface.

23,463. What do you allow them when ill ?—We allow them 6*s.* per week when ill, and 8*s.* per week in case of accident.

23,464. Does that keep the account pretty square ?—It does. We generally keep a slight balance to the credit of the account.

23,465. Is that balance small in proportion ?—There is no addition to the balance ; it is about the same at the end of each year.

23,466. Am I right in concluding that the men who pay 1*s.* per head per month and receive 6*s.* a week when ill, cannot suffer, therefore, on the average more than a fortnight per annum ?—I believe you are pretty correct.

23,467. Are the persons who pay 6*d.* a month younger ?—No.

23,468. Then why do they pay a smaller sum ?—Because they are receiving rather less wages.

23,469. Is the proportion of sickness proportionate with the expenses, or not ?—No, but because they earn less and are, therefore, less able to pay the money. The underground men are more liable to accidents ; they earn more, and can afford to pay more. The surface men are not so liable to injury.

23,470. Do miners look decidedly older than other men of the same age, when they get to about 50 years of age, or not ?—No, I think not.

23,471. Is there any marked disease amongst miners to have them noticed ?—No, I think not. I should say that here they are in better health and in better condition than agriculturists.

23,472. Do you think they keep their health better ?—Yes, they do.

23,473. (*Chairman.*) Supposing you were to expend the whole money of the club, would the men willingly contribute an extra shilling per month ?—I don't think they would. They would have to look for their average ; and they would look for a certain amount of wages.

23,474. Would you be kind enough to describe how far the dead end is from any sump or winze in your mine ?—Well, we reckon it about 70 fathoms.

23,475. How do you find the air there ?—The air is dead there ; we cannot work with six men there.

23,476. Are you making any preparation to have it ventilated ?—The pipes are ready to go down.

23,477. Have you any other place you would like to complain of ?—I have heard no complaints.

23,478. What way do you ventilate ?—The usual thing is a fan, worked by a boy.

23,479. What size pipes do you carry air through ?—About three-inch galvanized iron tubes, costing about 8*d.* per foot.

23,480. How do you pay your men ; how long before you pay them after a man takes his work ?—After a man takes his work he will not receive pay until the following month. If a man takes work on the 1st of March he will get nothing until the 1st of April ; that will be his subsistence.

23,481. How much do you give him to subsist on ?—We give him a regular amount ; generally speaking about 30*s.* a man.

23,482. Then when would the ore be drawn ?—The March ore will be drawn and proved in April, and paid for in April.

23,483. How if it were a tut workman ?—They would be measured on the 1st of March, and given their subsistence. If we knew the men worked well, we would give him more.

23,484. Then you would pay the balance on the 1st of May ?—Yes.

23,485. (*Hon. F. L. Gower.*) Was there any other accident besides the one you described to us ?—Yes ; there was an accident in which one man was killed. The shaft men were clearing a trip-plat at the 72 fathom level, and a portion of the ground came down upon one of them, and so injured him that he died in the course of four and twenty hours.

23,486. Was that owing to his own carelessness, or was it purely accidental ?—The men say that the block of ground which came down sounded sound, but it came down upon him unawares.

EDWARD KELLY examined.

E. Kelly.

23,487. (*Chairman.*) What age are you ?—48, going on 49.

23,488. Have you been working in these mines for a long time ?—Yes ; for 32 years.

23,489. In what capacity ; as tutter or tributer ?—I have worked as a tributer, and as a labourer in sinking shafts ; but for the last 10 years I have been minding the pit work.

23,490. How has your health been ?—I have enjoyed very good health. I don't think I have had more than a day's sickness in bed within these last 20 years.

23,491. Have you never felt any ill effects from climbing the ladders ?—No ; and I don't yet.

23,492. Did you ever work in bad air ?—Yes, I have.

23,493. What was the greatest distance from the sump ?—I have worked as far as 70 fathoms from the sump or place of ventilation.

23,494. What means of ventilation did you use when you were so far from the sump ?—We had'nt applied any. We could not go any further, and we then employed duck machines.

23,495. Did you, sir, go so far until you could get no further ?—I never was in any place that I was obliged to give it up.

23,496. Has there been any improvement in the ventilation ?—There has. There have been more sumps sunk and larger levels cut.

23,497. What size do you carry your levels now ?—Four feet and a half wide by seven high.

23,498. That carries in a good current of air ?—Yes, we carry in a good air with that.

23,499. Then you don't carry in anything with you to get air ?—We have fire now.

23,500. How did you discover the air was bad ?—By the candle first. I found I could breathe myself where the candle burns dull. I never suffered when the candle was fed. I thought it was wisest to get more air when the candle didn't burn.

23,501. You mean to say that you could work

where the candle did'nt burn freely ?—I have worked in places where the candle did not burn freely.

23,502. Are the feeders in good repair here ?—I think they are good here, and I look to them two or three times a week.

23,503. You never met with an accident yourself, did you ?—Never, not one of any consequence.

23,504. Since the time you have been working here, have accidents been frequent ?—There has been a few.

23,505. What did they arise from ?—From pieces of soft ground coming away without notice.

23,506. Is it usual for the ground to fall away in this mine ?—Yes. The ground runs up and then falls down in a good lump.

23,507. How far do you reside from the mine ?—I live about 20 yards from the mine.

23,508. Are the men provided with good cottages here ?—Yes, good for working men.

23,509. Have they any fields attached to them ?—Yes, some of them have, and some of them have little bits of fields and keep a cow.

23,510. Do you consider your comrades a quiet set of men ?—Yes.

23,511. Are there any other clubs in the neighbourhood, beside the one attached to the mine ?—There is a branch of the Odd Fellows, and there are 130 men in it.

23,512. What do you pay per month ?—We pay two shillings per month.

23,513. What do you receive when ill ?—10*s.* a week.

23,514. Do you employ a doctor at your own expense ?—We have a doctor belonging to the Odd Fellows' club.

23,515. Have you the benefit of applying to the mine doctor as well ?—Well, I suppose that lies with Mr. Thomas. There is no obligation to get a doctor, but they can get one if they like.

23,516. In illness would they provide it ?—I never was ill, and I don't know what is done for other people.

23,517. (*Hon. F. L. Gower.*) How many fatal accidents have there been since you have worked in this mine ?—Perhaps 15 or 16 in all.

23,518. Have the most of those accidents occurred from the falling away of the ground ?—Well, some of them. I recollect one man falling from the ladder.

23,519. Was that his own fault ?—I don't know. He was standing by himself, they said. Two men went down to take a door off one of the lifts, and he dropped beside them, but they could not tell how he fell.

23,520. Do the miners appear to you to be in better health now than when you were young ?—I think they do.

23,521. (*Mr. Holland.*) Are miners as healthy here as farm labourers ?—I think they are. I know there is one man here, Mat. Smith, who has worked underground for the last forty years, and he is eighty years of age now.

23,522. Is mining considered an unhealthy employment here ?—I never heard that it was.

23,523. Do the miners do any work aboveground ; I mean the gardens in the fields ?—They do ; some of them have little bits of land, and they will do little bits of jobs at home in their gardens.

23,524. Is that a general thing with them ?—Yes, it is.

23,525. Are there many who don't do so ?—Some.

23,526. Is there any difference between those who do and those who do not ?—I have not seen much difference.

23,527. Have you worked in air so bad as to prevent you doing a fair day's work ?—No, sir.

23,528. When the candles begin to burn dim does it affect you, and prevent your doing a good day's work ?—No ; I have not been prevented doing a good day's work by that.

23,529. Have you ever known powder-smoke hang longer than quarter of an hour ?—Sometimes it will hang for half an hour where it is still warm. I have seen some cases where it has hung longer, but it would not hang warm.

23,530. Was it disagreeable ?—No ; I always stood back till the place was cold ; till the smoke cleared out a little.

23,531. Do you think candle-smoke disagreeable ?—No.

23,532. Does the dust annoy you much ?—I believe it is annoying in dry places ; but I have been working in damp places myself, so I cannot tell.

23,533. Are there dry workings in the mine ?—There are.

23,534. Sufficient dust to be disagreeable ?—No, I think not ; but it will dust a little when you work the tools against the ground.

23,535. Are there many of the miners who are quite free from "touch" in the wind ?—There are a good many who are not touched in the wind.

23,536. Can they run and walk as good as any men ?—I think they can.

THOMAS WHITTAKER examined.

23,537. (*Chairman.*) What are you ?—I am a clerk.

23,538. Have you resided long in this neighbourhood ?—Seven years.

23,539. Are you well acquaited with the miners living here ?—Pretty well ; I know them all.

23,540. Do you visit their cottages ?—Sometimes.

23,541. Have you any knowledge of the manner in which they live ?—I have, of some of them.

23,542. The working miners, for instance, how do they live ?—Some of them live pretty fair.

23,543. What is their food generally ?—They have butcher's meat—beef and mutton ; milk and potatoes, and herrings, and fish of all kinds ; that is their principal food.

23,544. Do they provide themselves regularly with their food ?—They generally provide a stock of herrings.

23,545. Then they do not spend much of their money at the public-house ?—There are a few who tipple ; but ordinarily they are a very steady set of men.

23,546. Do you know anything of the agricultural labourers ?—Yes, something.

23,547. Do you know how they live ?—I don't think they live so well as the miners ; their pay is not so good.

23,548. What is their pay ?—About 10*s.* per week.

23,549. A little more than half of the miners ?—About that.

23,550. They have not the means of living ?—No.

23,551. Are they steady ?—The majority of them are.

23,552. Are the cottages of the miners kept pretty clean ?—Some few of them are rather dirty.

23,553. Are they cleaner or dirtier than those of the farm labourers ?—On the whole they are cleaner.

23,554. Are the miners' cottages generally more roomy ?—They are.

23,555. Have the farm labourers generally got fixed windows in their cottages ; I mean windows that will not open ?—The old houses generally have fixed windows ; but in all the houses lately built the windows are made to open.

23,556. Do most of the miners live in these new houses ?—Yes.

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For Her Majesty's Stationery Office.

APPENDIX B.

TO

REPORT OF THE COMMISSIONERS

APPOINTED TO INQUIRE INTO THE

CONDITION OF ALL MINES IN GREAT BRITAIN

TO WHICH THE PROVISIONS OF THE ACT 23 & 24 VICT. CAP. 151.
DO NOT APPLY,

WITH REFERENCE TO THE

HEALTH AND SAFETY OF PERSONS EMPLOYED IN SUCH MINES.

Presented to both Houses of Parliament by Command of Her Majesty.

LONDON:
PRINTED BY GEORGE EDWARD EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.
FOR HER MAJESTY'S STATIONERY OFFICE.

1864.

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APPENDIX B.

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I.

MEDICAL REPORT

By Thomas B. Peacock, M.D., F.R.C.P., Physician to St. Thomas's Hospital, and to the Hospital for Diseases of the Chest, Victoria Park, on the Condition of Miners in West Cornwall.

The following report is the result of observations made during two weeks spent in the mining districts of West Cornwall in July and August 1862. I then visited the Par Consols mine near St. Austell, the Dolcoath and United mines in the Camborne and Gwennap districts, the Wendron Consols in the neighbourhood of Helston, the St. Ives Consols near the town of St. Ives, and Botallack, Levant, and Wheal Owles in the district of St. Just. At the same time I took notes of 83 cases of different forms of disease met with in miners in the districts named and in the neighbourhood of Liskeard, and examined upwards of 500 men who were found at work in different mines, or who had formerly been employed as miners.

General Condition of the Miners.

In examining, even casually, a large number of miners, it is impossible not to be struck with the peculiarly delicate appearance of many of them, and especially of the older men and of the boys and young men who have worked under ground only for a short time. Instead of having the bright and clear complexions of the young people employed at the surface, those who labour in the mines have a very pale sallow appearance, and this they seem to acquire even after having worked underground only for a few months. The middle aged men are less unhealthy looking, but those who have long worked in the mines and are verging towards old age have a prematurely old apparance, a stooping gait, and an anxious expression of countenance. They are thin, pale, and sallow, and have peculiarly dingy complexions. For men following a laborious occupation they are by no means muscular, and very generally their pulse at the wrist is feeble. If inquiry be made of them they frequently acknowledge that they are not in good health, complaining of dyspeptic symptoms, want of appetite, qualmishness, sense of weight or flatulency after taking food, sometimes pain at the pit of the stomach, and occasional vomiting of the food, and an uncertain condition of the bowels, either confinement or diarrhœa. Very frequently also they suffer from pains in the back and limbs and failure of muscular power; or from breathlessness, especially on any active exertion, tightness at the chest, chronic cough and expectoration, and palpitation of the heart.

Many of the young and middle-aged men are healthy and robust-looking. Some also are seen, even at advanced periods of life, who state that they have been miners all their lives and are still going under-ground or have only recently ceased to work below, who nevertheless are hale and strong and free from appearances or symptoms of disease. Comparatively few men are, however, found at work who have much passed the middle period of life, and still fewer who under such circumstances appear and report themselves to be in good health.

The facts upon which these statements are made are confirmed by the reports given in the appendix. It will be there seen that in various mines I carefully examined and took notes of the condition of 464 men and boys who were found at work. Of this number 117 were of ages from 9 to 20, and of these 42 appeared and stated themselves to be quite well, 38 were pale or had a worn appearance, 37 were either decidedly delicate looking or complained of some symptoms of indisposition, the proportion of the latter being therefore 31·6 per cent.; 233 of the men were from 20 to 40 years of age, and of this number the proportion of healthy men was larger; the number of the healthy being 112, of the pale and worn 59, and of the decidedly ailing and delicate 62, or only 26·6 per cent.; 114 were between 40 and 63, and of these the healthy were 43, the ailing 62, the latter constituting 54·3 per cent. Altogether of the 464 men examined 197 were healthy, 106 pale or aged looking, and 161 presented symptoms or appearances of impaired health, the ailing thus constituting not less than 34·6 per cent. It will also be seen that of the men who were labouring under different forms of disease 49 were regarded as permanently incapacitated from working again as miners and many of them from performing any active labour, and of these persons the average age was 43, the youngest being 21, the oldest 66 years old. The period during which these men

had worked under-ground varied considerably. The mean period of work before the commencement of their attacks of illness was 28·5 years; one man had however only been able to work for five years, another had been a miner for 53. These facts show a decline of strength and a failure of health at periods of life much earlier than those at which men engaged in out of door occupations at the surface ordinarily become invalided. It would have been satisfactory to have instituted similar investigations as to the state of a considerable number of men employed in similar occupations at the surface in the same districts. This the time at my disposal did not afford me the opportunity of doing. From, however, the limited enquiries and observations which were made I do not hesitate to assert that the condition of the mining population is much less satisfactory in a sanitary point of view than that of men employed in laborious occupations out of doors, as masons, stone-cutters, farm labourers, fishermen, &c., that their capacity for severe labour is exhausted at an earlier period of life, and that their health also fails at an earlier age.

The forms of indisposition which were met with among the miners were the following :—

Diseases of the Miners.

1. *General Debility, Indigestion, Rheumatism, &c.*—I have already alluded to the delicate state of many of the miners and to the frequency with which they complained of dyspeptic symptoms and of rheumatic pains. Generally, however, these affections are not so severe as to prevent their working, but the men are constantly ailing, and on the occurrence of some slight exciting cause, a trivial accident or an ordinary cold, have attacks of severe illness and are laid by for a long time before they are capable of resuming their work underground.

In some cases also the dyspeptic symptoms are very severe. The miner has little appetite; the food which he takes causes flatulency, pain or sickness and vomiting. His bowels are in an uncertain state, often obstinately confined, in other cases relaxed, or passing from one condition to the other. Symptoms of hepatic disorder are not uncommon. Several of the men stated that their illnesses of different kinds commenced with attacks of jaundice, and the ailing men have very frequently a more or less deep bilious tinge of the eyes and surface generally. They suffer also from piles and pass blood by stool, sometimes to such an extent as materially to reduce their strength.

In three cases the dyspeptic symptoms were so severe as to have unfitted the men for work, and in two of the cases there could be no doubt that there was serious organic disease of the stomach and other viscera. These patients were aged 52, 61, and 67; they had worked underground for 36, 50, and 51 years respectively, and had been laid by for 7 months but previously ailing 2 years, for a year and a half but far from well for 6 or 7 years, and for 4 months.

Rheumatic affections of different kinds are, as would naturally be supposed, extremely common among the miners. Generally they take the form of subacute rheumatism or of chronic pains affecting the trunk or limbs, especially the back and loins,—lumbago, or the hips,—sciatica. In few of the cases of disease among the men were some symptoms of this kind absent. In the cases of chest affection pains in the sides, apparently intercostal rheumatism, were common, and occasionally excessive tenderness of the surface was found. Several of the men said that they had formerly had attacks of rheumatic fever, and I met with one case in which mitral valvular disease had supervened on such an attack, and a second in which there had been symptoms possibly of slight rheumatism at the time the cardiac affection commenced.

In one instance a man had paraplegia caused by working with his legs in cold water; a second patient, who also suffered from miners' asthma with mitral valvular disease, had been subject to rheumatism for many years, and after a slight twist of the leg felt something give way in the knee and had not been able to work since. He apparently had a false cartilage in the joint, which on his using any exertion produced irritation. He had worked several years under ground as a miner but had latterly been employed in the "sump shaft." Another man, 45 years of age, who had worked in damp and draughty shafts, was entirely incapable of working from chronic rheumatism.

2. *Slow Fever.*—The miners frequently state that they have suffered from what they call "slow fever." This term they evidently apply to at least two distinct forms of affection. One of these is the ordinary typhoid or continued fever, well known to be generally due to the decomposition of animal matter and consequently to be met with in imperfectly drained houses and districts. This affection I saw both in Camborne and St. Just, and at the latter place found that it had prevailed extensively and fatally. Nor was this surprising when the state of the cottages was considered, for they displayed in many cases all the circumstances which are well known to be conducive to the development and spread of the disease. The other form of affection is one which is clearly due to the occupation of the miner, and of this I met with two very characteristic cases, and the symptoms were frequently described to me by other persons who had suffered from the affection.

The disease usually appears to commence gradually after the miner has been working under ground for some years. It generally occurs after he has been employed in a close end where there has been very imperfect ventilation or great heat, or when he has been working at tribute for some time at a scarcely remunerative rate, so that he has not been able to obtain an adequate amount of wholesome and nutritious food. The patient's appetite first fails, often he experiences an entire repugnance to food and the little which he takes does not agree with him, giving rise to sense of distension, weight or pain, or being followed by retching and vomiting. There are frequently colicky pains in the abdomen; the bowels are confined, and the patient not unfrequently has piles, passes blood by stool, and has pain or tenderness in the region of the liver. He usually also suffers from headache, dizziness, and depression of spirits, rapidly loses flesh, and soon becomes so prostrated as not to be capable of continuing his work. The failure of power is sometimes first experienced in the arms in striking; more frequently, however, there is weakness in the loins and lower extremities, especially experienced in ascending the ladders; and usually there are pains in all parts of the body and particularly in the back and limbs. With these symptoms there is generally some shortness or difficulty of breathing, but rather from weakness than any active affection of the chest. Marked feverish symptoms are also experienced, burning heat in the palms of the hands and soles of the feet, aggravated towards the after part of the day; with extreme restlessness at night, so that the patient obtains no sleep and rises in the morning less refreshed and more prostrated than when he went to bed at night. In one of the cases which I saw there was a peculiar desponding or depressed expression of countenance, and the face was sallow and pale but very unlike the sallow paleness of a person suffering under malarious influence. The sufferer had a peculiar glassy eye, the tongue was thickly furred and the breath offensive; there was some tenderness in the region of the liver and the bowels very much confined. There was no impairment of the resonance on percussion in any part of the chest, but the chest did not move freely and fully with the inspiratory and expiratory acts and the respiratory sounds were very feebly heard. The heart's sounds and action and the pulse at the wrist were also feeble.

This form of affection seems to be very aptly termed "slow," it prostrates the patient, and renders him altogether unfit for work, without being at any time actively ill. He is rather out of condition than ill, and is proportionately long before he recovers his health and vigour. The men state that when they feel themselves a little better they frequently try to resume their work underground, but a few days, or even a few hours, often again prostrates them and compels them to relinquish the attempt. One of the patients to whom I have referred was a man 37 years of age, who had worked as a miner for about 20 years without suffering from his occupation till the occurrence of the attack. When I saw him he had been laid by for 7 months, and though he had two or three times attempted to resume work, he had soon been compelled to give up again. The other patient was a man 38 years of age, who had worked underground for about 25 years. He when seen had been incapable of work for five weeks.

The result of this affection varies. I met with instances in which the men said they had suffered from "slow fever" for several months, 15 or 20 years before, and had entirely recovered from it, and been able to work steadily ever since. In other cases, however, it is only the commencement of a state of indisposition which is never entirely overcome, and ultimately determines one or other of the forms of disease to be hereafter described.

3. *Affections of the respiratory organs.*—By far the most common forms of disease met with among the miners are affections of the respiratory organs, asthma, bronchitis or pneumonia or the two combined, and phthisis or tubercular consumption. Indeed, of 83 cases of disease tabulated in the Appendix, 54 or 65·06 per cent. were of this description.

Miners' Asthma.—The broncho-pneumonic and asthmatic affections are so common as to have received from the miners, and indeed in the district generally, the names of miners' asthma, disease or consumption, and of the 54 cases of disease of the respiratory organs 41 may be regarded as of this description.

The disease is described as varying considerably in its

mode of commencement. In some cases it supervenes after the occurrence of cold or a state of prolonged but slight indisposition, as dyspepsia or rheumatism. In others it occurs suddenly with a severe attack of inflammation of the chest, occasioned by cold taken in the mine or at the surface. When the disease originates in the former mode, it appears to have a special tendency to run into chronic asthma, with increasing difficulty of breathing and impairment of general power. In the latter mode it more frequently is attended by active febrile disturbance and terminates in consolidation of some portion of the lungs, from which the patient never entirely recovers, but is left continually suffering more or less from cough and expectoration, with increasing debility. In the former class of cases, or as I should regard it, in uncomplicated miner's asthma, the physical signs are often very slight in the earlier stages and afford little explanation of the difficulty of breathing, prostration of strength and palpitation, under which the patient labours. On carefully examining all parts of the chest, the only morbid conditions detectable are often the want of full and free expansion, general feebleness of the respiratory sounds, and extreme weakness of the sounds and action of the heart and pulse at the wrist.

In the advanced stages, however, the symptoms of asthma and the signs of emphysema become very marked. The difficulty of breathing is extreme, and is aggravated by any slight exertion, as by ascending stairs or a slight elevation, and it is usually much increased by certain states of atmosphere and when the patient takes cold. Notwithstanding the great effort which is made in breathing the movements of the chest are most imperfect, there is little change of capacity with the inspiratory and expiratory acts, and the respiration is almost entirely abdominal. The patient speaks slowly and interruptedly, and often is not able to count aloud to10 or 12 without drawing a fresh breath. The shoulders are raised, the supra-clavicular spaces much depressed, and the chest covered by large and distended veins. The chest is full and rounded. The resonance on percussion is abnormally clear, and the inspiratory sound is scarcely audible and the expiratory prolonged; or the respiratory sounds, if there be more or less bronchitis, are masked by sibilant and sonorous rhonchi.

The dulness on percussion in the region of the heart is altogether absent or considerably diminished in extent; and the heart's sounds are very inaudible, and the pulsation feeble and visible over a large space in the left side of the epigastrium. The pulse at the wrist is also uniformly weak and often slow.

In the other or complicated form of the disease there are usually evidences of consolidation in some part of the chest, at the upper clavicular, dorsal or lateral regions; indicated by the usual signs, deficiency of resonance on percussion and of the respiratory movements and unduly loud cough and vocal resonance and tubular breathing. Sometimes the whole chest is contracted being narrow across, the supra clavicular spaces are depressed, and the liver and stomach advance to a high level from below. In this condition the resonance on percussion may be only slightly if at all impaired, but the movements of the chest are very imperfect, the vocal thrill is usually exaggerated, and the respiratory sounds are harsh. Large veins are also generally seen upon the surface of the chest.

In both forms of the disease the patients' strength becomes very much reduced, their complexion is very sallow, and they suffer from shortness and difficulty of breathing, much aggravated upon taking any active exercise or when suffering from cold. They have usually a hard cough, often with a husky or hoarse voice, and they expectorate a considerable quantity of secretion, which is generally described as of a deep brown colour. Their appetite is impaired, their food does not agree well with them and their bowels are confined. They often experience palpitation, and the sounds and action of the heart and the pulse at the wrist are very feeble.

The form of the disease in which there is local consolidation in some portion of the lungs, bears a close general resemblance to true consumption, and especially where, as often happens, the voice is husky and the patient expectorates blood. There are, however, features by which it is sufficiently distinguished from that disease. It usually occurs in persons who do not present any hereditary predisposition to phthisis—their parents and other relatives having often attained advanced ages and being quite healthy. It commences at a later period of life than phthisis, indeed in persons who have reached ages at which consumption is by no means of frequent occurrence. It is also much slower and less active in its progress, so that in persons who have been ill for several years the signs often do not indicate extensive or advanced disease. The quickness of pulse, the rapid and extreme emaciation, and the night perspirations so characteristic of true phthisis, are also generally absent or only slightly marked, and there is rarely diarrhœa, indeed the bowels are often obstinately confined.

The course and result of the two forms of miners' disease differ. When the affection takes the asthmatic form, though the patient continues always a great sufferer and unfit for any active occupation, life may be prolonged for many years. I met with instances in which the men stated that they had been in this state for several years, 7, 11 or 12, 20, and 25 or 26 years. Indeed this condition seems to be a kind of imperfect natural cure. Patients several times mentioned that many years before they had been very seriously ill so as to be compelled to give up work, and were stated by medical men to be running into rapid consumption. After having, however, completely laid by for some months, or a year or two, they rallied, and while suffering from symptoms of asthma, recovered a certain amount of vigour, and had continued much in the same state since.

In the form of disease in which portions of the lung become consolidated, the disease seems generally to progress, though slowly, and ultimately to determine some form of disorganization of the lungs. The signs of cavities develop themselves, indicating either considerable dilatation of the bronchial tubes or the occurrence of ulceration in the lung tissues, and the patient's power more rapidly breaks down, so that the affection usually terminates fatally at the most in 7 or 8 years.

The precise nature of these several forms of affection can only be ascertained by a series of post-mortem examinations, and I have had the opportunity of examining after death but one case of miners' disease. In that instance the affection seemed to have originated in bronchitis and pneumonia, leading to collapse or consolidation of the lung, and no tubercle was found in any part of the body. The patient was a man 55 years of age, who had been a miner since he was 13 or 14 years old; he had been laid by ill for three years, though ailing for a greater length of time.

The left lung was found slightly attached to the parietes by old cellular adhesions. It was voluminous, somewhat emphysematous at the edges, of a deep blue or black colour, and sparingly crepitant. The bronchial tubes contained much secretion of a dark brown colour. The right lung was universally attached to the parietes by strong fibro-cartilaginous adhesions. One of the ribs was carious, and an abscess had formed in the situation, containing thick yellow pus, which involved the pleura but not the lung itself. The substance of the lung was of the same colour as the left, and entirely solid except towards the upper part, where there were several irregularly shaped cavities, which, together with the bronchial tubes, contained a similar brown material to that found in the tubes of the left lung,

The bronchial glands were also very large, hard, and of a black colour. In the bronchus of the right lung, the terminal portion of that of the left, and the commencement of the trachea, the mucous membrane was deeply reddened and studded with small yellowish coloured deposits of lymph. The trachea and larynx were large, but the mucous membrane on the epiglottis and cordæ vocales, though thickened, was free from ulceration.

It will be seen from the tables in the appendix that this form of disease occurred, generally speaking, in persons of midddle age; of 39 patients examined, the mean age at the time was 47 years, and the extremes of age 25 and 63. The average duration of the disease was then four years, but there was a great variety in the cases in this respect, the periods having ranged from 1 year to 25 or 26. The ages at which the patients stated that they had first worked underground ranged from 7, 8, and 9, to 20 and 27 years, and their period of work prior to the occurrence of disease was, on an average of 36 cases, 27 years. From this calculation, however, three cases in which the patient had only worked one year, five years, and eight years, are excluded; and without these cases the periods of work ranged from 11 to 51 years.

Consumption.—Next in point of frequency among the diseases of the miners was tubercular consumption. Of this affection I met with 12 cases in which the disease was advanced, and three others in which it was only commencing. In five cases also classed under the head of miners' asthma, there were detected evidences of consolidation at the upper part of one or both lungs, which might have been tuberculous, but probably was the result of inflammatory action in impaired constitutions. As is usually the case, the instances of consumption which fell under my notice occurred most generally in persons who displayed some hereditary predisposition to the disease, other members of the same family and often persons who had not worked underground, having died of consumption.

The cases of consumption in miners did not differ from the disease as ordinarily seen, except that in some instances the affection occurred at ages at which, under favourable cir-

cumstances, the liability is comparatively small; the disease also was sometimes unusually prolonged. In other respects all the common characters of phthsis were observed—the quickness of pulse, the night perspirations, the tendency to diarrhœa, and the physical signs were those which are commonly detected. In one case the disease displayed a somewhat unusual complication, albuminuria and dropsy. The cases tabulated in the appendix illustrate the remarks here made. The mean age of the 12 patients was 35 years, and the ages ranged from 21 to 52. The duration of the disease averaged 9 to 10 months at the time the patients were examined, the extreme duration being four months and seven or eight years. The ages at which the patients had begun to work underground ranged from 9 or 10 to 21, and of 11 cases the period of work prior to the commencement of the symptoms was 20 years. The extreme periods of work were 14 and 41 years, exclusive of one case in which a person, always very delicate, had only worked five years.

There can be no doubt that the work in which the miners are engaged peculiarly predisposes them to suffer from affections of the chest; but the special form which these affections assume would appear to depend to a considerable extent upon the original constitutional power of the men, and especially upon the existence or absence of any hereditary predisposition to phthisis. When the miner is of healthy constitution, he resists to a much later period the unfavourable influences to which he is subjected, and the diseases which ultimately occur are asthma connected with gradual failure of the power of the heart and lungs, with or without chronic bronchitis; or inflammatory consolidation of some portion of the lungs, which may ultimately terminate in disorganization and ulceration of the tissue. When on the contrary the patient is originally of feeble constitutional power, and especially if predisposed to phthisis, he becomes an invalid at an earlier period, and suffers from true tubercular phthisis. In some cases, however, where the predisposition is only slight, the patient escapes the disease during the period of life in which the tendency is usually manifested, and only sinks under it when under more favourable circumstances he would probably have escaped it altogether.

A case of mesenteric disease, an affection also of tuberculous nature, in a boy 17 years of age, who had gone to work underground at 14 and had worked about a year and a half before his health failed, is also included among the cases examined.

4. *Diseases of the heart, &c.*—From the violent muscular exertion undergone by the miners, both when working underground and in ascending the ladders, I expected frequently to meet with affections of the heart among them, and such proved to be the case. The forms of disease which were observed were not, however, with one or two exceptions, such as are generally occasioned by any violent muscular exertion, as rupture or injury of the aortic valves. The prevalent form of cardiac defects appears indeed rather to be mitral valvular disease, resulting probably from dilatation of the left ventricle and consequent ill adjustment of the valves, so as to render them incompetent to close the orifice.

In four cases patients complained of palpitation of the heart, increased on exertion and incapacitating them from following their employment. In two of these the symptoms were first experienced after severe sprains, and some injury had probably been sustained by the heart, though no signs of valvular or other defect could be detected. In one of the two other cases the heart was apparently dilated, and in the fourth there were marked dyspeptic symptoms.

In four cases there were the usual symptoms and signs of more or less aggravated mitral valvular disease. In one of them the affection had supervened on acute rheumatism; in another the patient had had some pain, redness and swelling of the hands at the time the heart first became affected, which might have been rheumatic. The other cases had no connexion with rheumatism. The ages of the men who were thus affected were 21, 31, 36, and 36; they had first commenced working underground when 13, 15, 16, and 17 years of age respectively, and when examined they had been incapacitated from work for two and a half to three years, seven months, ten or eleven years, and four years.

In addition to these cases, there were others classed under the head of miners' asthma, in which palpitation was a predominant symptom, the heart was dilated, and the action of the mitral valves probably defective. Indeed it will be remembered that in that form of affection, shortness of breath and palpitation were common symptoms, even at an early period, and often existed to an extent altogether disproportionate to any signs of pulmonary disease which could be detected. They were therefore probably connected with some failure of muscular power and dilatation of the cavities of the heart. In the later or more advanced stages of miners' asthma there could be no doubt of the existence of dilatation of the right side of the heart, and the affection probably involved the left side also. The pulsation was generally visible over a large space in the præcordia and to the right of the left false ribs in the epigastrium; the impulse of the heart was feeble, the sounds indistinct, and the pulse at the wrist also weak.

In the only case of miners' disease which I had the opportunity of examining after death, the heart was found somewhat large, and weighed probably about 10½ oz. avoir. The cavities were dilated, but the walls not increased in thickness. The attached pericardium was loose and œdematous, and the muscular substance of the heart pale and flabby. The valves were healthy, but the aorta and pulmonary artery were both considerably dilated, though not otherwise diseased.

A case of aortic valvular disease was met with in a miner 51 years of age, who laboured also under hemiplegia. He stated that he had commenced to go underground at the age of 15, and had always worked in good air, having been employed as a "coacher," or in pushing the trucks along the tramways from the places where the men were getting the ore or driving levels to the shafts. The work was severe and he had been much exposed to cold draughts, but had never had any rheumatic symptoms. The date of the first occurrence of the cardiac symptoms could not be ascertained, but the first attack of paralysis had occurred five years before I saw him.

Another man, 44 years of age, laboured under symptoms of angina pectoris. He had first worked in a mine when 14 years old, and had chiefly been employed in damp shafts, repairing them when "forking out," or being pumped out to be re-worked after having been abandoned. He complained of suffering severe pain at the sternum and in the region of the heart, extending through to the left shoulder blade and down both upper arms especially the left. He was first attacked when walking to the mine one morning; and the pain had since continued to recur, especially on exertion, with such severity that he had been quite incapable of undertaking any employment whatever. It was accompanied by breathlessness, but was unattended by any sense of faintness or insensibility. It usually subsided in a few minutes if he immediately stood still when it came on; and under the rigid observance of rest and freedom from excitement had become less severe and of less frequent occurrence. On careful examination no signs of disease of the heart or aorta could be detected.

5. *Affections of the nervous system and organs of special sense.*—I have already mentioned that in the case of aortic valvular disease the patient had hemiplegia. He had had two attacks of paralysis; of which the first occurred five years before he was seen, since which time he had been unable to work. In the other case the patient had commencing miners' asthma. He was 69 years of age, had worked as a miner from the age of 10, and had been laid by with paralysis for eight and a half years.

In three cases the patients were paraplegic. In one of them a man 50 years of age, who had first worked in a mine at 17 or 18, had been laid by for one year and seven months with loss of power over the lower extremities, which came on after he had been working in cold water. In the second case the patient was 49 years of age; he had first gone underground at the age of 18, and had been paraplegic for six years. In this instance the power of speech was affected and the paralysis was becoming general. In the third case the paraplegia was less complete. It occurred in a man 44 years of age, and was ascribed to a fall in the mine from a height of 24 feet which had occurred seven months before.

I met also with a case of very marked paralysis agitans in a man 52 years of age, who had begun to work as a miner when nine years old, and laboured under very severe miners' asthma. He had been ill and unable to work for seven or eight years.

In addition, however, to these more serious affections, symptoms of nervous disorder are very often complained of by the miners. Deafness is extremely common, and frequently exists to a marked degree in men who have worked several years underground, and this too when they have never sustained any injury from blasts or other accident to which the condition could be assigned.

In the cases of slow fever, miners' asthma, and indeed in almost all the forms of affection to which the miners' are liable, the men very generally complain of suffering from headache, giddiness, noises in the ears, depression of spirits, &c., and these symptoms often exist to a very distressing extent.

6. *Dropsical affections.*—In one of the most marked cases of miners' asthma which was seen, the patient stated that when his asthmatic symptoms were more severe, as during winter or when he took additional cold, his feet and ankles became swollen. He was 49 years of age; had first begun to work as a miner when 14, and had been incapable of

going underground for 20 years, and quite unable to work for 7. In a case of mitral valvular disease in a miner 21 years of age, previously referred to, the lower extremities were œdematous. In three other instances there were also dropsical symptoms, doubtless due to cardiac and pulmonary obstructions. In two cases there was anasarca connected with renal disease. In one of them, a man 21 years of age, hereditarily predisposed to phthisis, laboured under advanced consumption with dropsy and albuminous urine. He had only worked underground for two years and a half. In the other case the man was 29 years of age, had worked as a miner since the age of 15 or 16, and had been in America, where he had drank much and contracted syphilis. In addition to these cases, a man 57 years of age, who was still working underground, stated that three years before he had suffered from a general swelling of all parts of the body. The affection came on after exposure to cold and damp, and was attended by pain in the loins and scanty and bloody urine, and was doubtless renal dropsy. He was laid by in consequence for three months and still suffered from weakness in the loins, though the anasarca had entirely disappeared.

In the fatal case of miners' disease the kidneys were found large and somewhat mottled and the cortical portion narrow, but the tumica propria separated readily and the organs did not appear to have undergone any organic change.

The miners might certainly be expected to suffer from renal affections subject as they are to be exposed to cold and damp, after they have been working hard in hot places and perspiring profusely, and they must be especially susceptible when exhausted by working in close places.

The dingy complexion of the men who have long worked underground, and especially of those who suffer from miners' asthma, is very striking, and though occasionally partly due to affection of the liver, is, in many cases altogether disproportionate to any bilious tinging of the conjunctivæ which may exist. Indeed some of the men who present the sallowness in the most marked degree have peculiarly pale and glassy eyes. I was therefore led to suspect that the sallowness might have some connection with the condition of the supra-renal capsules, and the state of those bodies was carefully investigated in the case of miners' disease which was examined after death. One of the capsules was found extremely atrophied, so that it seemed little more than a mass of condensed cellular tissue. The structure of the other was wholly destroyed, and its substance was converted into a cyst with extremely thin parietes. It remains to be ascertained whether the existence of the disorganization of the supra-renal bodies in this case was merely an accidental coincidence, or whether a similar condition is of frequent occurrence in the miners who present the peculiar dinginess of complexion which has been described.

7. *Diseases of the skin, scrofula, &c.*—The only important skin affections which were noticed were two cases of lepra or psoriasis. The subject of one of these was a man 38 years of age; the other was a boy of about 14. Neither presented any peculiar features. Some of the children had also impetiginous eruptions about the face.

Though both among the men and boys enlargement of the cervical glands and the cicatrices of abscesses were occasionally observed, such were not of by any means of frequent occurrence, and in most cases the affection was stated to have commenced before the subjects went to work underground. Several of the men were much marked with smallpox.

8. The two remaining cases included in the tabular statement of the diseases of the miners were the *results of injuries* which had in each instance been sustained three years before the men were seen. In one case the man was crushed by a fall of stone, and had suffered from shortness of breath and palpitation ever since. In the other intance the man had had his leg broken, and had otherwise been much bruised and shaken. Neither of them had been able to do any work since the occurrence of the accidents.

In several cases the men were found to have sustained more or less serious injuries of the eyes and face in blasting, and several were nearly or quite blind of one eye from this cause.

A large number of the men examined also stated that they had sustained more or less serious injuries and accidents, falls from the ladders, crushes, &c. In some instances also it appeared that accidents of comparatively slight description had, doubtless from the state of health of the miners at the time, been attended with serious symptoms that entailed very prolonged periods of absence from work.

After the evidence which has been advanced as to the sanitary state of the mining population and the enumeration of the various forms of disease met with among the miners, it remains to inquire what are the causes which conduce to their unhealthy condition.

Causes of Disease among the Miners.

Predisposing causes.—Construction of dwellings, drainage, &c.—There can be no doubt that the county of Cornwall is eminently healthy, and there is nothing about the meteorological or geological features of the mining districts which can act unfavourably upon the sanitary condition of the mining population.

In the Camborne and Redruth districts the modern cottages are generally well and substantially built, and are very much better than those inhabited by the agricultural labourers in the midland counties. They contain generally 2 or 3 or 4 or 6 rooms; in the former case being only occupied by one, in the latter by two families. They have usually a small plot of ground in front or behind in which vegetables, potatoes, are cultivated. They are stated, however, not to be generally provided with any system of under-drainage, and the lower rooms have rough cast or concrete floors, so that they must be damp. The upper rooms are also not usually ceiled but open directly to the slated roof, and must be hot in summer and cold in winter. With these exceptions, however, and the want of a larger number of rooms for the separation of the different members of the families, the cottages inhabited by the better class of workmen are exceedingly good. Some of the cottages are, however, the reverse. They are thatched, and consist of only two rooms, the upper one in the slanting roof; and they are not provided with any system of under-drainage and many of them have no privies. This was the case with the house in which Mr. Bankart and myself performed the post mortem examination on John Francis, and in several of those adjoining; and I was informed that many others in Redruth are similarly circumstanced. In Camborne I was taken to a row of thatched cottages, each consisting of only two dark and low rooms, and all of which had no privies and no system of drainage whatever, the inmates throwing everything either into a small back yard or on a common dust heap in the street.

There can be no doubt that this state of things must exercise a very deleterious influence over the whole population. I learn from the resident medical men, that typhoid fever, the unmistakable indication of defective drainage, prevails not unfrequently in the district. Were it not for the general healthiness of the climate and locality, the free exposure from the absence of any high hills to the winds blowing from every quarter, the great facilities for natural drainage afforded by the rocky character of the surface, and the great fall of rain, typhoid fever would certainly prevail extensively.

In other parts of the mining districts, I found the condition of the cottages most defective. At Wendron, they consisted of low buildings with thatched roofs containing 2 rooms. In one which I visited, there were three beds in a small room up stairs, without any window which admitted of being opened. In this room there was a father who was ill and a wife with a little baby in one bed, a married daughter and a baby in the second bed, and the rest of the family consisted of the son-in-law, a daughter about 16, and two sons of 14 and 12. In none of these cottages was there any drainage or privies. The cottages in the St. Just district were also generally most defective. They were small, low, and thatched; contained only two rooms for large families, and the little windows which were provided in the sleeping rooms would rarely open. The floors were of concrete, and there was no underdrainage and rarely any privy, the whole refuse being thrown out on a dust heap in front of the door or into a pool of dirty green water, through which it was necessary often to pick the way to reach the door. This district is elevated and perfectly open to the sea and should be most healthy; but from neglect of all attention to sanitary regulations, at the time of my visit in August, it was suffering from typhoid fever, and I was informed by Mr. Searle, who obligingly took me to several of the cottages, that the disease had been prevailing extensively and fatally for several months.

The defective construction and drainage of the cottages cannot, however, afford any explanation of the condition of the miners, for they are less exposed to such injurious influences than the other members of their families.

The *diet and habits* of the miners have been blamed as causes of their unhealthy state. They usually live upon bread and butter and a kind of pie, the pasty, which they take down with them into the mines. This consists of a paste of flour and water and suet, with a small quantity of meat—fresh meat or pork, and potatoes and other vegetables. It is both an innutritious and indigestible article of food, and may in some degree explain the frequency with which the miners suffer from dyspeptic symptoms, and be connected with the occurrence of the skin affections, lepra or psoriasis, of which diseases cases were met with. There is great reason to believe

that the men, for persons who are engaged in a laborious and exhausting occupation, do not get a sufficiency of nutritious food, more particularly fresh butcher's meat. The miners are, as has been before said, very thin, sallow, and ill nourished, and for men engaged in athletic pursuits are not generally very muscular; and, though their condition may be in part ascribed to the profuse perspiration when they are working in the mines, the deficiency in the quantity of nutritious food is probably influential in its production. It was not easy to ascertain the precise quantity of butcher's meat which enters into the diet of the men, but I met with no one who stated that he got more than half a pound of uncooked meat in a day, and they assert that they only obtain this amount of fresh meat very occasionally. The irregularity with which they get their meals was assigned by one man as a cause of the indisposition under which he laboured.

I have been informed that the men indulge too largely in beer; and this may possibly be the case on the pay days; for the practice of paying in notes, adopted in some instances, almost necessarily drives the men to the public house to get the notes cashed. I however made frequent inquiries of the men working in different districts and of the overseers, and, if not entirely misinformed, conclude that the Cornish miners are not an intemperate race of men, at least when compared with the working population of London and other large towns. I was assured that they rarely drink spirits. I cannot think that their habits in this respect can be blamed as the cause of their unfavourable sanitary condition. The men are also said to be much addicted to smoking, and they excuse this habit with the assertion that it is necessary to smoke in the mine to avoid the injurious effect of the air and of the smoke of the blasting powder. The practice is certainly very objectionable. Other causes which may be blamed for the state of the miners are the absence of fresh air and sun light, the breathing of a deleterious atmosphere, the inhalation of gritty particles, the heat of some of the workings, the violent muscular exertion, and the exposure to sudden chills after working in the mine or on coming to the surface.

Absence of Sunlight, &c.—At all seasons of the year some of the men must be very little exposed to sun light and fresh air. Working as they do in spells of 8 hours, they must even in summer be much in the dark, and in winter can scarcely have any sunlight at all. This will go far to explain the peculiar blanched appearance, the glassy eyes, and pale lips which are constant among the miners, and even in the men who regard themselves as in robust health. This is the more striking from the peculiarly fresh complexions and the healthy appearance of the other portions of the population of the same district. By the politeness of the Rev. Mr. Ellis, I visited, in conjunction with Mr. Temple, the National Schools at Pool, which are attended by a large proportion of miners' children. On the day of our visit, Monday, the attendance was smaller than usual, but in the female school we found 46 infants and 82 girls, and in the boys' school 140 boys; and I have certainly never seen a more healthy set of children collected together. I did not, on close inspection, detect a child with swelled glands or other signs of scrofula, and was informed on inquiry that such were very rare. The older children also, both boys and girls, who are seen working at the surface in dressing the ores, are usually very healthy looking; and the young women who are employed in breaking the ore and picking it before it is crushed and dressed, have remarkably clear, bright, healthy complexions. The married women who are seen in the cottages are also very healthy looking. No contrast can indeed be more striking than that which is presented by the children employed at the surface and those who work in the mines; and the men often have the appearance of being thoroughly worn out and decrepit when their wives, at about the same age, are healthy and young looking.

Deleterious influence of the air of the Mines.—There can be no doubt that the air of the mines, especially in the deeper workings, and at considerable distances from the shafts, becomes extremely impure from the very imperfect ventilation, the deteriorating influence of the respiration of the men at work, and the combustion of the candles which they burn. This cause seems indeed to be by far the most important in determining the unhealthy condition of the miners. The ventilation generally becomes more difficult and defective with the increasing depth of the mines, and the state of the miners is therefore usually found most unsatisfactory in the districts where the mines have attained the greatest depth. The ventilation is, however, most seriously interfered with by the distance of the levels from a shaft, and several of the men complained much of the character of the air which they had breathed in workings which were very near the surface.

Of 45 cases in which the men who were examined assigned specific causes for the failure of their health, in no less than 16 they traced their indisposition to having worked in places where the air was "dead," "bad," "thin," "light," or "poor," as they variously described it, alone or in conjunction with other causes. The miners, however, do not usually speak of the breathing of bad air as directly occasioning the illnesses under which they labour. On the contrary they regard this, and doubtless correctly, as impairing their power and giving rise to a state of general weakness in which they become susceptible to any other morbific influences, and often suffer severely and for a long period from indisposition occasioned by some very trivial exciting cause.

Most persons with whom I conversed on the subject, the miners themselves, the underground captains, and indeed almost every one who had ever worked underground, admitted the frequency with which the air of the mines was impure. I was often told that "all men who went underground had to breathe bad air more or less," and the tables in the appendix afford ample confirmation of the correctness of this assertion. Of 54 out of the 63 fully reported cases of disease amongst the miners, in which the character of the air in which the men had worked is stated, in 38 the men reported that at various times they had worked in bad air; of the remaining 16, 3 stated that the air in which they had worked had never been particularly bad, 8 that it was generally good, and 5 only said that they had always worked in good air. It is possible that had fuller inquiries been instituted the proportion of cases in which the air was defective would have proved to be much greater than this. Of 22 men whom I questioned on the subject, who were still working in mines in the neighbourhood of Liskeard, not less than 18 complained of the character of the air in which they worked.

When not at any great depth and not far removed from a shaft, there is often a very ample supply of fresh air, indeed the men not unfrequently complain of suffering from the draughts of cold air in the shafts and levels; but, when working at a close end driving a level, or getting the "stuff;" or when engaged in sinking a "winze," or cutting a "rise," or driving crosscuts so as to open up the different levels, the men state that the air is often very "dead" or "bad." In such cases they say that their candles cannot be got to burn, except when the wicks are constantly teazed out, or when they are held on one side. Sometimes they stated that the candles could not be got to burn at all, so that they required to be placed some distance behind the part at which the men were at work. In other cases the men said that even lucifers if struck would not set fire to the wood; and more than one miner told me that on going to his work in the morning at a close end, a long way from the shaft, they often could not get their candles to burn at all, and had to take off their coats and beat them about so as to create some little current of air, before the candles could be lighted.

That these statements were not overdrawn I had personal proof in Dolcoath mine, otherwise extremely well ventilated, for in one part where some men were at work sinking a "winze," at about 40 fathoms from the shaft and 190 from the adit, two candles were found burning very badly, and one actually went out while we were looking down.

The work of the kind which has been referred to is chiefly done by "tutwork," and accordingly it is the tutworkers who suffer most from mining. The following amongst others affords a striking instance of the injurious effects of the air which this class of men often have to work in. A man 33 years of age, who had first gone underground when 14 years old, stated that he had been quite well till he worked in a close end, in which the air was so bad that the candles could scarcely be got to burn; the level was 160 fathoms from surface, and the mine was also cold and very wet. Four other men were employed in the same place. All the others were repeatedly laid by; but he continued the work for three months when he became seriously ill, and, though five months had elapsed when I saw him, he had never been well since. Another of the men was also laid by ill at the same time.

The quantity of unconsumed carbonaceous material thrown off by the candles, especially when burning so imperfectly as they are reported to do, and the gases and smoke from the explosion of gunpowder, must further tend to render the air of the mines injurious. The very small movement of air is also attested by what the men very frequently complain of, the slowness with which the smoke from the blastings clears off, or as they term it the length of time which "it lies in the mine."

The excessive prostration of strength, altogether disproportionate to any evidences of actual disease which can be detected, and the affection described by the men as "slow fever" are precisely the forms of indisposition which would *à priori* be expected to be occasioned by slow poisoning from

the continued breathing of very impure air. The asthmatic symptoms also which seem to result from gradual failure of power in the lungs and heart may also be in part fairly referred to the same cause. The frequency of dyspeptic symptoms among the miners is doubtless also in some degree to be ascribed to the impure air which they breathe. Several of the men mentioned that after having been working in very close places for some time, their appetite failed and the food which they took did not agree with them and they became subject to severe pains in the stomach and bowels and sickness, with obstinate constipation or diarrhœa. In the cases of severe dyspepsia or organic disease of the stomach, the patients said that the symptoms had first commenced after they had been working in poor or bad air. Vertigo, headache and other nervous symptoms, with general failure of power, first experienced in the arms and legs in beating the borer and in ascending ladders, with palpitation and shortness of breath, were equally referred to the same cause.

The older men, however, frequently stated that the ventilation of the mines was very much better at the present time than formerly.

Inhalation of gritty particles.—If also the men inhale the smaller particles of granite and other hard and gritty earthy matters which are thrown off from the rock by their tools, such must certainly be serious sources of irritation to the delicate structure of the laryngeal and bronchial mucous membrane and to the substance of the lungs. Several of the men complained of the dryness and dustiness of the mines in which they worked, and one man said that "the dust was far worse than anything else" they had to contend with. So far, however, as I was able to judge I should doubt whether this cause generally acts very unfavourably upon the men, or at least whether it is comparable in its effects to other injurious influences. Portions of the lung of John Francis were subjected to careful chemical analysis by Dr. Bernays, and no siliceous material was detected in them. In the French millstone makers, to whose peculiar condition I have elsewhere drawn attention, there can be no doubt that the sharp particles of siliceous matter which they inhale do find their way into the lungs and become sources of serious irritation; determining, in persons of healthy constitution, broncho-pneumonic attacks which may ultimately lead to disorganization of the lungs, or in persons predisposed to consumption, true tubercular phthisis. The Cornish miners, however, probably like the gunflint makers of Meunes in France, suffer more from the impure air which they breathe than from the inhalation of particles of stone.

Dr. Bernays found that the dark material, contained in large quantity in the lung of John Francis was carbon.

High temperature of some mines.—The great heat of some of the Cornish mines, and, according to the men, especially of those in the killas or clay slate, must also injuriously affect the men who work in them; both directly by exhausting their powers, and indirectly by rendering them unduly susceptible to the influence of cold, to which they may be exposed in other parts of the mine or at the surface.

Some of the workings in the mines are so extremely hot that the men stated that they could not remain in them for many minutes together, but required to go into colder places and bathe in cold water to cool themselves. In these levels the men work with very little clothing on them; some men told me that they wore only their boots and a "dickie" or flannel shirt, others that they worked quite naked; all stated that in such places they were greatly exhausted even by very short periods of work. They especially complained of some of the mines, which were both hot, dry, and dusty. In 5 cases of disease among the miners, the heat of the mines was assigned by the men as the cause of their impaired health.

Violent muscular exertion.—The violent muscular exertion which is undergone by the men when working below, beating the borer or pushing the trucks along the tramways in the levels, or in ascending from the levels to the surface by the ladders where a man-engine or skip is not provided, must also tend much and prematurely to exhaust the powers of the workmen. The operation of beating the borer is generally performed by two men, who strike and hold alternately. Sometimes by three, or by two men and a boy, the former striking while the latter holds. The hammer which is employed is heavy and the strokes are delivered as rapidly as possible. In hot places the men can only make a few strokes in succession without stopping to rest, and under any circumstances they are soon put out of breath and are much fatigued by the work. One man who laboured under palpitation stated that he first suffered when engaged in beating the borer, and the heart had doubtless sustained some injury though no signs of valvular defect could be detected. Sometimes also the men have to work in very constrained positions, and one of them ascribed his illness to having worked in a nearly upright pitch. The work is also objectionable, as calling into action chiefly the muscles of the arms, not those of the whole body.

The men who are employed in pushing the trucks along the tramways, "tramming" or "coaching," have more general exertion, and the labour is more severe; and I have referred to a case in which the aortic valves were probably injured by violent exertion in this way. These men have, however, the advantage of working in good air, though they are much exposed to cold draughts and wet in the levels.

The labour of ascending the ladders, especially when the men have to work at great depths, 100 to 200 fathoms or more, is very severe, and occasions, even in young and active and robust men, great breathlessness, palpitation and quickness of pulse, followed by exhaustion, and especially when the men have been working their full spell in a hot place and perhaps in bad air. The captains state that the younger men are in the practice of racing up the ladders trying who can reach the surface in the shortest time, and assign the breathlessness of the men to this cause. There is, however, no doubt that when an ample amount of time is allowed for the men to come up they are very greatly exhausted by the exertion. On reaching the surface they gasp for breath, cannot speak, and have a palpitating heart and quick pulse. After a short time in robust and healthy persons these symptoms subside, and the pulse is feeble and occasionally slow. In men who are ailing and weak and verging towards old age, the exhaustion and distress occasioned by ascending the ladders by no means so readily subsides; and I met with several miners, working in mines where man-engines were provided, who stated that they would be quite incapable of going underground were they compelled to make use of the ladders.

The violent muscular exertion thus made by the miners are I believe, mainly the cause of the feebleness of the pulse at the wrist, which is so generally a noticeable peculiarity among them, and especially in the men who have attained or passed middle life. The imperfect respiration while beating the borer or ascending the ladders, causes primarily engorgement of the right side of the heart and subsequently of the left side also. This condition, at first only temporary, with the constant repetition of the same causes, comes with the progress of life to be permanent, or in other words gives rise to dilatation of the cardiac cavities. In men employed in athletic pursuits, if they live on the surface and have a sufficiency of nutritious food—as smiths, strikers, &c., the heart generally becomes hypertrophoid and the pulse at the wrist is consequently full and strong. Nothing therefore struck me more forcibly than to find in the miners so frequently the signs of dilatation of the heart—a condition the very opposite of that generally presented by persons following similar laborious occupations.

It has been already stated that the mitral valvular defect which is so common amongst the miners, results apparently from dilatation of the left ventricle; not, as is most generally the case, from disease of the valves originating in rheumatism. I met with only one case of mitral valvular disease which had supervened on acute rheumatism, though it was possible that some slight rheumatic symptoms might have accompanied the commencement of the cardiac disease in a second instance.

It has already been mentioned that only a small number of the miners ascribed the immediate occurrence of their illnesses to the direct effect of bad air, and the same remark applies to the violent muscular exertion which the men undergo; indeed both these causes rather act as predisponents to disease than directly give rise to it. The men often said that they "were worn out by hard work and going underground," and there can be no doubt that the impairment of their health is due to the operation of several causes, of which these two may be regarded as the chief. The men when thus predisposed readily suffer from severe and prolonged attacks of illness on the operation of any of the ordinary exciting causes, often when such are too slight to have seriously affected healthy persons.

I may here remark upon another cause of undue exhaustion of the men in some districts, the distances to which they have frequently to walk to and from the mine. In the Wendron district some of the men said they had to walk several miles in consequence of being incapable of obtaining cottages in the neighbourhood of the mines at which they worked.

Exciting causes.

Cold, damp, &c.—The foul air of the mines, and the violent muscular exertion which the men undergo, may immediately give rise to disease; but the cause most frequently assigned by the men as having occasioned their ailments was cold, taken either in the mine or at the surface. A large proportion of the cases of asthma, both simple and complicated, and several of the cases of consumption and other forms of disease, were stated to have commenced with symptoms of cold and after the miner had been chilled.

Some of the men ascribed their illness to the exposure to "cold damp" in the mine, others to having been chilled on resting in a cold and damp level after they had been working in a hot and close end and perspiring freely, and yet others to their having had to pass through cold water on leaving the place at which they had been working. Some blamed as the cause of their indisposition the cold draughts to which they were exposed in the shafts when wearing their wet underground clothing. Another said he had taken cold from having to wait in the shaft till the expiration of the time for leaving the mine. One traced his attack to exposure to cold and damp on reaching the surface from having to go through the rain to the changing house, another to having had to wash in cold water, and yet others to having put on the clothes in which they had walked through the rain to the mine, and which had not been properly dried.

One man ascribed the failure of his health to having gone to work in a cold mine in the granite after having long worked in a warm one in the killas; another, who suffered from symptoms of angina pectoris, referred his indisposition to having been employed in repairing the shaft of a mine which had been abandoned, and was being reworked, "forked out," and in which the cold water came down upon them and kept them constantly wet. A third, who was paraplegic, said that the symptoms had rapidly come on after he had been working with his legs in cold water, owing to the drainage of the level being obstructed by "attles" or "deads." And a fourth referred his illness to having taken cold from having been employed in repairing the neck of the shaft, when he was accustomed to working in warm levels underground.

The cold and damp to which the men are in various ways exposed, especially the continued working with the feet in cold water, explains the frequency of rheumatic affections among the miners; and it is evident that the warmth of some of the workings and the impurity of the air in others must render the men extremely susceptible to suffer from these causes.

Effects of dressing the ores and other work performed at the surface.

It does not appear that the operations performed at the surface of the mines, the breaking of the ores and dressing, &c., are injurious to the work people employed in them. Indeed, as a general rule, the men who work at the shafts and at the dressing floors, form in their appearance of health and vigour, striking contrasts to the underground miners. At all the mines men are met with who have formerly worked underground, and have given up in consequence of the failure of their health. They not unfrequently state that at the time they ceased working as miners they were thought to be going rapidly into consumption or into the miner's complaint, and that for some months or even one or two years or more, they were incapable of doing any work, that they then got better and were able to do some light work, and are now perhaps quite well or tolerably robust for their age. It thus appears that the surface work acts as a restorative upon the men who have suffered from going underground. Indeed, there is nothing which seems likely to be injurious except the process of roasting to expel the arsenic from the tin ores, and this process is not required to be followed with all the ores.

When the ores require to be exposed to heat for this purpose, it is done in a furnace communicating with long flues, in which the sublimed arsenious acid condenses, and these flues require to be emptied at intervals.

The men who are employed in removing the arsenic from the flues state that they suffer occasionally from eruptions on the skin and pains at the chest and in the stomach and spitting, and that any abrasions or cuts are apt to fester, but I did not in any case hear of more serious effects. In the furnace rooms the smell of the arsenic and the fumes are often very distinct from the feeding of the furnace being carelessly performed, but I did not learn on inquiry that injurious effects resulted to the persons engaged in the work. A man came under my notice who had been employed in preparing pure arsenious acid from the crude arsenic, and who had apparently been much exposed to suffer, but he only stated that he had experienced the symptoms which have been mentioned. One man, aged 45, who laboured under consumption, who had formerly been a miner and had for some years worked at the dressing floors, stated that he thought his illness was caused by the arsenic he had been in the habit of working in, but he did not mention any symptoms which pointed to his having really suffered from the influence of arsenic. The water in the workings of some mines is said to contain arsenic and sulphur derived from the decomposition of the arsenical pyrites which exist in the tin and copper ores; and this "mundic water," as it is termed by the miners, produces irritation and festering if applied to cuts or abrasions.

The young women who are employed in breaking the ores and tending the dressing floors, did not appear to suffer from their occupations, though some of them from about 16 to 20 were chlorotic looking. The proportion of these was, however, probably not greater than it would be among the same number of young women employed in any open air occupation, and was certainly less than in persons leading sedentary lives and residing in towns. Indeed, as a general remark, they were remarkably healthy looking and had fresh florid complexions.

The children, both boys and girls, employed at the dressing floors were generally remarkably healthy in appearance.

Suggestions.

It is scarcely my place to comment upon the management of the mines, but I venture to offer the following suggestions as to matters bearing upon the health of the miners.

1st. That in some districts there is a great want of cottage accommodation in the immediate neighbourhood of the mines, and the cottages which do exist are of the most defective construction, so as to be objectionable both in a sanitary and moral point of view. It is also very desirable that the cottages should have plots of ground attached to them for the cultivation of vegetables, so as not only to aid the miners in producing the necessaries of life, but to furnish them with out of doors occupation during their leisure time. This would render them less susceptible to the injurious influences which operate upon them when underground. We were informed that in the St. Ives district the miners work in the market gardens and assist in landing and preparing the fish, and these occupations are doubtless very beneficial to them.

2nd. That some means should be provided in all mines to convey the men to and from their work underground, in the place of the ladders, which are the all but universal mode employed in Cornwall at the present time. Perhaps on the score of health the skip would be preferable to the man engine, as it would enable the men to pass more rapidly through the cold and draughty shafts, and so render them less likely to take cold in coming to the surface in their mining clothes, after having worked hard below and especially in hot and close places.

3rd. That, if possible, the ventilation of the mines should be improved, and means provided to secure the passage of a current of air, derived directly from the surface and not from other parts of the mines, through all the workings. It is well known that respiration and combustion deteriorate the air to a much larger extent than by the removal of the oxygen consumed, and it is essential to the maintenance of a pure atmosphere and to the levels being kept cool, that a large change of air should be obtained.

4th. That stringent regulations should be enforced to prevent the ventilation and drainage of the mines being interfered with by the accumulation of "deads" or refuse in the workings; such accumulations must materially increase the injurious influences which operate upon the miners.

5th. That the openings of the shafts used for footways should be covered in, and the changing houses situated in connection with them, or at least immediately adjacent to them. I visited mines in which the shafts in very exposed situations were entirely uncovered, and where the changing houses were at great distances from some of the shafts.

6th. That the changing houses should be sufficiently large to afford full accommodation for the whole of the men who have to make use of them; they should be provided with space for drying all the clothes, and with a sufficient supply of warm water to allow the men to wash thoroughly, and even to bathe themselves. In one of the mines visited, the changing house was much too small for the number of men; and from the reports of the men it appears that the supply of water is not always sufficient, and sometimes it is not warmed; and as far as I know in no mine are baths provided. I have also been told that the space for drying is not always sufficient, and that consequently the men on returning from below have sometimes to put on their clothes still wet.

7th. That boys should not be allowed to commence working underground at so early an age as at present. In some of the mines visited the proportion of young boys was large, and both the boys and men questioned often stated that they had commenced working underground at very early ages, 7, 8, 9, 10, 11, and 12. It will be seen from the tables in the Appendix, that of the men examined, 3 stated that they began to work in the mines when 7 years of age, 10 at 8, and 27 at 9 years of age; and not less than 185 or 39·8 per cent. between the

ages of 10 and 13 inclusive; altogether 225 or 48·4 per cent. began to work underground before the age of 14. Of the whole number of men found at work 117 or 25·2 per cent. were only 20 years of age and under. All experience shows that when persons in early life are exposed to injurious influences they suffer from them more severely, and earlier fall under their influence, than if they had attained a more advanced age and greater constitutional vigour. The boys employed in the mines form no exception to this rule, and no greater contrast can be presented than that between the boys working at the surface of the mines, and those at about the same age working underground, and this too when the period during which the latter have been in the mine is only very short. I frequently asked the miners what they thought was the effect of going underground upon boys in early life, and was uniformly told that if they went too young they could not long stand the work. I was also, however, told that if they did not begin mining as boys they never became good workmen. It is generally said that the boys only do "boys' work," but some of the men told me that what was so named was really harder work than that of the men themselves. It is, however, probably the air of the mines which is chiefly injurious, and to this the boys are just as much exposed as the men. If the boys were not allowed to go down before at least 15 or 16 they would probably have attained sufficient vigour to bear up against the injurious influences, and be quite young enough to become efficient workmen.

8th. The processes of breaking the ore and of dressing, in which young women and children are employed, are often carried on entirely in the open air. This may be more conducive to health than otherwise in warm and dry weather, but when it is cold and damp some protection should be provided.

Some of the children employed in these processes are very young, and must be taken from school before their education can properly have commenced. It would be desirable that regulations should be enforced to require a portion of the day, or certain days, to be devoted to attendance at school in the children under a fixed age.

9th. I cannot but think the system of giving pecuniary and medical relief to the men in cases of accident and illness is open to very grave objections. I was told that the relief furnished from the fund stopped out of the men's wages, was only given to the men when suffering from accidents, and that in some mines the medical relief was similarly limited to cases of accidents. The general rule I believe is that medical attendance is provided by the mine both in sickness and accident. In any occupation so injurious to the health of the work people as mining unquestionably is, the claims of the men for pecuniary as well as medical relief are quite as great in sickness as in accident, provided that the sickness results from the work in the mines, and some arrangement should be made by which the men can be equally assisted in both cases.

It struck me also that in districts where there are several medical men engaged in practice, it would be preferable, instead of certain medical men being appointed to particular mines, if the men were left at liberty to employ whatever medical man they chose; he being remunerated at a certain fixed rate from the mine fund. I should be very far from wishing to be understood to express any doubt that the medical men attached to the mines as at present do not zealously and efficiently perform their duty to the men; but I feel sure from remarks made to me by the men, that it would be more satisfactory to them; and to the medical men and the adventurers the change could make no difference. I have been informed that in certain districts an arrangement of this kind exists and is found to work satisfactorily.

10th. Taking into consideration also the early age at which many of the miners become incapacitated, either for work entirely, or for going underground and so obtaining sufficient to maintain themselves and their families, it has occurred to me whether some fund could not be formed in connexion with the mines by which the men should be allowed small pensions in cases of failure of health, after having worked in the same mine for a certain number of years.

At present it is a frequent ground of complaint on the part of the managers and the captains, that the men cannot be got to work long in the same place and are constantly changing from mine to mine. The plan suggested would probably go far to prevent the tendency to change and to keep the men steadily working at the same mines. Certainly it is a very discouraging prospect before a man, that though engaged in a dangerous occupation and likely to be prematurely worn out, he has little chance of obtaining the means of maintaining himself when no longer able to work, and is likely ultimately to come upon the parish.

TABLE of CASES of DISEASE among the MINERS examined in July and August 1862.

	Cases	
Dyspepsia or organic disease of stomach	3	
Rheumatism	1	
Slow fever	2	
Convalescence from fever or inflammation of the lungs	1	
Diseases of respiratory organs:		
Miner's asthma	41	54
Abscess in the pleura opening through the lungs	1	
Consumption	12	
Mesenteric disease	1	
Affections of the heart, &c:		
Palpitation	4	9
Diseases of heart	5	
Diseases of nervous system, Paralysis:—		
Hemiplegia and paraplegia (1 from injury)	6	
Kidney disease and dropsy	2	
Disease of skin	2	
Effects of injury (not otherwise classed)	2	
Total	83	

TABLE of AGES at which the Miners permanently disabled by illness first worked underground.

Years.	
7	1
9	2
9 or 10	2
10	3
10 or 11	1
11	2
11 or 12	1
12	3
13	1
14	4
14 or 15	1
15	6
15 or 16	3
16	6
17	2
17 or 18	1
18	4
20	3
21	1
27	1
	48

TABLE of the periods of work before the failure of health in Miners premanently disabled.

Years.	
5 to 10	5
10 to 20	9
20 to 30	9
30 to 40	14
40 to 50	7
50 to 53	4
	48

Mean period, 28·5 years. Extreme periods, 5 and 53 years.

TABLE showing the AGES at which the Miners' health failed in cases in which they were permanently disabled.

From 21 to 30 years of age	9
„ 30 to 40 „	8
„ 40 to 50 „	14
„ 50 to 60 „	12
„ 60 to 66 „	5
	48

Mean age, 43. Extremes, 21 and 66.

TABLE showing the duration of illness in the above cases.

	Cases.
Under 2 months	3
„ 3 „	3
„ 4 „	3
„ 5 „	1
„ 6 „	5
„ 7 „	3
„ 8 „	1
„ 1 year	6
„ 1 year and 5 months	1
„ 1 year and six months	1
„ 2 years	2

Under 2 or three years	1
„ 4 years	3
„ 5 „	1
„ 6 „	1
„ 6 or 7 years	1
„ 7 years	2
„ 7 or 8 years	2
„ 8½ years	1
„ 10 „	1
„ 11 or 12 years	1
„ 12 years	1
„ 15 or 16 years	1
„ 20 years	1
„ 25 or 26 years	1
28 years	1
	48

TABLE showing the ASSIGNED CAUSES of ILLNESS in the fully reported cases of disease among the MINERS.

	Cases.
Working in damp and draughty shafts	3
Repairing the neck of the shaft in underground clothing	1
Working in cold damp	2
Working in a cold mine in the granite, in which the drainage was stopped	1
Working in cold and damp mine in the granite after being accustomed to a warm one in the killas	1
Got chilled in cold and damp place after working hard, and when sweating	5
Got chilled from waiting in the shaft for the engine to bring him up after working in a warm place	1
Putting on clothes which he had taken off when workingi n the mine, and which were wet	1
Keeping on his flannel when at work, and getting it wet with sweat	1
Got chilled in walking from the shaft to the changing house through the rain, after having been heated from working in a close place	1
Putting on clothes in which he had walked through the rain to the mine, and which were still wet	1
Washing in cold water after coming out of the mine	1
Working in wet and draughty places	1
Working in very wet places	1
Working in wet and hot places	1
Working in bad or poor air, or in close places	8
Working in bad air and getting cold	1
Working in bad air and cold damp	1
Working in bad air and dry and dusty places	1
Working in bad air, and in hot, dry, and dusty places	1
Working in a close and hot place, and in a constrained position	1
Working in bad air and in a wet place	1
Working in bad air and want of sufficient food	1
Irregularity in taking his meals	1
Injured by the arsenic in the tin and copper ores	1
Took cold at the surface	2
Got chilled at the surface when under the influence of drink	1
Worn out by hard work	2
Worn out by hard work and poor air	1
	45

TABLE of the AGES of the MINERS found at work in different Mines in August 1862.

Ages.	Numbers.		Ratio per cent.
11 to 15 inclusive.	23	117	25·2
16 to 20 „	94		
21 to 30 „	147	233	50·2
31 to 40 „	86		
41 to 50 „	76	107	23·06
51 to 60 „	31		
61 to 63 „	7		1·5
	464		

Mean age - - 30·69.

AGES at which the MINERS COMMENCED WORKING UNDERGROUND.

Ages.	Numbers.		Ratio per cent.
7	3		
8	10	40	8·6
9	27		
10	40		
11	35	185	39·8
12	68		
13	42		
14	60		
15	55	115	24·7
16	32		
17	29		
18	18	86	18·5
19	7		
20	17		
21	4		
22	2		
23	4		
24	3	38	8·1
25	1		
26	3		
30	4		
	464		

Mean age - - 14·6 years.

PERIOD during which the MINERS had WORKED UNDERGROUND.

	Numbers.		Ratio per cent.
Under 1 year	6		1·29
1 year	7		
2 years	19		
3 „	16	80	17·2
4 „	18		
5 „	20		
6 „	23		
7 „	21		
8 „	14	100	21·5
9 „	13		
10 „	29		
11 „	13		
12 „	24		
13 „	13	72	15·5
14 „	13		
15 „	9		
16 „	9		
17 „	12		
18 „	9	49	10·5
19 „	10		
20 „	9		
21 „	8		
22 „	9		
23 „	4	38	8·1
24 „	6		
25 „	11		
26 „	5		
27 „	9		
28 „	12	49	10·5
29 „	15		
30 „	8		
31 „	5		
32 „	1		
33 „	5	25	5·3
34 „	8		
35 „	6		
36 „	9		
37 „	2		
38 „	3	24	5·1
39 „	4		
40 „	6		
41 „	5		
42 „	5		
43 „	3	16	3·4
44 „	1		
45 „	2		
47 „	1		
48 „	1		
49 „	1	5	1·07
50 „	2		
	464		

Mean period 16·2 years, or 16·6 years exclusive of those under one year.

TABLE showing the STATE of the MINERS FOUND AT WORK.

Ages.	Number examined.	Healthy.	Pale.	Worn.	Decidedly delicate looking.	Complaining of various symptoms of indisposition.*
Under 21	117	42	36	2	32	5
		35·8 p. c.	80=68·3 p. c.		37=31·6 p. c.	
21 to 40	233	112	45	14	45	17
		48·06 p.c.	171=73·3 p. c.		62=26·6 p. c.	
41 to 63	114	43	8	1	33	29
		37·7 p. c.	52=45·6 p. c.		62=54·3 p. c.	
	464	197	89	17	110	51
		42·4 p. c.	303=65·3 p. c.		161=34·6 p.c.	

* Dyspeptic and rheumatic symptoms, cough, expectoration, difficulty of breathing, palpitation, &c., with more or less marked general appearance of debility or indisposition.

CASE of MINERS' DISEASE examined after DEATH.

John Francis, at 55, under the care of Henry Harris, of Redruth.

He was reported to have worked underground at various mines, Carn Brea, Wheal Bassett, Wheal Buller, Tin Croft, and East Pool, and commenced working when 13 or 14 years of age. At first he did boys'-work, assisting the men, rolling the trucks underground, &c. After he did full men's work he had chiefly been employed at tutwork. His illness was ascribed by his friends to his having worked in damp and wet places and in bad air.

For five years before his death he had been out of health, suffering from difficulty of breathing, cough, and expectoration, and pains in the chest. He continued to work at the mines for three years after these symptoms first appeared, but for two years he had not been able to go underground, and had been employed in a drying room attending to the men's clothes. Latterly he complained of pain in his right side, which prevented his lying on that side, and he had also a swelling of the right thigh. He generally expectorated white matter, but had brought up blood.

His father was a miner, and died of "miners' disorder" after an illness of two years' duration, when 67 years of age. His mother died at the age of 60 of stricture of the œsophagus. He never had any brothers, but had three sisters, of whom one died at 63 of consumption; the other two are alive at 60 and 68 years of age.

He was not a very steady man, having been addicted to drinking. For these particulars I am chiefly indebted to Mr. Harris.

The post mortem examination was performed by Mr. Bankart and myself, about 24 hours after death.

The body was moderately emaciated. The left lung was voluminous, perfectly black on the surface, and adhered by old attachments in the mammary region, and the pleura in the seat of the adhesions was thick, white, and solid. The substance of the lung was very sparingly crepitant, and of a deep blue or black colour. It did not contain any tubercles; a peculiar brown coloured secretion was found in the smaller bronchial tubes. The edges of the lung in front were somewhat emphysematous. The right lung was universally adhered to the parietes by firm fibro-cartilaginous attachments. The third rib was carious, and an abscess existed in that situation which presented externally, and had separated the rib from the pleura. The abscess contained a considerable quantity of thick yellow pus mixed with cheesy matter.

The right lung was of a deep blue colour, and solid everywhere except at the upper part, where there existed several irregular cavities containing brown coloured fluid similar to that found in the bronchial tubes of the left lung. The bronchial glands were large, very solid, and of a deep black colour.

The trachea was considerably wider than natural, but the larynx was free from ulceration. Shortly above the bifurcation of the bronchi, and at the bifurcation and for a short distance along the right bronchus, the mucous membrane was studded with small specks of yellow-coloured lymph. Under these the mucous membrane was not abraded or otherwise altered.

The heart was of large size, and probably weighed from 10 to 10½ oz. avoird. The pericardium was somewhat loose, the cavities large, and the walls moderately thick and flaccid, and the whole organ appeared as if atrophied. The valves were dyed by blood from decomposition, but free from disease. The aorta and pulmonary arteries were both very considerably dilated, but the coats were of natural thickness and free from deposit.

The liver was partially attached to the diaphragm by old cellular adhesions, and its structure was dense, coarse and resistant.

The kidneys were easily deprived of their tunics, and the surfaces of the organs when exposed were smooth. The cortical portion was rather narrow; one of the supra-renal capsules was so completely atrophied as to consist of little more than cellular tissue. The other was converted into a mere cyst with thin walls and with a rough and dark surface in the interior.

The stomach was healthy, and the intestines apparently free from any disease.

The brain was not examined.

Note on the fever cases visited at St. Just with Mr. Searle.

The epidemic commenced in the spring in cottages surrounding the church, the churchyard being raised several feet above the adjacent ground. From this part the disease spread from cottage to cottage up the valley for upwards of a mile. The disease had the characteristic symptoms of typhoid-diarrhœa, tympanitic distension of the abdomen, &c., and Mr. Searle in all five lost patients.

In one case a young woman who was ill near the church, was visited by her sweetheart, who took the disease though residing in an entirely different district. The same young woman was nursed by a sister who came from a cottage about a mile distant, after about a fortnight she became ill, went to her own house, and spread the disease to others there, though no case had previously occurred.

The epidemic had to a considerable extent subsided when I was there; but Mr. Searle took me to two cottages forming one block of building in which there were still cases.

These cottages were situated on an open moor 200 or 300 feet above the sea, exposed in every direction, with a dry, shallow and rocky soil covered with heather, the sea being about 2 miles from it.

In point of situation nothing could have been healthier, yet the state of the cottages was most wretched. They were surrounded by shallow pools of water, covered with green slime, were not provided with any under-drainage or with privies, and all the refuse was thrown out on dust heaps situated in front of the doors and on the south sides of the cottages. One of the cottages was inhabited by a butcher who killed his meat on the spot.

The cottages were built of rough stone and covered with the heavy slabs which are obtained in the district; they consisted of three rooms each, one below and two above, and each had a small window opening N. and S. The floors of the lower rooms were on the level of the adjacent soil, and were paved with slabs of stone; the upper rooms were open to the slanting roof.

The disease first occurred in the cottage of the butcher, and I could not ascertain that there was any reason to suppose that it was imported. It commenced in April, affected four children from 9 to 21 years of age, and ceased in July; all the invalids were out when I called. From this house a young man who visited there at the time took fever, and spread it in his own neighbourhood at a distance.

In the other house the disease appeared also about the middle of April, and two children first attacked were convalescent, but still thin, pale, and very delicate looking when I saw them. They were aged 12 and 5 years, and had been respectively ill four months and nine weeks, so they must have sickened about the 21st of April, and the 5th of June. Their mother, aged 38, had had two attacks, the last seven or eight weeks before, and was pretty well again. Two children were still lying ill in the same bed, but approaching convalescence, one at 14 had been ill two weeks, and the other at 12, twelve days. In both there was the usual flushed face and torpid expression of countenance, though they were capable of being aroused to protrude the tongue; they were both deaf. In each case the tongue was dry and somewhat brown, the skin harsh and dry, and the remains of several characteristic typhoid spots were detected. The abdomen was tumid, and there had been more or less diarrhœa. The pulse was feeble and somewhat quick.

The general condition of the cottages in this neighbourhood was extremely bad. In ——— cottage by Treweller Chapel there were nine persons residing, a son and daughter being quite grown up. It consisted of three small rooms, with little windows which did not open, had a slanting roof above, and was low and thatched, paved with stones below, and with no under-drainage, and no privy.

The state of ——— cottage was much the same, as well as that of several others which I visited in the church town; indeed in answer to special inquiries I found that there was never any under-drainage and seldom any privies to the cottages; and on the inquiry where the refuse was thrown, a heap of rubbish was pointed out lying undisturbed in front or at one side of the door. The cottages at Bosorn, to the S. E. of St. Just church town, were perhaps the worst in the whole district.

MEDICAL REPORT

On the State of the Miners in the Lead Mining Districts of Alston, Nenthead, Allenheads, and Weardale. By Thos. B. Peacock, M.D., F.R.C.P.

REPORT 1.

In the month of September last I visited the mining districts in the North of England, examined about 225 men at work at mines near Alston, Nenthead, Allenheads, and in Weardale, and took full notes of 25 cases of disease among miners in those districts, and at Middleton in Teesdale.

The forms of disease with which I met consisted of affections of the respiratory organs, disease of the heart, chronic rheumatism, general failure of power, dyspepsia, &c. I also found men suffering from various injuries which they had sustained when working in the mines.

1. *Bronchitic affections, Miners' Asthma.*—By far the largest number of cases of disease which fell under my notice were bronchitic affections, emphysema of the lungs, &c., the conditions known in the district as well as in the West of England as "miners' asthma," or "miners' disease or complaint." Indeed this form of disease constituted 18 out of the 25 cases of decided disease, which I have reported in the Appendix. In three of these cases the affection was only commencing, and in the remaining 15 the disease was so far advanced as to have completely incapacitated the labourer from following his usual occupation.

In the former cases the subjects of the disease were 31, 49, and 53 years of age. In one of the cases there were recent signs of pleurisy. In the more advanced cases the men were generally old; the mean age of the 15 being 57·7 years, and the extremes of age 70 and 67, and 44 and 49. In the latter cases, however, the men had been suffering under the disease, in some instances for several years; the period at which their health had first failed being on the average 49·08 years, and the extremes of age 60 and 56, and 34 and 44. It thus appears that they had been ailing on the average nearly 8 years; but in some instances the duration of illness was much more prolonged, having amounted to 18 or 20 years.

From the statements of the men examined, it appears that they became incapable of work on the average at 55·07 years of age, or at the extreme ages of 63 and 46; and the period during which they had worked as miners before becoming so seriously ill as to be entirely unable to work was on the average 40·6 years, and the extreme periods 57 and 28 years.

These calculations indicate that the health of the miners fails from asthma in middle age; but it will be subsequently shown that the men in whom the disease assumes the form of pulmonary consumption are incapacitated for work at much earlier periods. I am also satisfied, from information given me, that the asthmatic symptoms frequently if not generally manifest themselves at much earlier periods than the calculations would indicate. I was repeatedly told that "all miners who have attained middle age suffer in their breathing more or less, and that many of them who are young are similarly affected, though they will not acknowledge it." I met with several men who had gone to work underground at 14 to 16 or 18 years of age, and had only followed the occupation for 8 or 10 years, who said that they had given up working as miners, from being then in some degree affected in their breathing; and I have been assured that many men suffer at 30, and few escape beyond 40 years of age. The men who are getting into years, though they may still be able to work, almost always suffer from difficulty of breathing, either constantly, or in certain states of the weather, or when labouring under cold. Thus, of 24 persons above 50 years of age, whom I found still working in the mines, and who were questioned as to their health, all but eight stated that they were more or less "touched in the wind," or "short in their breath," &c.; and some mentioned that they suffered severely in this way. I feel convinced also that had all the men given a correct account of themselves, the proportion of those stated to be ailing would have been even greater.

That, however, I should not appear to overstate this fact, I may quote from a report made to me by a medical man of great experience in the diseases of miners, Dr. Ewart, the resident medical officer of the London Company at Middleton in Teesdale. "A healthy young man enters upon work in a lead mine; in a few years, more or less, he begins to experience some degree of difficulty of breathing—nothing to hurt him very much as he continues an efficient miner; still, however, 'he is touched in the wind.' Along with this difficulty of breathing there is an increased expectoration of mucus, often tinged, more particularly after leaving work, of a bluish black colour. The difficulty of breathing continues, and generally increases as age advances, rendered worse, perhaps, by an attack of bronchitis now and then supervening. On recovering from these attacks, he again resumes work; or, should it happen that he has no acute attacks, he goes on working with increased shortness of breathing, expectoration and failing strength. His appetite for food is impaired, and what he takes for breakfast is frequently vomited as he walks to his work in a morning. He has great langour, and frequent fits of severe coughing, and evidences of imperfect oxygenation of the blood in the blueness of the lips, &c. He may now have got to 40 or 45 years of age; he is low in health and strength, and is compelled to give up work, and stay at home as a worn-out miner. But even at home his health cannot be restored. He may wander about for some years, incapable of work, from difficulty of breathing and debility; in the summer improving a little, but in the autumn, winter, and spring being very liable to acute disease of the chest producing more copious expectoration of muco-purulent matter, tinged or rather streaked with blue or blackish spots. The poor worn-out miner now soon dies exhausted; that is to say, in a year or two he is cut off by persistent chronic disease of the chest, aggravated by acute or sub-acute seizures now and then taking place."

This report so clearly describes the asthmatic affections of miners that it is not necessary for me to dwell further upon the subject; and I have already fully explained the chief features and course of such affections in my report upon the diseases of the miners in Cornwall. I may, however, remark that while the asthmatic affections of the miners are similar in the two districts, it appeared to me that in the North the bronchitic symptoms were less frequently complicated by disorganization of the lungs, and that the sufferers were less exhausted, and their digestive organs less severely affected, than in Cornwall.

I am not in possession of information relative to the usual duration of life in the subjects of miners' asthma in the lead districts of the North of England. From the statements made to me, however, it appeared that not unfrequently when the miners cease to work underground their sufferings diminish, and, if they have not continued too long, they may ultimately recover so far as to be able to follow some occupation at the surface, and may survive for some years. If, however, their period of work underground has been prolonged, though their breathing when at the surface may be less affected, their strength does not materially return, and for the remainder of their lives they continue incapable of undertaking active work, or of following any occupation at all. In these respects also the condition of the miners in the North entirely corresponds with that of the Cornish miners.

Pulmonary Consumption.—Of this disease I met with four cases. As before mentioned the cases of consumption occured in men at an earlier age than those who suffered from the more decided forms of miners' asthma. The mean age of the patients was 37·5 years, and the extremes of age were 42 and 32. In three of the cases the period at which the health failed was ascertained to have been at the ages of 25, 31, and 35½. The patients had worked as miners for 12, 15, and 20 years before the commencement of the disease. In three of the cases there were evidences of hereditary predisposition; near relatives of the miners, and persons not employed in underground work, having also died of consumption. Indeed the circumstances under which the several forms of disease of the chest occurred among the miners in the North of England were similar to what had been observed in Cornwall. Men originally of feeble power, and especially if predisposed to consumption, falling victims to disease in earlier life, and after a shorter period of work in the mines; while those not so predisposed, and altogether of more robust constitution, resist the injurious influences of the occupation for a much longer period. The former also suffer from pulmonary consumption, while the latter become the subjects of asthma. Of the prevalence of consumption in the general population I am not able to speak, but I saw cases of the confirmed disease in persons who had not been employed in the mines.

3. *Diseases of the Heart and Large Vessels.*—I met with only one case of disease of the heart. In this instance the man was 71 years of age, but, though he had worked as a miner for 40 years, he had not been employed in the mines

for 20 years, and had since followed the occupation of a butcher. He had laboured under the symptoms of disease of the heart for about 12 months before I saw him, and was then dropsical, suffering from difficulty of breathing so severe as to prevent his lying down, and presented the characteristic signs of obstructive and regurgitant disease of the aortic valves. This affection could not, of course, be directly traced to his former occupation as a miner; but he stated that when so employed he had suffered from rheumatism, and probably might then have had some affection of the lining membrane of the heart, which laid the foundation of the subsequent disease. In another case, a man 37 years of age, who reported that he had recently suffered from chronic diarrhœa or dysentery, and was probably becoming consumptive, complained of suffering from palpitation of the heart, especially when using active exertion; and there was reason to suspect that the mitral valve might be in some degree defective. In three other cases, two of advanced miner's asthma and one of general failure of power with indigestion, difficulty of breathing, &c., the patients complained of palpitation; but no disease could be detected on examining the heart. The first case referred to, and possibly the second, constituted therefore the only instances in which decided disease of the heart was met with among the miners in the North of England. I was further assured by several medical men practising in the district that diseases of the heart and great vessels were not of frequent occurrence among the miners.

4. *Chronic Rheumatism.*—A man 47 years of age was reported to have been entirely incapacitated for work for four years, in consequence of suffering from chronic rheumatism. The affection commenced in the shoulders and then passed into the hip. He stated himself to be otherwise well and free from any difficulty of breathing. He ascribed his indisposition to having worked in cold and draughty places, but said that he had never been in workings that were particularly damp or where the air was bad. He first went to work underground when 10 or 12 years of age, and had been employed 31 to 33 years before his health failed.

In several instances, men labouring under other forms of disease complained of suffering from different kinds of rheumatic affection, or stated that they had formerly had rheumatic fever, or pains in different parts of the trunk or limbs.

5. *General failure of power, Dyspepsia, &c.*—The only other case which will be found fully reported in the Appendix is one in which a man, 66 years of age, was permanently disabled in consequence of general failure of power, difficulty of breathing, palpitation, and symptoms of indigestion. He had gone to work underground when about 9 years of age, and had been a miner for about 57 years, and had been unfit for work for two or three months.

In all the forms of miners' disease, symptoms of indigestion were of common occurrence. The men state, that, as a general rule, the miners have small appetites, while the pitmen take much food. Not only also do they frequently complain of want of appetite, but also of flatulency, nausea, and occasionally actual vomiting. The action of their bowels is uncertain; sometimes they suffer from diarrhœa; more frequently from constipation; and they are very liable to colicky pains in the bowels.

6. *Disease of Kidneys, &c.*—In some cases the men stated that they suffered from pains in the loins, and symptoms of gravel, but I met with no case of disease of the kidneys or dropsy among the men.

7. *Injuries.*—Among the cases only cursorily referred to will be found notices of two, in which the men were entirely blind, and were stated to have lost their sight from explosions or "shots" in the mines. I was also informed that there were two other miners in Alston parish who had lost their sight in the same way. I saw among the men at work several cases of partial blindness and injuries of the face from explosions, and heard of other injuries from falls of rock and in other ways in the mines. Several of the men were extremely deaf.

Causes of Disease among the Miners.

There is a striking uniformity in the causes which are assigned by the miners for the impairment of their health; the answer very generally being, when questioned on this point, that it was "bad air, powder reek, and stour."

"*Bad air.*"—The reports of the older men, and of the agents and medical officers, and indeed of almost every one connected with the mines, show that formerly the state of the mines as to ventilation was very much more defective than at present. The most striking accounts of the extremely deleterious effects of the air in which they had to work was given me by men who had been employed in driving the "fossway," extending from Alston to near Nenthead, which was constructed by the Commissioners of Greenwich Hospital some years ago. But, notwithstanding that great improvements have of late years been effected in the state of the mines, some of the workings are still evidently, from the reports of the men, very defective. I was repeatedly told by miners now at work, "that all miners have to breathe bad air, more or less," or that in "all mines there are places where the air is bad." From the Table of the assigned causes of disease in the men it will be seen that in 11 cases "bad air" is stated to have been the source of indisposition, and all but one of those who referred their illness to other causes or did not give any direct answer to the inquiry, stated that they had worked to a greater or less extent in bad air. When questioned as to the reasons which made them regard the air as bad, they frequently stated that the candles could not be got to burn, except when "heeled" or placed on one side, or when the wicks were being continually teazed out, or two candles were placed together. Sometimes, they said, that the candles could not be got to burn where they worked, and had to be placed some distance behind them. Occasionally, they stated, that the air was so bad that the candles would not burn at all, and they could not work in consequence; and they said that this was especially the case in dull days in summer and autumn, and might occur for several days together. A man to whom I spoke on his way home from Burtree Pasture Mine on the afternoon I was there, said that several men had been compelled to leave their work that day; and one of the men who was ailing and had been at work in the "fore end," said the air had been very bad. When asked to describe the effects of the breathing of bad air, the miners mentioned all those symptoms with which my inquiries in Cornwall had made me familiar. They said, that the bad air made them dizzy, sometimes adding, "as if they had been in liquor,"—caused violent headache, and made them feel sleepy, so that they could scarcely keep awake, and took all the power out of their limbs. Sometimes, they said, that they became quite faint; and I was told that the men had occasionally "fits" when working in very bad air, and had to be carried out. Not unfrequently they felt sick, and would vomit violently on coming to the surface; and they suffered from pains in the bowels, constipation or diarrhœa; were much prostrated, and had little or no appetite for their food on getting home.

The mines are generally in this district entered by "day levels," or horizontal shafts, running into the sides of the hills. From these, other shafts are raised or sunk, which open up the different levels and frequently reach the surface, so as to provide for the supply of fresh air through the different workings by a natural process of ventilation. It is chiefly when driving the "fore ends" or "foremost ends," or in the "rises" carried up from the different levels, or the "sumps" sunk from them, that the men are subjected to bad air. For the purpose of ventilating these "close places," air is frequently driven by a fan worked by hand or by water power, or by a water blast, and in some of the mines of Mr. Beaumont exhausting furnaces have been introduced. Of the efficacy of the latter plan, I had very decisive evidence in several cases; being assured by the men that the general atmosphere of the mines was much improved, and by the agents that places were worked which were before scarcely capable of being entered, or in which the men could only remain for a short time.

The "choke damp" or carbonic acid gas, which constitutes the most dangerous element in the workings of the mines, is doubtless partly the result of the combustion of the candles, the respiration of the men, and the explosion of the powder in blasting the rock. The agents, however, state, that it is given off from the strata, and especially the shaly strata or plates, and often escapes quite suddenly into the workings. This account was confirmed by several of the men, especially by one who had worked at the "fossway." He stated they had a bell which they could pull below to give warning if an escape of gas suddenly took place, in which case they were immediately drawn up, and sometimes, nevertheless, very narrowly escaped with their lives.

As I have before-mentioned, "*powder reek*" is also frequently assigned by the men as rendering the air of the mines very injurious to them, and they often complain of the length of time required in some places for the smoke to clear off after the blasts or "shots." Dr. Ewart, to whom I have before referred, ascribes much importance to the deleterious influence of the gases generated by the explosions of powder in the mines, and to the diffusion in the air of the unoxidyzed charcoal. He states, that when a miner is injured by an explosion, the face or hands are thoroughly blackened and remain so partially for life. He also ascribes to the charcoal so diffused in the air and inhaled by the miners, the "black spit" or blackish mucus brought up by the men when they leave their work, and which he states they often continue to expectorate for years after they have ceased to go underground. That this view is generally cor-

rect there can be no doubt; but it is well known that persons labouring under some forms of chronic bronchitis expectorate matter quite as dark, though they have never breathed a particularly smoky atmosphere. In such cases, therefore, the black matter must be excreted by the lungs, and cannot have been inhaled. It is therefore probable that the dark expectoration of the men who have long ceased to work as miners is, in part at least, an excretion, not entirely the carbon formerly inhaled. The candles also, as stated by the men, when burning so badly as they often do, and especially when the wicks have to be teazed out and the candles held on one side or two placed together, give out much dense smoke, and this must further deteriorate the atmosphere.

The "*stour*" or *dust* of the mines is often blamed by the men as a cause of indisposition, and some say that the "stour" is worse than anything else. The mines are chiefly driven in the shales or plates of sandstone and beds of limestone, and much dust is caused by the boring and blasting, and must, when the air is dry, be diffused in the workings and inhaled by the miners. Dr. Ewart thinks that in this respect also the atmosphere of the mines is very seriously detrimental to the men. He has published a case in which, after prolonged indisposition, cough, expectoration, difficulty of breathing, &c., a piece of sandstone as large as a pistol bullet, which had apparently been formed in one of the large bronchi by the accretion of small particles of sand, was expectorated by a miner. After the escape of the mass, the bronchitic symptoms were relieved. One of the men who had a curvature of the spine and stated that he had always been delicate, especially complained that his breathing was affected by the dust of the mines. Judging by the reports of the miners, I am disposed to think that dust or gritty particles, thrown off from the sandy strata in which they frequently work, considerably adds to their sufferings when employed in the mines. I think it probable also, that in this respect the northern mines are more injurious than those of Cornwall, which are generally worked in the harder crystaline rocks, and which, therefore, are probably less dusty. Some of the men especially complained of the dryness of the mines in connexion with the dust. Generally speaking, however, the atmosphere of the mines would appear to be damp; and the men often complained of the cold and damp and thickness of the air in the workings. It will be observed, that one man ascribed his severe rheumatic symptoms to working in cold draughts, and another blamed the cold for his illness. The mines do not appear, however, to be generally very wet, though there is often water in the workings and the men have to work with their feet wet.

Hard work, working too early, &c.—The other causes assigned by the men as probably affecting them were, "slavish work," and "working too hard when he had a good bargain,"—"going to work at too early an age,"—"working at night." One man ascribed his illness to having taken cold, from having to walk a long way to his home, there being no changing house at the mine. Another admitted that he had injured his health from having been a "hard drinker."

Ladder climbing.—I did not in any case find the climbing blamed by the men as having been injurious to them. Indeed, most of the mines, as at Nenthead, are entered by day levels; the men ride to their work in waggons drawn by horses or pushed by their fellows, which remove the waste and ore, and have only to use the ladders when passing between the different levels or up or down short shafts. They have thus not usually to climb more than 15 to 20 or 30 fathoms. In other mines, as in Mr. Beaumont's, at Allenhead and Burtree Pasture, the men are let down and drawn up by machinery moving by water power, and have generally not much climbing when below. It is not, therefore, probable that the little ladder work which they have can produce any very injurious effects.

Temperature of the mines.—The mines are also not apparently so hot as to exercise any injurious influence. When the men are working in very confined spaces, and there are many men at work, many candles burnt, and much blasting, the workings may become hot, but this does not generally seem to be the case. The mines are also usually only worked in two shifts each day, and for four or five days in each week; and thus there is much time for the effects of the blastings to clear off, and for the places to be kept cool. In only two instances did the men complain of the heat of the mines, or state that they regarded them as injurious on that account.

Of the different causes which have been enumerated as probably operating unfavourably upon the health of the miners, I am led to conclude that by far the most influential is the defective quality of the air which they breathe.

Comparison between the State of the Miners in the North of England and in Cornwall.

1. *General condition of the miners.*—I was much struck, in visiting the northern mining districts, with the more robust character of the men whom I found at work at the different mines, and the larger proportion of middle-aged and old men among them. On analyzing the reports which I then made, I find that they confirm the impressions formed at the time. On comparing the table of the condition of the men at work with the similar table showing the state of the Cornish miners, it will be found that there are a smaller proportion of young boys, and a larger number of middle-aged and elderly men, employed in the mines in the North than in those in Cornwall. It will further be seen that the state of the men, as judged of by their general condition and appearance and by their own statements, was better in the North than in Cornwall; the proportion of delicate and ailing persons being at all ages less in the North, and especially in more advanced life. On referring also to the ages at which the men permanently disabled by miners' asthma, &c. first went to work underground, and the ages at which their indisposition became so marked as to prevent their pursuing their occupation any longer, it will be seen that the period during which the miners were able to work in the North of England was much greater than in Cornwall. Indeed, the period of work in the North exceeds that in Cornwall by, on the average, 5·8 years. It does not, however, appear that there is the same difference between the periods at which the health of the miners first fails in the two districts;—the men in the North suffering from their occupation, probably at nearly as early an age as in Cornwall; but the affections under which they labour being less severe and less rapidly advancing, they are not so soon disabled.

2. *Diseases of the miners.*—The diseases met with among the miners in the North of England correspond generally with those observed in Cornwall, but present some differences. In both districts the men suffer frequently and severely from symptoms of indigestion, constipation, &c. Miner's asthma is, however, amongst all miners, the form of serious disease which is of most common occurrence, and which appears to indicate the ordinary process of decay in the men who are originally of healthy constitution. Next in frequency also in both districts is pulmonary consumption; this disease being developed at an earlier period than the former, and in men possessed of less constitutional vigour. It appeared, however, to me that miners' asthma was in the North usually a simpler form of disease than in Cornwall and less frequently complicated by the results of inflammation of the lungs occasioning serious disorganization of their tissues. I also found the affection in the North not so commonly complicated with disease of the heart as in Cornwall. Doubtless in all advanced cases of miner's asthma the right side of the heart undergoes dilatation, as in other similar forms of bronchial desease. In Cornwall, however, it was found that the miners labouring under asthma very frequently presented symptoms and signs of imperfection of the mitral valve; a condition not decidedly met with in any case in the North, though it may possibly have existed in one or two instances. Other forms of disease of the heart also occurred among the miners in Cornwall in several instances; and palpitation was a very common symptom in their various ailments. Whereas decided disease of the heart was only once met with in the North, and the affection could in that instance be only indirectly referred to the underground work. Palpitation also was not a frequent complaint in other forms of affection.

What then is the cause of the differences indicated in the condition and diseases of the two sets of men?

1st. *Ventilation of the mines.*—The mines in the North of England are worked by horizontal shafts or day levels, opening from the sides of the hills, sufficiently large to allow of the passage of waggons and horses, and by vertical "sumps" or shafts rising from the horizontal shafts at different levels or sinking into the lower strata. The horizontal shafts sometimes pass entirely through the hills, and the vertical shafts frequently open on the surface above. The mines also are comparatively shallow. They would therefore appear to afford great facilities for natural ventilation. In the mines in Cornwall, on the contrary, which communicate with the surface only by deep vertical shafts, the natural ventilation is more likely to be imperfect. It might, therefore, be supposed that the miners in the North breathe better air than in Cornwall. I cannot, however, think that the more satisfactory sanitary condition of the miners can be ascribed to the mines in the North being generally in a better state as to ventilation

and freer from "choke damp," &c. So far, indeed, as I can judge by the description of the men, I should think that the workings in the Northern mines were quite as frequently the seat of noxious gases as in Cornwall. Indeed I think their reports rather indicated a worse condition of certain parts of the mines in the North than in Cornwall. I have also before stated that, so far as dustiness is concerned, the Northern mines are probably more injurious to the men.

2nd. *Race.—Diet of miners.*—The miners in the North are certainly a more robust race; and it is probable, upon the whole, their diet is more nutritious than that of the Cornish men. Many of them, at least in some districts, as in Weardale, Nenthead, &c., are small farmers; they have plots of ground sufficient to keep a cow, and thus they are able to obtain milk, and probably altogether more fresh animal food than the Cornish miners ordinarily have. I do not, however, think that there is sufficient difference between the miners in the two districts in this respect to explain the differences in their sanitary state.

3rd. *Age at which they begin work.*—Throughout the mining districts of the North of England the miners do not now go to work underground at by any means so early an age as in the West. In none of the mines did I find that boys were allowed to work underground before they are 13, 16 or 18 years at age. The regulations of the London Lead Company are especially judicious on this point. No one is allowed to work underground in the Company's mines regularly till they are 18 years of age; but as, during winter, for three or four months, the climate is too rigorous for the boys employed at the dressing floors to work on the surface, those boys who are 14 years of age are allowed to work in the mines under the superintendence of the older miners during this time, and thus they are gradually inured to the underground work. This arrangement, I am assured by Mr. Carson, the company's medical officer at Nenthead, has very materially conduced to the healthiness of the miners who have come into work since it was adopted. He stated that there is now much less illness among the miners than formerly, and he does not think that, except this regulation and the better ventilation of the mines, there is any other alteration in their condition to which the improvement can be ascribed. When in Cornwall I was much impressed with the early age at which the boys were allowed to commence working underground, and with the delicate appearance which the younger men so soon acquire when working in the mines, and I think that some restriction as to the age at which the boys should commence is imperatively called for. I think also that an arrangement, like that adopted by the London Company, by which the boys would be gradually introduced to the underground work, would be most desirable throughout the mining districts. It does not, however, appear that the longer period of work in the North of England, of the men at present invalided, can be explained by their having commenced mining at a latter period of life than is usual with the Cornish miners. Indeed, most of the disabled men whom I examined had worked underground before the regulation referred to was introduced, and at ages quite as early as is now the practice in Cornwall. I find that on the average they began work when only 14 years of age, and some stated that they first went underground much earlier; the extreme ages at which they commenced being 7 and 18.

The circumstances which are mainly influential in favourably affecting the sanitary state of the men working in the northern mines, appear to be the comparatively short periods in each week during which the men work in the mines, the ready access to the mines without having to climb the ladders to any extent, the natural temperature of the workings, and the length of time during which they are left free.

4th. *Periods of work.* The men in the northern mines are ordinarily required to work for 5 eight-hour shifts in each week, making in all 40 hours of work. They are however allowed, if they so like, to work for longer periods than 8 hours, and a common plan is to work 4 daily shifts of 10 hours each. Thus, as the mines are generally at some distance from the mining villages, they frequently work on Monday, Tuesday, Wednesday, and Thursday; and return home on the Thursday, spending the remainder of the week in working on their small farms or in their gardens, or for the farmers in the neighbourhood. This plan has a double advantage. There can be no doubt that for men who work in the impure air of a mine the greatest possible protection from suffering is for them to be much in the open air when at the surface. The ordinary plan in the district is also for the mines to be worked in only two shifts in the 24 hours, except when driving ends or in cases of emergency. It thus results that the workings are left unoccupied for at least 4 hours in each 24, and entirely for two or three days in each week; an arrangement which allows of the offensive gases generated by the explosion of the blasting powder, and by the respiration of the men at work and the combustion of the candles, being got rid of by natural ventilation. At the same time the workings are so kept cool. In Cornwall the mines are generally worked six days in each week, and often for three 8-hour shifts in the 24 hours.

5th. *Climbing by ladders.*—I have already mentioned that the miners in the North of England have not much climbing by ladders. They, together with their tools, are usually conveyed to their work in waggons drawn by horses or pushed by their fellows, or by "lifts" or "skips" moved by machinery, and have only to climb the ladders for 10 to 20 or 30 fathoms in passing up or down shafts between the different levels. This I cannot but regard as a very important improvement upon the plan, generally adopted in Cornwall, of descending and ascending great depths by the ladders. It is, I believe, mainly to the hurried breathing and violent exertion in using the ladders that the frequency of affection of the heart among the Cornish miners is to be ascribed. The absence of this violent exertion and the hurried breathing so caused, goes far, in my opinion, to explain the better sanitary state of the northern miners, and especially the infrequency of diseases of the heart among them. I believe also that their greater vigour is much due to their being less exhausted than the Cornish miners from being conveyed to and from their work without any material exertion of muscular power.

6th. *Temperature of mines.*—The mines in the North of England do not appear to be generally so hot as to be injurious to the men. I met with only two or three of the men who made any complaint of this kind. The natural temperature of the mines is a great advantage to the men in two ways: they do not become, by any means, so much exhausted by their work, and are not so much tendered by it as to become very unduly susceptible to cold when at the surface. In the mines in Cornwall in which the workings are very hot, the men suffer much when below, and very readily take cold when at the surface. It is, I believe, mainly to this cause that the affections of the chest which occur among the miners in the two districts differ. In the North of England active inflammatory affections being rare and the asthma of a less complicated character; while in Cornwall the men more frequently have active inflammatory affections leading to consolidation and disorganisation of the substance of the lungs.

Effects of Dressing the Ores, Smelting, &c., on the men employed in those processes.

The surface works at the mines in the North of England is entirely performed by men and boys, chiefly the latter. In the London Company's works no boys are employed at the dressing of ores till they are 12 years of age. At Mr. Beaumont's works they commence at 10. I did not on inquiry hear that any of the persons thus employed suffered from the influence of the lead or in any other way from the work.

The London Lead Company have smelt works both at Nenthead and Eggleston, in Teesdale, and there were also smelt works in use at Allenheads. Formerly, I was told by medical men, in all these districts, that the smelters suffered from lead colic, and the same was confirmed by the reports of the men themselves. Sometimes, also, they seem to have had the more severe symptoms of lead poisoning, dropping of the hands, &c., but of late years, since the works have been better ventilated, these forms of lead poisoning have entirely disappeared, though the men still occasionally have colicky pains in the bowels, constipation, &c., and those especially suffer in this way who are employed in emptying the flues. Of 25 men whom I examined at different works, who either were then or had been employed as smelters, 10 stated that they had never had any symptoms of lead poisoning, and the other 15 said that they had formerly suffered to a greater or less extent; and all but five stated that they still occasionally had colic and constipation, though none of them apparently to any serious extent.

I examined the condition of the mouth in the men I have mentioned, and of the whole number 14 displayed the blue line upon the edges of the gums to a greater or less extent, several had their teeth and gums in a very unhealthy state, and some were pallid and anæmic looking. I did not meet with any cases of paralysis from lead. The acting superintendent of one of the mills had apparently had a sharp attack of lead colic.

The men stated that when they entered the flues from the furnaces and the condenser to clear them out at stated intervals, the sulphurous and other gases tried them very much in their breathing, and that occasionally they suffered from pain and confinement of the bowels afterwards. The

flues are, however, by recent improvements, to a considerable extent emptied of their contents, and especially of the lighter and therefore more injurious portions, by currents of water which are continually passing through them, and thus the men are less likely to suffer.

I was told that at Nenthead the exit chimney of the smelt mill was formerly situated at about 800 yards from the furnaces, and in a somewhat lower situation, and at the time the residents in a group of cottages near the chimney suffered from symptoms of dyspepsia, with a tendency to colic. Since the chimney was placed at a further distance of 400 yards, and in a more elevated and exposed situation, this has entirely ceased.

I was assured from the experience of the Benefit Society of the London Company that the smelters were longer lived than the miners, and amongst the men whom I examined were several in very advanced life, and who were yet hale and strong for their ages.

REPORT 2.

Ages of Men at Work at Nenthead, Allenheads, and Burtrie Pasture Mines.

12 to 16 years of age,	4	ratio per cent	1.96	18.13 per cent.
17 to 20 „	33	„	16.17	
21 to 30 „	66	„	32.35	54.4 per cent.
31 to 40 „	45	„	22.05	
41 to 50 „	40	„	19.60	25.48 per cent.
51 to 60 „	12	„	5.88	
61 to 64 „	4	„	1.96	
Total	204	Mean age	31.5	

State of Miners examined at Nenthead, Allenheads, Rodderup Fell, and Burtree Pasture Mines.

Under 21 years of age; Total 41:
Healthy, 36; pale, thin, &c., had sustained injuries, 3;=39. Ratio per cent. 95.1.
Delicate and complaining, 2. Ratio per cent., 4.8.

From 21 to 40 years of age; Total 124.
Healthy, 106; pale, thin, &c., had sustained injuries, 10;=116. Ratio per cent., 93.5.
Delicate and complaining, 8. Ratio per cent., 6.4.

From 41 to 64 years of age; Total 60.
Healthy, 31; pale, thin, &c., had sustained injuries, 1;=32. Ratio per cent., 53.3.
Delicate and complaining, 28. Ratio per cent., 46.6.

Total: Healthy, 225; pale, thin, &c., had sustained injuries, 187. Ratio per cent., 83.1.
Delicate and complaining, 38. Ratio per cent., 16.8.

Forms of Disease among the Miners in the North of England.

Commencing miners' asthma, 3 cases; confirmed and advanced 15, -	18
Palmonary consumption - -	4
Disease of heart - - -	1
Chronic rheumatism - - -	1
General failure of power, asthma, dyspepsia, &c. - - -	1
	25

Ages of Men affected with Miners' Disease.

Mean age of 18 cases, 55.5.
Extremes of age, 70 and 67, and 31 and 44.

Age at which the Health first failed in Men permanently disabled.

Mean age of 13 men, 49.18.
Extremes of age, 60 and 56, and 34 and 44.

Age at which Men permanently disabled became unfit for Work.

Mean age in 14 cases 55.07.
Extremes of age, 63 and 46 and 47½.

Ages at which the Men permanently disabled began to work underground.

Mean age of 17 men, 14 years.
Extremes of age, 7 and 18.

Assigned Causes of Disease in Men labouring under Miners' Asthma, &c.

Bad air and slavish work - - - -	1 case.
Bad air, powder reek, and stour - -	3 cases.
Bad air, smoke, and damp - - -	1 case.
Bad air - - - - - -	1 „
Much bad air and beginning to work too soon (at 9 years of age) - - -	1 „
Powder reek and stour (but had also worked in bad air) - - - - -	2 cases.
Bad air and powder reek - - -	2 „
Had been a great drinker (but had also worked in bad air) - - - - -	1 case.
Taking cold (but had worked in bad air) -	1 „
Cold and influenza (but had in worked in bad air) - - - - - - - -	1 „
Working at night and in bad air and powder reek, and getting cold in coming to the surface from there being no changing house -	1 „
The stour and bad air, and working too hard when he had a good bargain - - -	1 „
Had always been ailing, but air of mines made him worse - - - - - -	1 „
Working in cold draughts (never in bad air) -	1 „
No precise cause assigned, but had all worked in bad air - - - - -	7 cases.
	25

Period of work in persons permanently disabled by Miners' Asthma.*

In North of England, 14 cases—
Mean period 40.6 years.
Extremes 57, and 28 years.

In Cornwall, 15 cases—
Mean period 34.8 years.
Extremes 52 and 15 years.

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* I have taken this form of affection alone as indicating the mode of breaking up of the miners when their powers are not prematurely exhausted by accidental diseases

APPENDIX 2.

Brief Notes of Cases of Disease, &c. among Miners in the North of England.

Clitheroe, &c., Alston, Aug. 3, 1863.—No 1, aged 45. "Blinded by a shot," April 29, 1862, at Stone Croft Lead Mine, Northumberland.

Nenthead, Aug. 3, 1863.—No. 2, aged 42. Blinded in blasting, 8 or 10 years ago.

Two other blind men are said to be in the parish of Alston who are blind from injuries in blasting.

No. 3, aged 50, who lost his sight 10 or 12 years ago, and No. 4, aged 30, injured a year ago.

There are several other men who have sustained partial injuries of the eyes in the same way.

Alston, Aug. 5, 1863.—No. 5, aged 35. First went underground when 18 years of age, and worked for 8 years in Mr. Beaumont's mine at Coalcleugh, and then left and went to Australia. He was at the time a little touched in the wind. "All miners suffer more or less at the chest, and many quite as young as he was." "Some parts of the mine were very bad; the candles could only be got to burn by putting two together, and heeling them on one side, and then they gave out much smoke. The smoke also lay long in the mine when they fired a shot. Sometimes for days together the candles could not be got to burn at all, and they could not get in to their work. The bad air made them heavy and sleepy, and took the power out of their limbs, and he had known persons carried out as if dead from working in it." Since his return from Australia he has not worked underground. He is now delicate looking.

Rodderup Fell, Aug. 5, 1863.—No. 6, aged 60. Went underground at 20, and has worked steadily ever since with some short breaks. Latterly his health has failed, and he has been laid by with two attacks of influenza, and has "whiles been bad with his wind." He was incapable of working 12 months ago, and was seen by Mr. Bankart. He is now "a little bad in the wind," but is better than he has been, and he is at work. He is old-looking, and pale and thin.

Alston, Aug. 6, 1863.—No. 7, aged 25. Went to the mines at 19, and worked underground for a year, when he injured his eye and one hand by a blast, and has not worked since. He has recovered his sight, but his hand is much shattered. He has worked as a hostler for 6 years. The mine he worked in was dry and stoury, there were some bad places; "but it was not so bad as some." "Very near all miners are more or less touched in the wind."

St. John's Chapel in Weardale, Aug. 6, 1863. Mr. Hewitson.—No. 8, aged 25. Went underground at 12, and has worked as a miner till he got ill. He has had an attack of gastric fever, with predominant head affection, and is now nearly recovered. He was very deaf before his attack, and continues so.

Ireshope Burn, Weardale, Aug. 6, 1853.—No. 9, aged 45. Went underground at 12, and has worked as a miner ever since, except when away from ill health. He has been out of health at times for the last 3 or 4 years, suffering from inflammation of the bowels. He has been laid by recently for 18 weeks, and is now only just able to return to the mine. His appetite was very bad, and his food did not agree with him, and he had pains in his bowels, and diarrhœa or dysentery. He looks pale and thin and delicate.

Middleton in Teesdale, August 7, 1863.—No. 10, aged 70. He went to work in the mines when he was 10 years of age, and worked regularly for 55 years with little intermission, and always in the Company's service. He never suffered till he had worked 30 or 40 years, or till he was 40 or 50 years of age. He has worked in some very bad places, and for 10 years was always in bad air, more or less. That was when he was from 25 to 35 years old. The candles could scarcely be got to burn from the badness of the air; but he thinks it was not so much the bad air as the dust that hurt him. The last place he worked at was a shaft which they were drivin to meet an adit, and he worked at this three or four years.g It was not very bad, for they had a blower at the top moved by hand. He left working underground when 56 or 58, or 12 or 14 years ago, and worked at the surface six or eight years. He has not worked at all for six years, and is pensioned by the Company. He is an active hale man for his age.

Allenheads, Aug. 4, 1863. Mr. Hewitson. Cases of fever.—I visited at the School Hill, Allenheads, two patients labouring under fever, apparently typhoid or gastric, and which, from the history given me by Mr. Hewitson, was certainly imported and had spread by contagion.

A young man, a schoolmaster at Fir Tree, about 25 miles from Allenheads, was taken ill with fever, and his sister residing at Allenheads went to nurse him, and was with him about a week when he died. She then returned home, sickened with fever a few days after, and died, after an illness of about a week, on the 26th of July. When I visited the house on the 4th of August there was a sister about 25 years of age, ill in bed, and presenting the usual symptoms of typhoid,—oppression of the brain, prostration of strength, and diarrhœa, with fullness of the abdomen, but without any spots, which had commenced six or seven days before. A brother also, about 20, was evidently sickening, and had been poorly two days. The first sister who died had symptoms of typhoid, but not any of the rose-coloured elevated spots.

Nenthead, Aug. 3, 1863.—Dr. Carson stated that he formerly saw much more of miners' disease than he does at present. Ten or 12 years ago he had always two or three cases of disease in the last stage under his care. Now, he has never at any time more than one or two cases. This difference he ascribes to the better ventilation of the mines, and to the more advanced age at which the men commence to work underground. Formerly they went very young, now they are not allowed to go to the mines before they are 18, though at 14 they work underground during the cold weather in the winter. There is no marked alteration of any other kind in the circumstances of the men; their wages are much the same, and there is no material change in their mode of living.

When at Middleton, 28 years ago, he occasionally saw lead colic among the men, and had seen dropping of the hands, but the men do not now suffer materially, the smelt mill being better ventilated.

The men are generally temperate in their habits, there may be some few who take a pint of ale after they finish their work in the evening, but the majority take none, except on pay nights, and then some may perhaps take too much. They smoke too much. The men live much upon tea and bread. They do not usually get animal food, except a little bacon, but they generally have a good dinner on Sundays. The men, some of them, have gardens and others ground enough to keep a cow, which helps them much, for generally there is a difficulty in getting milk.

There is no changing-house or "shop" at Nenthead, but the men live within a short distance of the mines, and change and wash at home.

Dr. Carson obligingly took me to the cottages inhabited by the various classes of workmen at Nenthead.

The cottages built by the company for the smelters are very good; they are pleasantly situated on one side of the valley with a bank sloping to the Nent, laid out as gardens. The cottages have two large and high rooms, are properly drained and have a yard behind, with a coal cellar, dust bin, and privy. The only objection is, that the rooms are only two in number, and this, for large families, is tao few, and was complained of by some of the residents.

In a group of recently built miners' cottages, the company have so enlarged the dimensions as to admit of two rooms on the ground floor and two bed-rooms above.

There are other cottages not belonging to the company, which are defective, and some of them are most objectionable. A portion of these cottages are thatched, have only two small and low rooms, the upper in the slanting roof, and sometimes only reached by a ladder; there is no under drainage, sometimes no privy, and rarely any garden ground. One row was especially defective, the houses being divided across so that there was one tenement in front and another behind, and of course no thorough draught.

The company provide schools, a reading-room, and medical attendance in accident or sickness, and there is a fund in connexion with the mine to which most of the men belong, and which gives relief, temporarily in case of sickness or accident, and permanently when the miner is disabled from following his occupation any longer. There are also clubs in which the men are enrolled.

Mr. T. Millikin.—The levels have for many years been driven 6½ feet high and 4½ feet wide, and they vary in depth from 20 to 100 fathoms. There are a great number of surface ventilating shafts, besides the various levels of the different mines, all communicating with each other, as well as the upper and lower levels of each separate mine. At the western boundary they likewise communicate with Garrigill mines, and at the eastern boundary, with the Coal Cleugh mines. The Rampgill mine, where it communicates with the Coal Cleugh workings, is one mile in length. Ladders are used from the various levels to all the different workings, which will not average 15 fathoms in height.

The mines are, as a whole, dry, and are chiefly worked by blasting.

Artificial ventilation is adopted in all the progressive new openings, such as levels, rises, opening drifts, &c.; this is done by means of trap doors, hand airing machines, and

various other machines, which are carried by water. There are trams laid in the day levels, along which small trucks are pulled by horses or pushed by the men, and when the miners go to their work their tools are placed in the trucks, and some ride whilst others push the trucks.

MIDDLETON IN TEESDALE, MR. BAINBRIDGE.—The required working hours of the miners is 40 hours per week, divided into five daily shifts of eight hours each, whenever the mines are near the residences of the miners, as in the Alston Moor district; but in Teesdale, where the mines are scattered and at a great distance from the miners' residences, then five 8-hour shifts are converted into four 10-hour shifts, and other equivalents of the weekly 40 hours.

It is only in urgent cases, such as the driving the level or drift to its destination, or the completion of communications to the surface, that the men are required to work three 8-hour shifts in the 24 hours. It is in these cases that the ventilating fans and water blasts are used to propel pure air through cast-iron pipes to the points where the men are working. When communications have been effected between drifts and rises and sumps and the surface, reliance is placed for ventilation upon the currents of air passing between the level mouth and the surface shafts.

The men, when working at mines at considerable distances from their homes, live at "mine-shops," provided for the purpose in the immediate vicinity of the mines. These generally contain separate changing, mess, and bed rooms, with a washing room provided with a stream of good spring water, which flows first into a wooden trough, in which the miners place their cans of milk for the purpose of keeping it fresh and cool, and then into a trough for washing. There is also a separate room or pantry for the deposit of the miners' wallets, containing the provisions which they bring with them from home for their support during the week. The ventilation of the sleeping-rooms is promoted by openings in the walls covered by perforated zinc plates, and by a double cylinder passing from the roof into the open air, the inner being longer than the outer, and both so capped as to prevent the entrance of snow and rain, or of too strong a downward current of air.

The beds and blankets in these shops are provided by the company, and are washed by the men.

When in the mines the men wear a flannel shirt and cap, with a vest and trowsers, which are taken off on leaving the mine and hung up in the changing room to be dried by the fire which is kept always burning.

Some of the working miners are small "statesmen" or the sons of "statesmen" whose properties are inadequate to their maintenance, but the larger proportion of them are merely the tenants of the lords of the mines and other landowners in the neighbourhood, and a still larger proportion have not more than a cottage and garden, but there are comparatively few who have not the opportunity of cultivating a garden. The district in which the mines are situated does not afford agricultural employment, but some of the men obtain occasional day's work in the improvement of the meadow and pasture lands.

No women or girls are employed about the mines in any way. The boys must be 12 years of age before passing from the school to the ore dressing floors; and during the suspension of the "dressing" in the depth of the winter, which as Middleton is about 700 feet above the sea, is severe and prolonged, the washer boys who are 14 years of age are placed as labourers with the underground pickmen. They thus get about three months work underground during each year till they are 18 years of age, when they are usually allowed to work regularly in the mines, but in recent years the need for employment of the boys at the ore dressing has been such as to occasion their engagement there up to 20 years of age, which will doubtless contribute to their healthy stamina, whatever may be the effect upon their skill as miners.

The company have schools for their workmen's children at Nenthead and at Middleton in Teesdale where the majority of their miners reside. In the more distant districts and where they have not schools, the company assist the local schools, and allow the parents to select those to which they send their children, on the condition that the company's inspector shall ascertain that the children are efficiently taught.

The reading rooms at Nenthead and Middleton were erected at the company's expense, and the cost of cleaning, heating, and lighting is borne by them. The members attending the room contribute 3*d.* monthly towards the purchase of newspapers and periodicals; an exception being made to youths under 18, who only contribute 2*d.* monthly. The general management rests with the members themselves. There are also free libraries open to all their workmen, and numerous village and hamlet libraries which the company have aided in establishing, and to the maintenance of which they contribute.

In Middleton there is a very large and beautiful schoolhouse which has recently been erected by the Company. I visited with Dr. Ewart numerous excellent cottages with four large and high rooms, and properly provided with all conveniences, and with back yards and gardens and underdrained, built by the Company for their own people. There are also numerous good cottages built on their own freeholds by the workmen.

In the Company's recently erected cottages a system of ventilation has been introduced which appears to act very efficiently. A tile pipe is extended from beneath the ceiling of the rooms in the wall along the side of the chimney flue, (but without any connexion with it) which has an outlet in the side of the chimney above the roof. The air in this tube becomes rarified by the heat derived from the adjacent smoke flue, and so the impure air from the room is removed.

The Company's benefit society includes all the regular workmen in their employment, together with the agents, clerks, overseers, &c. if they are anxious to become members. The members on entering the society must be in good health, and pay a fine proportioned to their age, and subsequently contribute 30*s.* a year till 65 years of age. From the society they receive 7*s.* a week when entirely laid by from sickness or infirmity, or a less sum if capable of partial occupation. At the age of 65 all contributions cease, and the members are entitled to 6*s.* per week, whether in sickness or health, for the remainder of their life.

The fund also makes a contribution at the death of the workman or his wife, and a small donation to the widows of those who have been upwards of a year members of the society.

The Company provide medical attendance in cases of sickness and accident, and have resident medical men at Nenthead and Middleton, whose duty extends to the families of the workmen (including midwifery), all free of charge to the workmen.

ALLENHEADS.—At Allenheads there is a reading room and school house provided by Mr. Beaumont for the miners, and numerous good cottages, some the property of the proprietor, others built by the workpeople. There is also a school house in Weardale.

MR. BEWICK.—At these and the other large mines belonging to Mr. Beaumont, until recently, the only parts which required artificial ventilation have been the foreheads or foremost ends of particular drifts, which had no through communication, and these have been hitherto almost invariably ventilated by propulsion by means of fans, bellows, water blast, or other adaptation, according to circumstances. Within the last two or three years ventilation by means of exhaustion has been introduced on the Blackett Level (new) Works. At one point on this work the air is extracted from the forehead in metal air pipes five inches diameter, connected with a pair of cylinders having valves similar to Struve's plan. These cylinders are fixed at the surface at the commencement of the level, (which is already driven nearly half a mile and daily increasing,) and are worked by a water wheel eight feet diameter.

At two other places on the Blackett Level exhausting fans on Biram's principal are applied; at one of these two and at the other three foreheads are ventilated. In each of these cases the machines are placed near the top of a vertical shaft or pit, a five inches air pipe being carried from each forehead along the level, up the shaft, and to the machines at the surface, both of which are driven by water wheels.

At another of the shafts on the Blackett Level where there are two foreheads, the fresh air is propelled from the surface by a fan connected with air pipes (5 inches diameter) which pass from the fan down the shaft and to each forehead. This fan is also driven by a water wheel.

The advantage of exhaustion over propulsion or vice versâ, is not yet satisfactorily decided. In narrow airless foreheads propulsion has the advantage of delivering a current of pure air at the place where the miners are occupied, whilst by exhaustion, the fresh air which has passed into the mine to replace the exhausted air, becomes deteriorated before it reaches the workmen. In ventilating a large area, or series of mines, exhaustion is, I think, preferable.

The general ventilation of the older and more extensive mines of Mr. Beaumont is carried out by shafts and levels without the intervention of artificial or machine ventilation, the only exceptions to this are the two furnaces, one at this place and another at the Burtree Pasture Mine in Weardale.

The Allenheads furnace was first lighted in July 1861, and has since continued without intermission, except for repairs, &c.; that at Burtree pasture was commenced in October 1862, and has since been in constant operation, except for about four months in the beginning of this year. Each furnace is in connection with the whole mine, but where the levels are far distant—say, 1 to 1½ miles—the effect is not perceptible. By these furnaces the atmosphere of the

mine is rendered more generally pure. The smoke from the explosion of the gunpowder and other deleterious matters are more quickly carried away, and the men are enabled to work more energetically for a longer time and with less fatigue than they could previously, and in fact, in some places under particular atmospheric conditions, they were, before the furnaces were erected, occasionally unable to pursue their work.

There is only one other furnace that I know of in the Northern Lead Mining Districts, and that is at Fallowfield Mine, near Hexham. The workings are comparatively limited, and it is only occasionally necessary to light the furnace.

Our experience of the furnace for ventilation is highly satisfactory, and its usefulness in ventilating extensive workings underground cannot, I think, be questioned.

The two furnaces and the three machines on the Blackett Level are the only cases of ventilation by exhaustion in this district.

The vertical shaft at this place is 77½ fathoms deep, but it is at 40 fathoms from the surface where the main horse level strikes off into the workings. There are many other shafts and levels connected and communicating with the surface, so that many parts of these mines are naturally ventilated. The different levels are connected by ladders or inclines, but more generally by the former. The men at this place have not to climb much, but at Burtree Pasture mine there is a good deal of climbing. Taking Mr. Beaumont's mines as a whole, there is not a great amount of ascending and descending by ladders; many of the mines are worked by adits, others by vertical shafts at which is erected machinery for winding, by which the workmen are brought to the surface, and with the exception of Burtree Pasture none of these mines can be considered deep, at least they are far short of the Cornish and other metallic mines.

Burtree Pasture mine is worked by day or adit levels, and by vertical and inclined shafts. The main or horse level, from its mouth to the forehead, is a little over two miles in length. In this however are several sumps, communicating with other higher and lower levels, and there are two shafts which communicate with the surface, at the top of one of which is placed the furnace, 96 fathoms above the horse level. The deepest workings for lead ore are 134 fathoms below the horse level, or 230 fathoms lower than the furnace, but not immediately beneath it. The furnace is more especially applied to ventilate that portion of the workings extending beyond the shaft at which it is placed, but it has a beneficial effect over the whole mine, the air being chased or traversed through the various workings by means of trap doors and such like. With the exception of the furnace, and any especial foreheads in which there is not a through communication, there are no artificial means of ventilation at this mine. Generally speaking, when air is forced into a forehead, it is not from the surface, but from the nearest ventilated point (say, in one of the main levels) underground. The maximum distance from the surface, by existing levels and shafts, of any working in this mine, is 785 fathoms.

In this district the levels are generally drifted of an egg-shaped section, the maximum dimensions being 6 to 7 feet high, and 3½ to 4½ feet wide. There are of course exceptions to these dimensions, both in height and width, but these are the usual sizes. The workings for ore are of almost every conceivable size and shape, from 2 to 20 feet wide, and 6 to 60 feet high but generally the veins are from 4 to 6 feet wide, and the ore is worked by headings, roofs, and soles; when a roof working gets to a height beyond reach, a timber floor or "bunding" is fixed, from which the miners continue their operations. When the ore is found in "flats" the height is from 3 to 6 feet, and up to 60 or 70 feet wide on each side of the vein, but the width is exceedingly irregular. In the Burtree Pasture mine, as before mentioned, the men have a good deal of climbing; this is owing to the great depth of the workings, and the want of machinery adapted for winding them down and up the shafts. This will, however, I hope, shortly be obviated by the erection of suitable machinery.

Mr. Beaumont's mines, as a whole, are dry: there are, no doubt, many wet places, but in the Great Limestone, and some other of the most productive strata, there is little water.

Boys are not employed until they are 10 years of age, and then only on the surface in dressing the ores and such like. None are employed in the mines under 13 years of age, and unless they are robust and healthy they must be 15 or upwards. Much depends too on the place of work. Youths of from 13 to 18 are not allowed to commence in the mines unless the place is unobjectionable as regards ventilation, &c.

In connexion with the Allendale mines there is an arrangement for providing medical attendance and medicines to the workmen and their families. Each workman who is a householder pays 5*s.*, unmarried workmen or lodgers 2*s.* 6*d.*, and boys about a day's pay, per annum. The married workmen in addition pay 7*s.* 6*d.* for each midwifery case. These sums, except the last, which is paid in full, are paid by half-yearly instalments at the offices of Mr. Beaumont, and go towards payment of the salary of the medical officer of the district; the deficiency, about 47 per cent., being made up by Mr. Beaumont. The surgeons are appointed by Mr. Beaumont, and receive a quarterly salary; they have to provide medicines, and give personal attendance, in all cases of sickness of the workmen or their families resident within a certain fixed district. The payment from the workmen living in that district is compulsory, but those residing beyond the limits are not required to pay the annual contribution, and do not receive the benefit of the surgeon of the works, except by paying his charges as an ordinary practitioner. The medical officers are, in addition to their salary, allowed any private practice of the district. In *all* cases of accident the surgeon of the works attends without extra pay, and he has also to examine and report on the health of candidates for admission to membership in the benefit societies on the same terms. Non-workmen, members of the benefit society, may have the benefit of the surgeon for themselves, but not for their families, on paying at the same rate as workmen, and on condition that they intimate such to be their desire on *entering* the society. In the Allendale mines there are two districts—East Allendale and West Allendale; and there is a resident surgeon engaged by Mr. Beaumont for each district. In the Weardale district no such arrangement exists.

Quite independent of the preceding, there are benefit or friendly societies in the different localities. Those at Allenheads and in West Allendale were established within the last 17 years; the former in 1850, the latter in 1847; and both are most liberally supported by Mr. Beaumont on the principle that help is given to those that help themselves. The funds are, however, quite distinct, and under the entire control of the members. The tables were prepared by Mr. Neison, and the payments are proportioned to the age of the member on entering, and the amount of "sick pay" or "sum at death" for which he chooses to enter. Membership of this society is entirely voluntary. Mr. Beaumont subscribes aunually in proportion to the amount contributed by the ordinary members, and according to the funds safely and satisfactorily invested at the termination of each year's transactions. Thus, at the end of each year, Mr. Beaumont contributes *five per cent.* on the total amount paid by the ordinary members during the year, and *two per cent.* on the total capital at that time. These sums are guaranteed for periods of five years, and are purely donations. The monies of the societies are invested in the National Debt Office, the local Savings Bank, or on mortgage. Mr. Beaumont derives no direct benefit from, nor has he any control over, the funds.

In consideration of Mr. Beaumont's contribution, non-workmen are admitted members by permission of himself or his chief agent, and on payment of one halfpenny per sixpence or part of sixpence beyond the rates specified in the tables. It is also a condition that a workman, on leaving Mr. Beaumont's service of his own accord or for misconduct, has his contribution to the benefit society increased in the same proportion; but, on the other hand, when a non-workman member enters Mr. Beaumont's service, his payment is reduced to the rates given in the tables.

Except the trustees, all the officers of these societies are elected annually by the members. There is no restriction on their choice, except what is stipulated by their rules, viz., that not less than one-half of the committee shall be chosen from among the honorary members.

The trustees (not less than one-half of whom must be honorary members) are likewise elected by the members, but for life, or until they resign or are disqualified. These societies by special tables provide for annuities to commence on attaining 70 years of age, but not one has been subscribed for.

Similar benefit societies do not exist in Weardale, but the Miner's Lodge of Odd Fellows at St. John's Chapel numbers many members (mostly miners), and has a large capital. There is also a benefit society, the members of which meet at the Miner's Home at Newhouse Office, belonging to Mr. Beaumont, and, although an old society, it has few members, and is not flourishing.

At Allendale Town, too, there is an Odd Fellows Lodge, and a Friendly Society called the Royal Oak or "Private Club," in consequence of its meetings being held in a private house; but these societies, although doing much good, are not in prosperous circumstances.

The majority of the members of all the friendly societies

in these districts are miners, or workmen connected with lead mining, the staple trade of the locality.

The East and West Allendale and the Newhouse Benefit Societies have, by Mr. Beaumont's kindness, the free use of his miners' rooms for holding the monthly or other meetings, and firing and candle-light, gratis, at the respective places.

There is a building society established in the district, the head-quarters of which are at Allenheads. To this the owner of the mines does not contribute, but allows the members the free use of the Miners' room in which to hold their meetings, and at certain places on his property the members have the opportunity of purchasing freehold building sites at a very moderate rate.

There are no "mine shops" or "changing houses" in connection with the Allendale mines. Most of the miners live near the place, and go home to change. Others who live at a distance change in the cottages adjacent to the mines, and pay the cottager a nominal sum for the accommodation and for drying their mining clothes. In Weardale, where the mines are spread over a larger area, there are several "mine shops" or "barracks," in which the miners live during the five days they are at work each week, carrying their "wallets" and preparing their own food. For these shops Mr. Beaumont provides firing, fittings, and furniture of a rough kind, and each workman finds his own bed-clothes, plates, knives, and forks, &c.

Note, February 23rd 1864.

With reference to the propulsion or exhaustion of air for ventilating close foreheads in mining, from further experience on the Blackett Level Works the two Biram's exhausting fans have been removed and propelling machines substituted. The exhauster on Struve's plan continues in operation, and works satisfactorily. The great advantage in propulsion is the delivery of the pure cool air at the heading where the miners are at work.

MINERS AT WORK.

APPENDIX 3.

AT LONDON LEAD COMPANY'S MINES AT NENTHEAD.

Age of Miner.	At what age he began to work underground.	How many years he worked underground.	Whether he has ever suffered from any serious illness, and is now quite well. If not, of what does he complain.	Condition and Appearance.
38	19	19	No. Yes. But "rather touched in the wind."	Healthy.
22	14	8	No. Yes.	Healthy.
27	19	8	No. Yes.	Healthy.
33	20	13	No. Yes.	Healthy.
50	18	32	No. Yes.	Healthy.
24	18	6	No. Yes.	Healthy.
19	18	1	No. Yes.	Healthy.
29	23	6	No. Yes.	Healthy.
42	18	24	No. Yes.	Healthy.
55	18	37	No. "Middling well."	Healthy.
41	21	20	No. Yes.	Healthy, deaf.
18	Just beginning.	—	No. Yes.	Strong and healthy.
22	18	3	No. Yes.	Healthy.
30	19	11	No. Yes.	Healthy.
31	17	14	Injured by a blast.	Healthy.
19	18	1	No. Yes. *	Healthy.
29	20	9	No. Yes.	Healthy.
31	17	14	No. Yes.	Thin and pale.
22	18	2*	No. Yes.	Healthy.
25	19	6*	No. Yes.	Healthy.
28	26	2	No. Yes.	Healthy.
49	18	31	No. Yes.	Rather worn, but fairly healthy for the age.
20	18	2	No. Yes.	Robust.
27	19	8	No. Yes.	Healthy.
41	19	22	No. Yes.	Healthy.
43	17	31	Away for a fortnight with pleurisy, otherwise no illness, and now well.	Healthy.
41	18	23	No. Yes.	Healthy.
30	18	12	Eye injured by blast a year and a half ago.	Healthy.
24	18	6	No. Yes.	Healthy.
27	18	9	No. Yes.	Healthy.
30	18	12	No. Yes.	Thin but healthy.
20	18	2	No. Yes.	Robust.
24	18	6	Suffers from rupture, otherwise Yes.	Healthy.
31	19 Went underground to blow engine at 7.	12	No. Yes.	Healthy but rather pale.
31	18	13	No. Yes.	Healthy.
38	11	27	No. Yes.	Healthy.
35	18	17	No. Yes.	Rather pale and thin.
45	8	37	No. Yes.	Healthy.
52	10	42	2 or 3 years ago ill for 17 weeks.	Fairly healthy for the age.
22	18	4	No. Yes.	Healthy.
44	18	26	No. Yes.	Healthy.
52	9	43	Has suffered from bad colds, and only has "middling" health.	Fairly healthy for the age.
27	18	9	No. Yes.	Healthy.
30	9	21	No. Yes.	Healthy.
43	18	25	No. Yes.	Healthy.
31	18	13	No. Yes.	Healthy.
33	12	21 Was away 4 or 5 years & then returned again.	Suffered from pain in back and kidneys 6 years ago, now well.	Healthy.
21	18	3	No. Yes.	Healthy.
28	19	7	No. Yes.	Healthy.
46	20	26	No. Yes.	Healthy.
32	18	14	No. Yes.	Healthy.
26	18	8	No. Yes.	Healthy.
24	18	6	No. Yes.	Healthy.

* Employed in Mr. Beaumont's mine.

FORMERLY MINERS, NOW WORKING AT SURFACE

Age at present.	Age at which he went under ground.	How many years he worked under ground.	At what occupation now employed.	Whether he has ever suffered from any serious illness, and is now quite well. If not, of what does he complain.	Condition and Appearance.
45	20	10	Foreman of washing floor.	No. Yes.	Very Robust.
50	18	not stated	At washing floor.	No. Yes.	Healthy.
35	not much underground		A Trammer in shafts.	No. Yes.	Healthy.

APPENDIX 4.

AT RODDERUP FELL MINE.

Age of Miner.	At what age he began to work underground.	How many years he worked underground.	Whether he has ever suffered from any serious illness, and is now quite well. If not, of what does he complain.	Condition and Appearance.
30	20	10	No. Yes.	Healthy.
18	just commenced.	½ of a year	No. Yes.	Healthy.
62	15	47	Is a little "touched in breath," but generally enjoys good health.	Fairly healthy for age.
52	13 or 14	38 or 39	Short breathed, and especially when suffering from cold.	Fairly healthy for age.
22	9	3	No. Yes.	Healthy.
30	19 or 20	10 or 11	No. Yes.	Healthy.
21	19	2	No. Yes.	Healthy.
55	24	31	No. Not much "touched in breath."	Healthy.
50	15	35	No. "Not much touched."	Healthy.
23	20	3	No. Yes.	Healthy.
42	18	24	No. "Little short in the wind."	Healthy.
18	—	not a year	No. Yes.	Healthy.
39	18	21	No. Yes.	Healthy but pale and thin.
20	—	A year and a half.	Injured by stone in eye.	Healthy.
24	18	6 years.	No. Yes.	Healthy.
23	18	5	No. Yes.	Healthy.
20	18	2	No. Yes.	Healthy.
21	18	3	No. Yes.	Healthy.
35	20	15	No. Yes.	Healthy.
19	12	7	No. Yes.	Healthy.
23	19	4	No. Yes.	Healthy.
34	24	10	No. Yes.	Pale but healthy.
33	18	15	Had misfortune and laid by for 3 months.	Healthy.

WORKING AT SURFACE, BUT FORMERLY MINERS.

56	14	41	No. Yes. Gave up a year ago, now foreman of surface work. "A little short breathed. Worked sometimes in good, sometimes in very bad places.	Healthy.

APPENDIX 5.

AT ALLENHEADS.

Age of Miner.	At what age he began to work underground.	How many years he worked underground.	Whether he has ever suffered from any serious illness, and is now quite well. If not, of what does he complain.	Condition and Appearance.
36	15	21	No. Yes.	Healthy.
57	12	45	No. Yes.	Healthy for age.
36	7	29	No. Yes.	Healthy.
43	9	34	No. Yes.	Healthy.
53	15	38	No. Yes.	Healthy.
58	12	46	No. Yes.	Healthy.
34	11	23	No. Yes.	Very robust.
38	16	22	No. Yes.	Healthy.
47	14	33	No. Yes.	Healthy.
21	15	6	No. Yes.	Healthy.
33	14	19	No. Yes.	Healthy.
38	15	13	No. Yes.	Healthy.
22	15 or 16	6 or 7	No. Yes.	Healthy.
43	14	29	No. Yes.	Healthy.
18	15	3	No. Yes.	Healthy.
32	14	18	No. Yes.	Healthy.
23	20	3	No. Yes.	Fairly healthy.
36	15	21	No. Yes.	Healthy.
34	14	20	No. Yes.	Healthy.
38	16	22	No. Yes.	Healthy.
19	15	4	No. Yes.	Healthy.
18	8	10	No. Yes.	Healthy.
48	14	34	No. Yes.	Healthy.
27	20	7	No. Yes.	Healthy.
33	14	19	No. Yes.	Healthy.
39	17	22	No. Yes.	Healthy.
39	14	25	Rheumatic fever and rheumatic pains when 20 ys. of age.	Healthy.
18	12	6	No. Yes.	Healthy.
44	14	30	No. Yes.	Healthy.
34	16	18	No. Yes.	Healthy.
34	15	19	No. Yes.	Healthy.
22	15	7	No. Yes.	Healthy.
27	15	12	No. Yes.	Healthy.
56	19	37	No. Yes.	Healthy for age.
47	15	32	No. Yes.	Healthy.
18	13	5	No. Yes.	Healthy.
37	15	22	Ailing. Shortness of breath, &c.	Not healthy looking.
52	15	37	Poorly in early life, but well since.	Healthy.
40	18	22	Laid by with rheumatics a year ago, now well.	Healthy.
24	17	7	No. Yes.	Healthy.
27	23	4	No. Yes.	Healthy.
19	12	7	No. Yes.	Healthy.
27	16	11	No. Yes.	Healthy.
43	17	26	Inflammation of chest twice within last 4 years, attended by cough and spitting of blood, shortness of breath, &c.	Decidedly delicate looking.
23	14 or 15	8 or 9	No. Yes.	Healthy.
52	10	42	No. Suffers from shortness of breathing.	Worn looking.
44	8½	36½	No. Yes.	Healthy.
64	18	46	No. Yes. Says he has all his life been well.	Healthy for age.
45	19	26	Suffered 3 years ago from sciatica, and still more or less.	Fairly healthy.

APPENDIX 6.

AT Mr. BEAUMONT'S MINE, BURTREE PASTURE, COWSHILL, WEARDALE.

24	12	12	Yes.	Healthy.
20	14	6	No. Yes.	Healthy.
37	11	26	No. Yes. Has had pleurisy and rheumatic attack, and is not so very well now.	Healthy. Delicate.
37	9½	27½		
35	17	18	No. Yes.	Healthy.
40	17	23	No. Yes.	Healthy.
20	16	4	No. Yes.	Healthy.
23	16	7	No. Yes.	Healthy.
21	16	5	No. Yes.	Healthy.
23	11	12	No. Yes.	Healthy.
19	17	2	No. Yes.	Healthy.
46	16	30	Suffers in breath and from indigestion.	Worn.
30	19	11	Suffers "little bit in breath."	Worn, pale, and thin.
38	20	18	No. Yes.	Healthy.
25	8	7	No. Yes.	Healthy.
19	14	5	No. Yes.	Healthy.
16	6	10	No. Yes.	Healthy.
19	10	9	No. Yes.	Healthy.
41	14	27	Short breathed at times.	Worn and pale.
18	10	8	No. Yes.	Healthy.
19	14	5	No. Yes.	Healthy.
42	14	28	No. Yes.	Healthy.
26	18	8	No. Yes.	Healthy.
37	18	19	No. Yes.	Healthy.
57	7½	49½	Little short breathed.	Worn.
23	14	9	No. Yes.	Healthy.
28	18	10	No. Yes.	Healthy.
38	18	20	No. Yes.	Healthy.
26	12	14	No. Yes.	Healthy.
41	15	26	No. Yes.	Healthy.
28	18	10	No. Yes.	Healthy.
21	15	6	No. Yes.	Healthy.
24	18	6	No. Yes.	Healthy.
23	15	8	No. Yes.	Healthy.
17	Just commnced.	0		Healthy.
20	15	5	No. Yes.	Healthy.
25	13	12	No. Yes.	Healthy.
42	12	30	No. Yes.	Fairly healthy.
30	21	9	No. Yes.	Fairly healthy.
37	18	19	No. Yes.	Fairly healthy.
31	21	10	No. Yes.	Healthy.
22	19	3	No. Yes.	Healthy.
46	14	32	No. Yes.	Healthy.
41	20	21	No. "A little touched in the wind."	Healthy.
22	17	5	No. Yes.	Healthy.
20	17	3	No. Yes.	Healthy.
33	12	21	No. Yes.	Healthy.
43	8	35	No. Yes.	Healthy.
21	17	4	No. Yes.	Healthy.
48	20	28	Injured by blast 4 years ago. "A little short breathed."	
45	17	28	Nothing particular. "A little worse in health."	Healthy.
22	10	12	Had a misfortune and was crushed by fall of rock in mine.	Thin but healthy.
24	12	12	No. Yes.	Healthy.
35	14	21	No. Yes.	Healthy.
26	19	7	No. Yes.	Healthy.
20	17	3	No. Yes.	Pale and thin.
38	20	18	No. Little short breathed.	Healthy.
19	12	7	No. Yes.	Healthy.
20	11	9	Stated himself not to have suffered and to be quite well, but was pale, thin, and decidedly delicate looking.	
44	15 or 16	28 or 29	"Nothing particular. A little short breathed."	Healthy for age.
50	15 or 16	34 or 35	"Touched in wind."	Fairly healthy for age.
27	14	13	No. Yes.	Healthy.
18	10	8	No. Yes.	Healthy.
19	10	9	No. Yes.	Pale.
25	10	15	No. Yes.	Healthy.
12	10	2	No. Yes.	Healthy.
21	10	11	No. Yes.	Healthy.
28	10	18	No. Yes.	Healthy.
62	10	52	No. "Little short in breath."	Fairly healthy.
28	16	12	No. Yes.	Healthy.
20	10	10	No. Yes.	Healthy.
19	14	5	No. Yes.	Delicate looking.
23	16	7	No. Yes.	Healthy.
50	10	40	No. Little touched in breath.	Healthy.
36	17	19	No. "Rather short breathed."	Healthy.
61	11	50	No. "Breath not so good."	Healthy.
21	16	5	No. Yes.	Healthy.
50	15 or 16	34 or 35	No. "Short breathed."	Healthy.
32	8	24	No. Yes.	Healthy.
19	14	5	No. Yes.	Healthy.
23	10	13	No. Yes.	Healthy.
25	10	15	No. Yes. Bronchocle.	Healthy.
49	11	38	No. Yes.	Healthy.
31	18	13	No. Yes.	Decidedly delicate looking.
26	10	16	No. Yes.	Healthy.
18	11	7	No. Yes.	Healthy.
16	15	1	No. Yes.	Healthy.
48	7 or 8	40 or 41	No. "Rather not much touched."	Healthy.
60	10 or 12	48 or 50	No. "A little touched."	Healthy.
25	18	7	No. Yes.	Healthy.
18	11	7	No. Yes.	Healthy.
20	16	4	No. Yes.	Healthy.
16	14	2	No. Yes.	Healthy.
42	9	33	No. Yes. "Not much touched in breath."	Healthy.
33	13	20	"Nothing particular." "A little short breathed."	Healthy.
41	15	26	No. Yes.	Healthy.
55	8	47	No. "A little short breathed."	Healthy.
38	8 or 9	29 or 30	No. Yes.	Healthy.
45	11	34	Had a misfortune; fell down a sump seven fathoms. "Short breathed."	Healthy.
64	8	56	Lost an eye, but not in mines. "Short breathed, but able to work."	Healthy.
20	18	2	No. Yes.	Healthy.

MEDICAL REPORT

On Condition of Miners in North Wales. By Thos. B. Peacock, M.D., F.R.C.P., Physician to St. Thomas's Hospital, and to the Hospital for Diseases of the Chest, Victoria Park.

After being in the mining districts of the north of England, I visited the neighbourhood of Mold in Flintshire. In that district I was informed that the lead mines had been generally closed about 20 years ago, and the men employed in them had either gone to other occupations, left the neighbourhood, or died off. The newly opened mines had not been long in work. There are not therefore, at the present time, many ailing miners to be met with in the district, but the medical men who had been in practice for a sufficient length of time, were well acquainted with the different forms of affection to which the miners are subject, and through them I was enabled to see and examine three men who were suffering in this way. Two of them were old men, 56 and 77 years of age, who laboured under miners' asthma, in its most characteristic form, which they had contracted while working in the former mines. The third case was that of a man 30 years of age, who had been a miner only for two years. He was suffering from a feverish attack with bronchitis, which he ascribed to having taken cold at the surface, but he was apparently predisposed to consumption and in delicate health before he commenced to work under ground. The particulars of the cases of these men will be found in the Appendix.

At Minera I also examined 100 men whom I found at work. A considerable number of them had, however, only worked underground for a short period, so that they could not be regarded as fairly representing the condition of the mining population. Many of them also spoke only Welsh, and the informatron obtained through others could not be thoroughly depended upon. I have not therefore given the results of the examination of these men. The general impression produced by their inspection was, however, that they are a less robust race and less healthy than the miners in the north of England. Scarcely any of the men had commenced to work underground at a very early age, and many of them had become miners at somewhat late periods of life, and it struck me that those who had commenced only after having attained adult age, were especially delicate looking.

As regards the causes of disease among the miners, there was sufficient evidence that they correspond with those which have been shown to operate in Cornwall and the North of England. The recently opened mines are apparently generally well ventilated, though I was informed that in some places and at some times, the air was "dead or rather slackish" and that "choke damp" or carbonic acid gas was occasionally given off from the shaly strata. The defect was reported not however to be such as to prevent the men working, for the candles can always be got to burn, though they require to be sometimes much held on one side, "listed." No artificial system of ventilation is usually employed, except a fan occasionally, in "driving." The men enter and leave the mines as in Cornwall, by vertical shafts and ladders, but the workings are at present not so deep as to make the climbing very injurious to the men, though I was told that the ladders tried the men who were getting into years, and whose breathing was at all affected. Some of the levels are said to be very wet.

The older mines, from the information which was given me by the men whom I examined, must have frequently been in a very defective state. One of the invalided men stated that he was in a mine at Brongwyn on the 4th of September 1854, when 7 men were suffocated by choke damp. He said that the air of the mine was generally good, but became very defective about nine days before the occurrence of the accident, as shown by the candles being with difficulty got to burn, and only burning when they were held on one side. On the morning of the accident the men did not return at the changing time, and he was sent down to see what was the matter. On getting to the bottom of the shaft he found that the "damp" was in the mine, and with difficulty escaped, and was only got to the surface with the assistance of others. "He was not sleepy and knew everything that passed, but had no power in his limbs, could not take hold of anything, trembled all over, and could not stir." He was ill for a fortnight, and then got about again, but had never been so good a man since, his breathing being affected and his limbs weak. He, however, only suffered seriously after he had sustained an injury in 1856. He is now 56 years of age; his health first failed when 46 years of age, but he continued to work underground till two years ago. He confirmed the statement which was frequently made in the north that when the miners work in bad air their appetite fails, and they have pains in the bowels, and on leaving the mine "spit black stuff, or stuff as black as a cherry or bilberry."

Some of the smaller mines in parts of North Wales, which I did not visit, appear to be at present in a very bad state. A man, met with at Minera, a smith who had worked at his trade at different mines, said that at a small mine at Nantfrancon and at other mines in Carnarvonshire, the men suffered very much. "He had seen the men come up after working in such places, as if they were almost dying, and he supposed they might have died if they had remained below much longer. They would throw themselves on the ground quite spent when they first came up, but it would soon go off. The bad air affected them in their heads at first, and it took the power out of their limbs, and after working some time their wind became bad, and they were never fit for hard work afterwards. This was the case with the young men, more or less, but particularly with men who were getting a little into years." One of the medical men residing at Mold mentioned that formerly the miners were subject to lead colic. After special enquiries of practitioners in other lead mining districts, this assertion has not been confirmed. Both in Cornwall and the North of England the miners suffer much from symptoms of indigestion, pains in the stomach and bowels, and constipation or diarrhœa, especially the former. These symptoms are probably due to the cold and damp to which they are exposed, and to working with their feet in cold water. The bad air which they breathe also produces indigestion, and the symptoms have apparently no connexion with lead. In the neighbourhood of Mold, where coal is got on the spot, the ores were formerly in some instances smelted near the mines, and thus the miners may have occasionally worked as smelters, and so have suffered from the influence of lead.

Note in reference to the occurrence of fever in cottages at Maes y Safyn, near Mold.

At the Maes y Safyn mine, near Mold, I found that fever had been very prevalent. At the mine there are some very good cottages, with slated roofs, four large and high rooms; properly provided with privies, and underdrained, and with a passage at the back and a large garden in front. There are also other cottages which are extremely defective. They are small, thatched, huddled close together in rows, and generally consist of only two small and low rooms; the upper one in the slanting roof, and reached only by a ladder; the windows too are generally small, and usually do not admit of being opened.

These cottages are placed upon the side of a somewhat steep and rocky hill, with a rapid descent to a valley in front. Several of them have pigsties; none are underdrained; few are said to have privies, and scarcely any have any garden ground. From the mode in which they are built in two irregular rows, one behind the other, the drainage of the upper row sets down to the lower. At the time of my visit, streams of dirty water from the pigsties and dirt heaps were oozing across the foot paths in different places, and the ground around the cottages must be completely saturated.

There are about 35 to 40 of these cottages, and only 8 or 10 of the good ones; the rent of the former, without any garden ground, I was told was 3*l*. per annum, while the good cottages, with a large piece of garden ground, were only 4*l*. 10*s*. The total population of the hamlet is from 300 to 350.

Shortly before my visit there had been many cases of fever, but they had all recovered. Fever was prevailing in other parts of the district; and it was apparently introduced into Maes y Safyn from Gwernymynnyd, a village about 2 miles off in the road to Mold. It commenced first in a public house on the opposite side of the valley to the cottages; then appeared in the good cottages; and lastly in the bad cottages, and amongst them it continued to prevail for a long time. Altogether I am informed by Dr. Hughes, of Mold, that at least 56 cases of fever occurred, though only one proved fatal. The situation of the hamlet on the slope of a rocky hill in a somewhat shallow valley, affording every facility for drainage, without any elevated hills to prevent ventilation, is certainly a healthy one; but huddled together as the cottages are, wanting in every means of ventilation, and unprovided with any proper drainage, it would be scarcely possible to select a place in which fever would be more likely to arise spontaneously, or, if introduced, to spread.

MEDICAL REPORT

On the CONDITION of the HÆMATITE IRON MINERS in FURNESS, LANCASHIRE, by THOMAS B. PEACOCK, M.D., F.R.C.P.

In the month of March last I visited the district of Furness with the object of inquiring into the condition of the men employed in the Hæmatite Iron Mines. At the Parks Mine, in the neighbourhood of Dalton, I examined 93 men found at work, and at Dalton, visited 13 men who were either labouring under some form of indisposition, or were aged and had been employed in the mines for several years.

The general impression formed of the men whom I examined was, that they were a robust race and as healthy as men who are employed in other equally laborious open air occupations. Only a small number of the men had been engaged at the mines for any considerable length of time, the majority having recently commenced to work underground, and after having previously followed other occupations, most generally agricultural labour. In 13 instances, however, the men had worked at the mines for periods varying from 20 to 30 years, though two of them had been away occasionally. Of these 10 both appeared and stated themselves to be in good health, and though the other three were somewhat delicate looking, they were free from any serious disease; and all of them on inquiry stated that they did not suffer from shortness of breath, cough, expectoration, or other indications of the asthmatic affections which are so common among the miners in other districts. The results of personal observation were confirmed by the information received from others who had ample opportunities of judging, and who stated that the miners were or any healthy as the men employed in agricultural labour, fully as other pursuits.

Through the obliging introduction of Mr. Hall, who, as surgeon to the clubs in which most of the men are enrolled, attends a large proportion of the miners, I was enabled to visit several ailing and aged men. The inquiries which I made did not elicit any information which led me to suppose that the work in the mines exercised a materially injurious influence over the men. Indeed the only cases of sickness which fell under my notice were cases of accident, cold and influenza, disorder of the digestive organs, and scarlet fever,—that disease being prevalent in the district at the time.

Mr. Hall also informed me that he has not in the course of his practice, extending over 35 years, or from the commencement of the period in which the mines have been in active operation, observed among the men any particular tendency to bronchial or other forms of asthmatic affection, or any proof that they suffer at all seriously from working in bad air. He states that the only affections to which the men are liable are common colds, bronchitis, or pneumonia, and rheumatic affections,—diseases which are prevalent in the district generally, but to which the miners are more subject than the rest of the population, from their becoming tendered by working underground and occasionally in damp or wet places. Mr. Cranke, who, from his position as medical officer of the Lindale Moor Mines, has had great opportunities of observing the condition of the miners, in a letter with which he has favoured me, confirms the statements of Mr. Hall.

It thus appears that the mining population in the district of Furness are free from those affections which are so productive of disease and premature failure of power, in the men employed in the tin, copper and lead mines of Cornwall and Devon, the North of England and North Wales; and I have no hesitation in pronouncing them to be in a far better sanitary condition than any other set of miners whom I have examined.

The following circumstances appear to be those to which the more healthy condition of the Furness miners is to be ascribed:—

1st. *The mines are better ventilated.*—The men whom I questioned uniformly reported the ventilation of the mines to be good. The ironstone mines are only shallow when compared with the mines of Cornwall. A mine which is 80 to 100 yards in depth, is usually spoken of in the Furness district as a deep mine. The ore lies in the strata in masses often of great depth and extending over a considerable space, and the strata through which it is reached are generally easily penetrated, so that several shafts are sunk within a comparatively limited space, and the men have never to work at any great distance from an air vent. The drifts or horizontal shafts which are run at different levels to effect the removal of the ore, are of large size, and afford ample space for the passage of air. The various shafts also generally freely communicate, and thus adequate ventilation is generally maintained without the employment of any artificial means.

Formerly, however, when the mining was carried on on a smaller scale, the men had sometimes to work in bad air, and they are still occasionally subjected to the same, but only for a limited time, as in sinking shafts or driving, or when working in the bottoms of the mines, before the levels have been fully opened up by different shafts. That under these circumstances the air is occasionally unusually bad, is shown by the reports given by the men. Thus they state that sometimes the candles burn badly, that they can only be got to burn when held on one side, or cannot be got to burn at all. Under these circumstances the men say they suffer from loss of appetite, sickness, dizziness, shortness of breath, and prostration of strength, but they do not apparently work in air sufficiently bad, and for a period so long as to be materially or permanently injured by it. It is indeed only very occasionally and for a day or two at a time, and chiefly during close weather in summer or autumn, that the general atmosphere of the mines becomes defective. When this is the case an iron pan containing briskly burning wood is let down one of the shafts by a chain and is moved up and down for a short time. In this way an upcast current is usually soon caused in the shaft, and the movement of the air is sometimes assisted by throwing a small stream of water down one of the pumping shafts. It is stated not to be necessary to have recourse to any other method of promoting ventilation.

The ore which is obtained in the Furness district is usually in small or soft masses, and only requires to be worked by the pick, blasting being, in some mines, seldom required. The air of the mines is thus not rendered unwholesome by the presence of the products of combustion, and when "shots" do require to be fired, the ventilation appears generally to be so good that the smoke rapidly clears off. Of the men whom I examined, several had worked in Cornwall, and others in North Wales, the Isle of Man, and Ireland, before going to the Furness mines, and all agreed in stating that the air in the latter was much better than in the mines they had before been employed in.

2nd. *The men have generally only become miners after they are grown up, and have attained their full vigour.* It will be seen by the table in the Appendix that of the men examined at Parks Mine, who had worked underground at the iron mines for periods of one year and upwards, 67 in number, the mean period of commencement of work underground was 24·9 years; the extreme ages being 40 and 34, and 15 and 16 years. Most of these men had previously been employed as farm labourers, some few as quarry men, and others as navvies working on the railways. I specially inquired of the men who had worked in Cornwall what they thought was the effect of the employment of young boys in the mines, and they all stated their belief that it was a main cause of the premature exhaustion and failure of health of the miners, and that it was not necessary in order to make a good miner that the boys should begin to work underground before they are 17 or 18 years of age and are approaching their full vigour.

3rd. *The miners in Furness probably live better than in the other metal mining diltricts.* In Cornwall the miners live chiefly or pastry, bread, potatoes, &c. and get but little fresh animal food and usually only some bacon. This diet may be in part from choice, but the men often say that they cannot afford to purchase fresh animal food. I endeavoured to ascertain the wages of the men with the view of learning how far the last assertion is correct, but from the way in which the miners are paid "according to their bargains," and the deductions to which their earnings are subjected, it is difficult to make out what sums they on the average actually receive. Whatever be the cause, I certainly thought that the Cornish miners did not get so nutritious a diet as men following an occupation so laborious as theirs require.

In Furness the wages of the miners are good, averaging as far as I could learn, from 20*s.* to 25*s.* per week, and though the underground men are paid by the piece, the sums which they earn do not appear to vary much. They also live well, getting fresh animal food, at any rate several times a week, with bread, milk porridge, cheese, potatoes, &c., and they are certainly better nourished than the Cornish miners.

The men who had worked in Cornwall, North Wales, the Isle of Man, and Ireland, all said that they earned better wages and were consequently able to live better in Furness than where they had previously been employed. I was also told, both by the miners themselves and by other persons residing in the district, that the miners live better

than the agricultural labourers; and this was assigned by more than one independent observer as the reason why the miners do not suffer, as they might otherwise be expected to do, from working underground. I thought myself that such of the men as had been only recently taken on at the mines were less healthy looking than those who had been some time employed as miners; though this might be due either to the new men suffering from the occupation, or to the old men having improved in health from the more nutritious diet which they got.

4th. *Dust.*—Some of the men who had worked in other metal mines before going to the iron mines stated as one reason why they suffered less from working in the latter, was that there was less dust, and that the litttle dust which they breathe is not injurious to them. It is probable there is much truth in this remark. One man whom I met with, who had previously worked at the hæmatite mines, said that the men swallow the dust, and when they leave working "spit red," and that the red spit will be brought up when they have colds, even five or six weeks after they have given up working underground. The softer kind of ore is also very unctious, and adheres readily to the skin, and the ochery tinge once acquired is long before it can be got rid of. The iron may therefore very possibly enter the system, and being absorbed into the blood, may counteract the blanching effect which is generally produced by working in the dark. Certainly the Furness miners have not the anæmic appearance which is so characteristic of the men who work in the tin, copper, and lead mines in all the districts which I have visited.

5th. *Temperature—Wet.*—The mines are, as before stated, shallow, and being better ventilated do not become so warm as to interfere with the work of the men. They are, however, so much warmer than the external air that the men complain that they become tendered by working in them. Some of the pits also, and especially those which are old, and the lower workings or "bottoms" of most mines, are often more or less damp and sometimes very wet. It will be seen that both Mr. Hall and Mr. Cranke ascribe the colds and rheumatic affections to which the men are liable to the operation of these causes.

6th. The miners usually enter and leave the mines by ladders or "sties," as they are locally termed; but the mines are not so deep as to make the exertion of ascending and descending any serious labour, and I met with only one man who stated that the ladders tried him, and he was 57 years of age, had been a miner at intervals for 22 years, and was still working underground.

It would be premature to pronounce definitively as to the effect of the iron mining upon the health of the men employed in the work. The mines have not as yet been in full work for a sufficient length of time for any large number of workmen to be brought up as miners. The mines have been chiefly opened within the last 25 years, and there were few men of those whom I examined who had been at work over 20 years; and of those some had not constantly worked as miners. Indeed, the period of work of the 67 men who had been entirely employed in the iron mines averaged only 11·7 years, and the extreme periods of work were 30 and 28 years, and 1 and 2. The mean age of the men will also be seen to be 36·4 years, and the extreme ages 56 and 57, and 20 and 21. It is evident, therefore, that but few of the men have been employed in the mines so long as fully to test the effects of the work, and that they have not generally reached the age at which the miners become ordinarily seriously affected in health and strength. It may, however, safely be concluded, that if the occupation were materially injurious to them, the men would already show signs of failing power and impaired constitutions.

It is possible that the mines, though now so well ventilated, may become hereafter less so. At present they are only shallow, but in some situations the extreme depths of the deposits of ore have not been reached, and it may be necessary to sink much deeper shafts. If so, the facility of ventilation may be lessened, and the character of the air in the lower workings may become defective.

Notes taken in Furness.

Mr. Hall, Surgeon, Dalton in Furness.

March 26, 1864.

There are not at present many ailing miners in the district. Those who have recently been ill have suffered from colds and dyspeptic symptoms, and from scarlet fever, which has been prevalent. The miners do not suffer particularly from any form of disease, and are upon the whole as healthy as the agricultural labourers, or any other set of workmen. They complain a little sometimes of working in bad air, and then suffer at the stomach, but not to any serious extent. They have sometimes to work in wet places, the water dripping down upon them, and often ankle deep in water, and under these circumstances have colds and rheumatic complaints.

For the most part, the men have only been employed at the mines for a few years, and after they were grown up, and had been previously employed in agricultural pursuits. Some few of them may have been at the work all their lives; but they also do not appear to suffer more than men who work in the open air, and they are not particular subject to bronchitic or asthmatic affections.

The miners are usually well paid. Most of them work at piece work, and may get from a pound to 25*s.* per week. Others work at the surface on regular wages, and they earn about 18*s.* They live well, usually having fresh meat several days in the week, with milk porridge, potatoes, bread and cheese, and bacon; and many keep a pig.

The cottages inhabited by the miners are generally good. The are built in rows, of rough limestone, and are slated. They usually contain four rooms, and are properly underdrained, and provided with dusthole, privy, coalhole, &c. Many of the cottages have small pieces of garden ground attached to them, but others have none, though many of the miners rent allotments. The cottages are usually inhabited by only one family, but some have two. Some of the older cottages consist of only two rooms, and are very defective. The rent paid varies according to the situation and accommodation from 2*s.* per week, to 2*s.* 3*d.*, 2*s.* 9*d.*, and 3*s.*, paid monthly.

The men are generally in clubs, from which they receive medical and pecuniary relief in cases of sickness; and in cases of injury the proprietors generally provide medical attendance. In some of the mines there are clubs to which the men subscribe, and from which they receive 8*s.* or 10*s.* per week in cases of accident. Medical relief is only provided, however, in cases of accident; except at the Lindale Moor Mine, where a medical man is regularly engaged.

There are large newly erected National Schools at Dalton, which are partly supported by an endowment formerly devoted to the maintenance of a grammar school, partly by the proprietors, and partly by the children's pence. Some of the mine masters stop a portion of the workmen's wages for the support of the schools. There are also other National Schools in the parish, at Lindale, Ireleth, and Newbarns, recently built.

Iron mining has been carried on in the Furness district for many years, but it is only within the last 25 to 35 years that it has become important. When Mr. Hall first knew it, about 35 years ago, the only mine in work was that at Lindale Moor, and it only employed from 40 to 50 men, and often fewer. Now there are 400 to 500 men at work there. Mr. Rawlinson's mine, at Butts Beck, was the next opened; and that gentleman and other mine masters have opened others all around, employing a large number of men.

Mr. George Simpson, the Relieving Officer for the Dalton district, confirmed the report of the state of the miners given by Mr. Hall. He said that the miners were as healthy as the rest of the population, and he was not aware that there were any particular ailments to which they were liable from working underground. Both he and Mr. Hall said that they were generally a steady set of men, though some occasionally took too much ale. Many of them smoke a great deal.

Mr. Cranke, Surgeon, Ulverstone.

Letter dated April 2, 1864.

"I have been employed by the Lindale Moor Company for some years to attend their workmen; and from the experience I have had I conceive their men to be as healthy as the agricultural labourers, except that they suffer more from rheumatism in its different forms, and from chest affections; that is to say, common colds, bronchitis, and pneumonia. These, however, might be obviated by the use of woollen shirts during work, and change of clothing immediately afterwards. The men do not suffer, in consequence of their employment, from asthma and consumption. They are not subjected to the breathing of bad air to any great extent; but the mines are sometimes very wet. There is no dust. I am paid by the Company; and in case of sickness and accident a weekly allowance is granted to the sufferer from a fund in connexion with the mine."

Captain Hoskins, Park Mines, Dalton in Furness.

Went to work underground in Cornwall when only 11 years of age, and worked as a miner for 13 or 14 years. He worked at Wheal Caroline, in the Marazion district, and at East Crofty and at Carn Brea Mines. He never worked

for any length of time in any place where the air was very bad and did not suffer at all from it. He has been at work at the Furness Mines for the last 25 years. He considers these mines to be far better for the men than the Cornish mines. The mines are a mere nothing in depth compared with those in Cornwall, and although the miners inhale a small portion of dust from working in iron ore, it is not injurious to the constitution. In Cornwall the boys go to work much too early. They should not go before they are 18. When they go as early as they often do it is not giving them fair play, for though they say the boys only do boy's work, it is harder work for them than men's work. They must not, however, go to work too late, or they will never make good miners. Many of the men employed here, who have been farm labourers before, were too old for miners. In Cornwall they would be worth almost nothing. But if the boys go at 18 they are generally strong enough for the work, and are quite capable of becoming good miners.

The strata which the shafts have to be sunk through to reach the iron ore consist of clay and gravel, which is provincially termed "pindle." The ore is reached by shafts, which vary from 6 feet 6 inches by 5 feet wide to 14 feet by 8 feet wide. Vertical shafts are sunk so as to be within about 100 yards of each other. The drifts are run at various depths from 20 yards to 100 yards, and they are made 7 feet square. The shafts are of various depths, but they all communicate to the 80 yards level, and the deepest or drainage shaft is 120 yards deep. The men use ladders for access and egress.

The chief part of the ore is so soft as to be worked with the pick, and there is very little kidney ore at Dalton. When reached it is all taken away, and the roof is supported by wood, larch wood being preferred for the purpose; the crush is, however, very great, so that the wood is entirely crushed, and the ground settles. In some places the surface has sunk 30 feet in consequence. The whole space occupied by the mine is about three acres.

The mines are generally dry, and there is not much dust. Occasionally, but not often, in certain states of atmosphere, the air in the shafts stagnates, and cannot be got to move, and candles will not burn, and the men cannot work. When this is the case they let down a fire pan filled with wood, which is burning briskly, by a chain into a shaft, and move it up and down, and this creates an up-cast current. If the air was very bad the fire would not burn, but he never remembers an instance of its not burning. In addition to this it is sometimes necessary to force the current on by throwing a stream of water by the engine which works the pumps for draining the mines, for an hour or two in a day, according to the state of the weather.

There are two changing houses or "drys" at the Parks mine. These are provided with a supply of hot and cold water, and tubs for washing, with frames for hanging up the clothes used in the mine to dry.

No women or children are employed at the surface, as the ore does not require any picking, and is sent as raised to the furnaces.

There is a fund in connection with the mine, which is formed by each man contributing 4½*d.* per week. From this fund the miners receive 10*s.* per week in cases of sickness and accident, and all expenses of medical attendance, &c. in cases of accident.

Captain Hoskins's brother is also employed at Parks mine. He began to work underground in Cornwall when 12 years old, and worked at the Pen, Bertha, Croft, Wheal Neptune, Marazion, and Carn Brea mines. He has worked in bad air, and thinks if he had stayed in Cornwall he could not have lived till now, but would have died of what they call the "miners' consumption." He has now been in Furness for 16 years, and thinks the iron mines more healthy than the mines in Cornwall, and he considers this to be from the Furness mines not being so deep and more free from sulphur and powder smoke.

Statements of ailing and aged Miners, &c.

No. 1. Aged 53. Dalton in Furness.

March 26, 1864.

Went to work at the ironstone mines 16 or 17 years ago (or at the age of 36 or 37). He has worked at Mr. Kennedy's mines at Roanhead for the last 15 years, and at depths varying from 30 to 50, 60, and 80 yards. The men are let down and drawn up in cages drawn by an engine. The shafts vary in size; some are single, and are about 4 feet 6 inches by 6 feet; others are double, or from 6½ by 7 feet. The "roads" or "drifts" in the pit are about 7 feet high and 8 broad. When they get to the ore they take it all away, and prop up the roof with wood. There are several shafts coming to the surface. Generally the air is good, but sometimes there may be a little bad air in places. The smoke is away in a moment, but in some mines it may "lig in for an hour or two," but not when there are several engines at work.

Some of the men go to work at 3 a.m. and leave at 12, and then another batch goes down at 12 and comes up at 8 p.m. They do not often have parties working at night, and only under particular circumstances. The mines require to be pumped, but when the men work it is quite dry. There is not much "stour or dust" in the mines.

Some of the men who work at the surface of the mines have regular wages, and earn about 18*s.* per week. Those who work below are on piecework, and get about 20*s.*, 21*s.*, or 22*s.* a week, and sometimes more. They generally live well. He has cake or bread and cheese and tea at breakfast, and he takes tea with him to the pit. At dinner he gets fresh butcher's meat almost every day, or at least two or three times a week, with potatoes. In the evening he has potatoes and bread, and sometimes bread and milk. Occasionally he has a pint of beer, very rarely any spirit. He smokes about 3 oz. weekly.

He has had to work sometimes for a few days in bad air, but never in very bad, and that was when he first started, and not since he has been at Roanhead. The bad air is shown by the candles not burning well; the flame gets small, and sometimes the candle goes out, and then they have to leave work. The bad air "makes a body dizzy, and "just as if he was drunk and weak, and all of a tremble "in the limbs, and takes away his appetite, and makes him "sick whiles." It does not cause pain in the stomach or affect their bowels.

He has never suffered in the chest particularly, and his breath is good, and he has never anything the matter with his stomach. The dust has sometimes affected his breathing. He is still working underground. He is small, has a stooping gait, and is spare and sallow, but is healthy looking for his age.

No. 2. Aged 72. Dalton in Furness.

March 26, 1864.

Worked as a farm labourer till he was 23 years of age, and has been a miner for 30 years, but has not been constantly at work at the mines, being occasionally off for a year or two when trade was not brisk. He has worked for 11 years at Elliscales for Mr. Ashburner, and for 5 years for Mr. Rawlinson, and before that at Lindale Moor, but he was off occasionally, and cannot say how long he worked there.

The air is very good in cold weather, but sometimes it is bad in close muggy weather, and the wind affects the air in some mines; in his, the air is bad when there is an east wind. When the draught is good the smoke clears away rapidly, but if not you are almost poisoned by it. Sometimes he has worked when the air was very bad, and when the candles went out, "and then he became weak and all of a totter, your limbs would not carry you, and the sweat stands upon the face as big as peas," but they had then been in long enough and had to come out. The last time he was in air as bad as this was two or three years ago, but generally the bad air goes off in a few hours. He had "to give up working in the bottom, it affected his wind, and he now works at top when the air is good." "He believes it is still the same way if there are not proper roads and air vents. They are ill plagued till they get a road, and it may be for a month or six weeks. Sometimes they work both ways and try to meet it."

He gets the same wages as other miners, about a pound a week, and lives well. At breakfast he gets bread and butter, and takes coffee to the pit with him; for his dinner he has meat, fresh or salt, and at night he takes milk porridge. He has taken a good many pints of ale in his time, but little or no spirits, and he smokes. He has never had anything particular the matter with him in his life. "His breath is not good, but may be as good as most men at his age." He has a hard cough and some expectoration. The heart's sounds are flat, but without murmur; the pulse is feeble; tongue furred; appetite "middling," and the food he eats agrees with him; the bowels are regular. He is still in regular work underground, and is hale and strong for his age.

No. 3. Aged 73. Dalton.

March 26, 1864.

Has worked regularly at the ironstone mines for 14 years, and was employed at farm labour before. He first worked at Parks mine, and then went to Mr. Ken-

nedy's, and has been there for the last nine years. "He has almost always been in good air, but he has worked in bad for a chance time for a bit, may be for a fortnight or so." This has not been the case for the last two years. "The candles would always burn, but they burnt dull. The air did not at all affect him, and he has never worked in any very bad air. He earns about a pound a week, and generally gets fresh meat every day. He does not take much ale. His tongue is somewhat furred, pulse quick, does not complain of shortness of breath or any other symptom of indisposition, and is a stout healthy-looking man.

No. 4. Aged 30. Barrow.

March 26, 1864.

Has twice worked at Parks Mine. He first went there when he was a young man and worked ten months, and then left in consequence of the water breaking into the mine and four men being drowned. He afterwards went again for two years, and then left in consequence of a crush occurring and his mate being killed. It was partly his own fault; he was not materially injured; there were only two or three scratches on him; but he was smothered. He does not know that the miners are not as good men as the agricultural labourers, but they look pale. He is in a club in which most of the miners are, and he does not think they suffer more than others. He is also not acquainted with any sick miners, and he must have known it if many of them had been sick; and was not aware that they suffered from coughs, or were bad in their breath, or in any other particular way. They got better wages, and that enabled them to live better, which was favourable for them.

The miners breathe the dust of the ironstone, and when they leave the mines they spit red stuff. When they get a cold they spit red stuff a long time after they have left going to the mine. He did so fully five weeks after he had worked in the mines. The iron ore is of greasy nature, and it gets into their skin, and won't come out even with washing.

Generally the air of the mines is good; but sometimes it is bad, and the candles cannot be got to burn, and the men are unable to work. Sometimes also the candles don't go out but won't burn well, and then if the men continue to work they feel sick and all of a tremble, and have their breath stopped, and lose their appetite; but this is not often the case.

No. 5. Aged 33. Dalton in Furness.

March 27, 1864.

Has been a miner for eight years, and worked as a quarryman before. Since he has worked at the ironstone mines he has been at Mr. Ashburner's mine of Elliscales, and also at Mr. Kennedy's at Roanhead. In the last mine he worked in bad air twelve months ago for six months. It was at the pit bottom gaining the ore. It was 60 or 70 yards underground, and there was only one shaft, and they were driving about 10 or 15 yards from the shaft. The candles only burnt when they were held on one side, and then they smoked very much, and sometimes they went out. He felt "a little short in the wind at times," but he stood it well and did not suffer; but one of three others who worked with him complained one day of being "terribly dizzy." They did not use any artificial ventilation. Now there are two shafts, and the air is good.

Before he went to work at the mines, about twelve years ago, he lost one eye from an injury by a stick, and now he has had an accident by which he has injured the other eye. This accident did not, however, occur at his work in the mines. He has been off work in consequence of this accident some time, and has got out of health, and now complains of dyspeptic symptoms, flatulency, pain in the bowels, difficulty in passing water, &c. His tongue is clean, pulse weak but not quick; bowels regular. He is pale and delicate looking.

No. 6. Aged 3 Dalton in Furness.

March 27, 1864.

First went underground when nine years of age, and works a Roanhead at the present time. He has however been away at the quarries occasionally. He has never worked in bad air. The drift he works in is 26 or 27 yards underground, and the air is good, but sometimes the smoke does not clear away very quickly.

He has always enjoyed good health, except that he met with an accident in firing a shot in a quarry. He has earned various sums while at work as a miner, as little as 16*s.* and as much as 27*s.*, but generally 20*s.* to 22*s.* or 23*s.* per week.

He is now suffering from cold. Has a severe cough but not much expectoration; his appetite is defective, his pulse somewhat quick, and he is prostrated and pale; the bowels are confined except when he takes medicine.

No. 7. Aged 47. Dalton.

March 27th, 1864.

He worked underground for six or seven years, at Elliscales, but for the last 13 years he has been engaged at the surface as an engine-driver. He never worked in bad air except for about four days, and then it was nothing but what he could stand. He thinks that the cause of the failure of his health was his having worked in the pit's bottom where it was warm (but not warmer than an ordinary room) and that tendered him so that he readily took cold when at the surface. "All miners get a little tendered and are not so hardy as men that work out." "Some of the pits are dry and some wet, and the old pits have naturally more wet than the new ones."

He complains that he has been suffering for some time from pains in the stomach, and sickness and vomiting after food; but he is now free from sickness and altogether better, but he still has pain and flatulency. There is obviously some swelling and hardness in the liver and in the situation of the pyloric end of the stomach, and he is extremely thin and pale, and much prostrated. There are no symptoms of or signs of disease of the lungs or heart.

No. 8. Aged 39. Dalton in Furness.

May 27th, 1864.

A Cornish man. He first went to work underground at "Buckett's" mine between Redruth and Cambourne, near Carn Brea, and while there worked in plenty of bad air, what they call "cold damp." "The candles would sometimes only burn when "heeled," or two placed together, or placed behind them, but he was young then and did not suffer." He has been working at the ironstone mines for 17 years. Since he came here he has not had to work in bad air, except a little at times for a day or two, but never for any length of time. He considers the mines much better for the men than in Cornwall. "His father was a miner and worked in Cornwall for 50 years, and died when he was 67, but generally they can't work in Cornwall after they are 40 to 43 or 44; certainly the ironstone miners are the better men. There is not much dust in the ironstone mines, and they don't swallow it as they do the copper in the Cornish mines."

"Then the mines in Furness are not a tenth part the depth. It is a deep pit that is 100 yards, and where he is now working is only 20 yards. The drifts also are larger and give more air, and that is one of the things the men have in their favour. Here too, the mines all lie together, and they sink many shafts near together, some perhaps as near as 100 yards, others may be 200 or 250 yards apart, and then there are so not many men for each shaft. They could not sink shafts in that way in Cornwall; they could not afford to do it."

"The men also live better in Furness, for they get more money. For the last year he has worked at the surface, and gets 3*s.* per day for a week of six days, though the Saturday afternoon is a holyday. When at work below he got 4*l.* 4*s.* to 4*l.* 10*s.* and might get sometimes as much as 5*l.* per month, according to his bargain, but there is not the uncertainty about the work that there is in Cornwall. He thinks that this country is one of the best for working men."

He first went to work underground in Cornwall to do what they call "boy's work," but that is harder for them than the men's work for them, and going so soon must wear them out very quick. He thinks they would make just as good miners if they went at 16 or 18, as if they went at 10, but it is a great gain to a man to be able to take a son down with him. When he worked in Cornwall there were not so many boys at work as he understands there are now.

Since he has been at work in Furness he has been at Parks Mine. About a year ago he had erysipelas, and has not worked underground since, though he has been quite well and at work at the surface.

His present indisposition is only a cold which he has taken, and he has had a cough and sore throat, and lost his voice, but he is now much better. He is a small dark-complexioned man and is somewhat pale.

No. 9. Aged 57. Dalton in Furness.

March 11th, 1864.

He has been altogether a miner for 22 years. He went underground at 20, and has been away sometimes. When underground he has worked both in good and bad air, but never in very bad; though he sometimes found the candles would not burn but he has never known this for the last 10 or 12 years. He has lately been working for Mr. Ashburner at Elliscales. He has never had anything the matter with him but typhus fever—sometime back. He is still at work but the "sties" or ladders try his breath, though it is not generally bad.

No. 10. Aged 73.

Went to work underground when he was 23 years of age, but has not worked regularly ever since, having been away at times when times were bad and work slack. He has generally worked in "capital air," but about 17 years ago he worked in bad air. He has latterly worked at Mr. Rawlinson's at Cross Gates. He has never had anything the matter with him except that he broke his leg badly. He is very deaf.

No. 11. Aged 59. Dalton.

March 27th 1864.

Has worked as a miner for 10 years, and before that was an agricultural labourer; then they used to get about 12*s.* per week; now they get 18*s.* from the farmers. He had been working at Cross Gates for Mr. Rawlinson, and has sustained a compound fracture of the leg near the knee-joint from the fall of a large piece of rock.

No. 12. Aged 21.

Has worked as a miner for Mr. Ashburner at Elliscales for for 3½ years. He is now just convalescent from scarlet fever.

No. 13. Aged 41. Parks Mine.

March 26th, 1864.

Went to work underground at 18, and worked for 15 years in lead mines in the Isle of Man. When there he was occasionally in bad air; they then felt weak in the arms and legs, and it took away their appetite. They had to use the ladders to get to their work, and he worked at a depth of 195 fathoms. The draught was strong in some parts, but in others it was very slack. There were two shafts to the mine.

He considers himself altogether better off since he came into Furness, and thinks that the ironstone mines are in a better state than the lead mines in the Isle of Man.

Examination of Miners at Work at Parks, Hæmatite Iron Mine, Furness, March 26, 1864.

Age of Miner.	At what age he began to work underground and previous occupation if any.	How many years he worked underground.	Whether he has ever suffered from any serious illness, and is now quite well. If not, of what does he complain.	Condition and Appearance.
30	29	1	No. Yes.	Healthy.
37	20	17	No. Yes.	Healthy.
47	30	17	No. Yes.	Healthy.
40	28	12	No. Yes.	Healthy.
52	30	22	No. Yes.	Healthy.
	Agricultural labourer.			
25	—	2 months.	No. Yes.	Healthy.
	Agricultural labourer.			
35	31	4	Injured his ankle. Yes.	Healthy.
	Agricultural labourer.			
33	25	8	No. Yes.	Healthy.
	Agricultural labourer.			
49	31	18	No. Yes.	Healthy.
	Working at mines at surface.			
40	34	6	No. Yes.	Healthy.
	Railway labourer.			
30	29	1	No. Yes.	Healthy.
	In the army.			
56	28	28	No. Yes.	Healthy.
	Agricultural labourer.			
37	29	8	No. Yes.	Healthy.
	Agricultural labourer.			
40	30	10	No. Yes.	Healthy.
	Agricultural labourer.			
44	9	35	No. Yes.	Healthy.
	Commenced work in mines in Cornwall. 13 years at work at iron mines.			
47	25	22	No. Yes.	Healthy.
	Worked first in mines in Flintshire. 15 yrs. at ironstone mines.			
42	34	8 months.	No. Yes.	Healthy.
	Agricultural labourer.			
32	24	8	No. Yes.	Healthy.
	Agricultural labourer.			
30	24	6	No. Yes.	Healthy.
	Agricultural labourer.			
31	23	3	No. Yes.	Healthy.
	Agricultural labourer.			
26	25	1 year.	No. Yes.	Healthy.
	Agricultural labourer.			
28	19	9 years.	No. Yes.	Healthy.
	Agricultural labourer.			
26	23	3	No. Yes.	Healthy.
	Agricultural labourer.			
39	16	23	No. Yes.	Healthy.
	Only four years at the ironstone mines.			
34	15	19	No. Yes.	Healthy.
	First worked for 3 years at lead mines in Ireland; 12 years at ironstone mines.			
28	22	6	No. Yes.	Healthy.
	Agricultural labourer.			
41	18	23	No. Yes.	Healthy.
	Worked for 15 years at lead mines in the Isle of Man. Since that at the ironstone mines.			
44	23	21	Occasionally from colds. Yes.	Delicate.
	Agricultural labourer. Away from mines for 2 years.			
47	23	24	Slight accident. Yes.	Healthy.
	Working for most part at the ironstone mines, sometimes off for a time.			
46	17 or 18	28 or 29	No. Yes.	Aged.
23	16	7	No. Yes.	Healthy.
30	23	7	Laid by a week with sore throat a short time ago. Yes.	Healthy.
48	24	24	No. Yes.	Healthy.
	Agricultural labourer.			
28	27	1	No. Yes.	Healthy.
	Agricultural labourer.			
43	31	12	Was ill for about 8 weeks 2 months ago. Yes.	Healthy.
	Agricultural labourer.			
28	22	6	No. Yes.	Healthy.
	Agricultural labourer.			
26	20	6	Colds occasionally. Yes.	Healthy.
	Agricultural labourer.			
23	21	2	No. Yes.	Healthy.
	Agricultural labourer.			
22	21	1	No. Yes.	Healthy.
	Agricultural labourer.			
25	—	5 months.	No. Yes.	Healthy.
	Agricultural labourer.			
21	19	2	No. Yes.	Healthy.
	Working at the surface before.			
25	20	5	No. Yes.	Healthy.
	Agricultural labourer.			
30	24	6	No. Yes.	Healthy.
	Agricultural labourer.			
30	21	9	Slight injury. Yes.	Healthy.
	Agricultural labourer.			
42	30	12	No. Yes.	Healthy.
	Agricultural labourer.			
22	12	10	No. Yes.	Healthy.
	Worked in the tin and copper mines in Cornwall: here only for 12 months, and Wales.			
30	20	10	No. Yes.	Healthy.
	Postboy.			
48	25	23	No. Yes.	Rather pale.
	Agricultural labourer.			
30	20	10	No. Yes.	Healthy but thin.
	Agricultural labourer.			
29	Has just begun.		Broke his leg before he came to the mines. Yes.	Healthy.
	Agricultural labourer.			
35	20	15	No. Yes.	Thin but healthy.
	Railway labourer.			
22	13	9	No. Yes.	Healthy.
	Worked in the mines in Cornwall and Devon. Here only for 6 months.			
23	18	5	No. Yes.	Healthy.
24	—	1	No. Yes.	Healthy.
	Agricultural labourer.			
20	17½	2½	No. Yes.	Healthy.
23	19	4	No. Yes.	Healthy.
	But has not worked regularly.			
48	21	27	No. Yes.	Healthy.
	Agricultural labourer.			
32	27	5	No. Yes.	Healthy.
	Agricultural labourer.			
35	26	9	No. Yes.	Healthy.
	Agricultural labourer.			
26	—	3 weeks.	No. Yes.	Delicate looking.
	Agricultural labourer.			
50	28	22	Had his leg broken. Yes.	Healthy.
	Agricultural labourer.			
38	20	18	No. Yes.	Healthy.
	Agricultural labourer.			
50	28	22	No. Yes.	Healthy.
	Agricultural labourer.			
26	—	7 weeks.	Was ill a month ago. Yes.	Healthy.
	Agricultural labourer.			
57	27	30	No. Yes.	Healthy.
	Agricultural labourer.			
29	27	2	No. Yes.	Healthy.
	Agricultural labourer.			
54	32	22	No. Yes. Quite free from shortness of breath, &c.	Healthy.
	Agricultural labourer.			
40	33	7	No. Yes.	Healthy.
	Agricultural labourer.			
46	40	6	No. Yes.	Healthy.
	Worked at a slate quarry.			
31	19	12	No. Yes.	Healthy.
	Brick maker.			
36	23	13	No. Yes.	Healthy.
	Agricultural labourer.			
31	21	10	No. Yes.	Healthy.
	Agricultural labourer not constantly at mines.			
35	25	10	No. Yes.	Healthy, but rather thin.
	Agricultural labourer.			
42	30	12	No. Yes.	Healthy.
	A navvy.			
38	24	14	No. Yes.	Healthy.
	Agricultural labourer.			
19	—	2 weeks.	No. Yes.	Healthy.
45	32	13	Colds occasionally. Yes.	Fairly healthy.
	Agricultural labourer.			
30	—	14 months.	No. Yes.	Healthy.
39	27	12 years.	No. Yes.	Healthy.
	Agricultural labourer, worked 2 years in Isle of Man, and 10 at the ironstone mines.			
43	30	13	No. Yes.	Healthy.
	Agricultural labourer.			
40	30	10	No. Yes.	Healthy.
	Agricultural labourer.			
33	22	11	No. Yes.	Healthy.
	Agricultural labourer.			
56	30	26	No. Yes.	Healthy.
	Agricultural labourer.			

Mean age of 67 men who had been employed only in the iron mines and for periods of one year and upwards, 36·4 years.
Extremes of age, 56 and 57 and 20 and 21.
Mean age at which they commenced working underground, 24·9 years.
Extreme ages, 40 and 34 and 15 and 16.
Mean period of work underground, 11·7 years.
Extreme periods, 30 and 28 years and 1 and 2.

DISEASES OF MINERS

IN

CORNWALL,

THEIR FAMILY HISTORY, PERSONAL HISTORY, AND PRESENT STATE, WITH REMARKS.

BY

DR. PEACOCK, M.D., F.R.C.P.

DISEASES

District, Date, and Disease.	Present Age.	FAMILY HISTORY. Ages, Occupations, state of health and cause of death of brothers.	Age, occupation, &c. of father.	Ages, occupations, &c. of other relations.	PERSONAL. Age at which he first worked underground.	In what mines he has worked, kind of work, and character of air.
1. Camborne, July 13, 1862; Miners' Asthma and disorder of digestive organs, hepatic symptoms, diarrhœa.	47	- - -	- - -	- - -	16, but worked at the surface for 4 years before.	First worked at tribute at Dolcoath at 180 fathoms below adit for 6 years and then had good air. He then went to East Wheal Crofty and worked at tutwork there for 14 years. While there he worked in bad air at the 64 level for 4 years and 5 months. He returned to Dolcoath and has worked there ever since till he took ill. The air in Wheal Crofty was generally good, but he worked in bad air when sinking winzes and driving ends. He has also worked in shafts where it was very damp and draughty.
2. Camborne, July 13, 1862; Miners' Asthma and Dyspepsia.	40	- - -	- - -	- - -	At 14 or 15, worked at Stamps for 4 or 5 years before.	First worked at North Roskear for 16 months, then went to East Pool, and in both assisted the miners and pushed the barrows with the stuff. The air was bad at the latter mine. He went after, to West Wheal Seton, where he worked for 11 or 12 years. About 12 or 13 years ago he was engaged in driving an adit end at about 25 fathoms from a winze. The place was dry but it was very close, and he suffered very much in it; he felt fulness in the head and stupor, lost his appetite and had weakness in the knees and back in ascending the ladders; he worked at this a year and a half, and then left from want of work. He afterwards went to Camborne Vean but has never been well since, at the latter mine he was also in bad air sinking winzes. It was not hot. He worked 6 weeks and then got ill and was entirely laid by for 8 months, and has not been able to go underground since; since that he has been engaged at surface in landing and drawing up the "stuff" with a horse whim.
3. Camborne, July 13, 1862; commencing Miners Asthma.	25	- - -	Father worked at the surface at mines, and is still living and healthy at 60.	- - -	16	Has chiefly worked at Dolcoath at tutwork, and generally enjoyed good health, till he suffered at the chest from working in a hot place in which also there was much wet, 300 fathoms below the surface. He sweated greatly when down and drank water, and also passed water 3 or 4 times in small quantities.
4. Illogan, July 13, 1862; Phthisis.	36	- - -	Father was a farmer and died of consumption when 40 years old.	Mother living and healthy, had only one sister and she died of consumption.	21, worked at surface before.	He only worked 3 years underground, when he left from suffering at the chest, from working in wet and draughty places, but always had good air; he first felt pain and weakness in the small of his back and in the legs, without either cough, spitting, or beating at the heart. After 3 months he got better, but has never been so strong since. He returned to work, and again failed 7 or 8 years ago, and has had cough and spitting and weakness ever since.

OF MINERS.

HISTORY.	PRESENT STATE.					
Duration and assigned cause of illness.	General condition.	Nervous system.	Respiratory Organs.	Circulatory Organs.	Digestive Organs.	Remarks.
He ascribes his illness to having taken cold from working in draughts and draughty shafts at Wheal Crofty; when he was repairing a shaft, the water came down upon him for hours together as from a "griddle," and he worked there 4½ years. When he worked at Dolcoath he was in good health. His health first failed about 5 years ago, and he suffered from loss of appetite and diarrhœa, and was forced to lay by; he was away some time and then returned, and continued tolerably well till 2 or 3 months ago. His illness commenced with cough and expectoration, and inflammation of windpipe and chest; has never any rheumatic affection, but had cholera 7 or 8 years ago.	Dark complexion, turning grey, very sallow and freckled; stooping gait, highshoulders, lips very pale, eyes glassy.	Has suffered from vertigo but not from headache.	Very short breathed, and has cough, expectoration; some palpitation but less than he has had. The "spit" was dark coloured, but is now pale. Respiration short, 32, chest narrow, fallen in above and below clavicles, very slight movement especially at upper parts, vocal thrill somewhat exaggerated, resonance on percussion somewhat unduly clear, especially at left side, respiration everywhere very feeble, slight sibilus both with the inspiration and expiration on left side, inspiration feeble and expiration harsh and prolonged, respiration especially feeble at right apex, with undue cough and vocal resonance there.	Pulse 112, small and feeble, cardiac dullness natural, cardiac sounds feeble. No anæmic murmur in neck; external jugular on left side distended.	Appetite tolerable, food lies heavy at the stomach; bowels somewhat relaxed, and stools watery. Tongue morbidly red and coated with a thick fur at base. Hepatic dulness extending to nipple and into abdomen.	When working he states that he has earned from 3*l.* 10*s.* to 4*l.*, 4*l.* 10*s.* or 5*l.* per month, and he has a wife and 3 children to support. He rises at about ½ past 4 in the morning and gets underground by 6, having to get his breakfast and walk about a mile. He works underground for 8 hours. His breakfast consists of a cup of tea and bread and butter; he takes also some water and bread and butter underground, when he returns at 2 o'clock he gets his dinner, which consists of a mutton chop and soup and vegetables. He has seldom any beer with it, he thinks he may take about ½ a lb. of cooked meat a day and about a pint of beer, never any spirit unless he is not well.
Assigns the failure of his health to having worked in bad air, and especially at West Wheal Seaton, about 12 or 13 years ago.	Dark complexion, but with light eyes, sallow, spare.	No complaint.	Has spat some blood, not much cough, but occasionally suffers. The sputum is scanty and dark coloured; some shortness of breathing. Respirations 28, very little movement, resonance generally imperfect, vocal thrill natural, no cough res. Respiratory sounds generally feeble, especially at upper part of right side.	Pulse 72, somewhat feeble, cardiac sounds flat and feeble, 1st somewhat rough, no palpitation, no anæmic murmur.	Tongue morbidly red, some prominence in the epigastrium and tenderness on pressure, hepatic dulness natural, splenic dulness also natural, throat relaxed, uneasiness at the pit of stomach, and occasional vomiting of food, bowels always regular.	When working underground he got upon an average about 15*s.* a week, and lived upon bread and butter and a little meat, made in the form of pasty with dough, perhaps not ½ a lb. when cooked, he also takes milk, eggs, and vegetables. He sometimes does not take any beer for 3 weeks together, but on pay days has a little porter and sugar.
Has suffered at intervals at chest but better for last two years, till quite recently.	- - -	- - -	Pains across the chest and throat, but without cough or expectoration, respiration 32, respiratory sounds feeble expansion defective, vocal thrill natural, throat relaxed.	Pulse somewhat quick, 88, and feeble, never spat blood, heart sounds somewhat flapping.	Appetite and digestion impaired, tongue clean, bowels confined.	
7 or 8 years -	Sallow countenance and anxious expression, eyes glassy, stooping gait, phthisical looking and thin.	- -	Complains of shortness of breath, cough, and expectoration, and spits very thick mucus, respirations 20, feeble, dulness on percussion over the right side, very marked below and less so under clavicle, sub. crep. and cough res. over whole side, and less so on left; voice very husky; pat blood 3 years ago.	P. 92 feeble, cardiac dulness not extended, sounds feeble.	Appetite defective, pain at pit of stomach after food, griping pains in abdomen, bowels relaxed at intervals, occasional sickness with cough after taking food, tongue white.	He states that when working he used to get about 3 lb. of meat per week, with potatoes in the form of pasty, he had soup also sometimes, but not milk or eggs. He has not drank spirits, but generally gets a pint of beer on pay days or at other times.

District, Date, and Disease.	Present Age.	FAMILY HISTORY. Ages, Occupations, state of health and cause of death of brothers.	Age, occupation, &c. of father.	Ages, occupations, &c. of other relations.	PERSONAL Age at which he first worked underground.	In what mines he has worked, kind of work, and character of air.
5 Camborne, July 13, 1862; Dyspepsia.	67	- - -	- - -	- - -	At 15, and has worked steadily for nearly 52 years.	Has worked in various mines and generally in good air; he was last working in Tolcarne in poor air, and after working for 9 months was taken with an attack of griping and has not been well since.
6. Camborne, July 14, 1862; advanced Miners' Asthma.	57	- - -	- - -	- - -	12, and has worked steadily for 33 years.	Has worked in various mines and generally in good air, sometimes in bad; he gave up after 33 years because he thought he could do without it, and kept a beer-shop. Has not worked underground for 12 years.
7. Camborne, July 14, 1862; Miners' Asthma and commencing Phthisis.	52	- - -	- - -	- - -	At 11, and assisted the men to bring up the "stuff" till 15.	Has worked in different mines, chiefly at tribute and in good air; but when about 20 years of age he had "slow fever."
8. Camborne, July 14, 1862; Hemiplegia.	64	- - -	- - -	- - -	At 11 -	Stated that he had worked in different mines, but for the last 12 years not in any in which there was very bad air. He has, however, worked in dry and dusty mines, and says they are worse than wet mines. He has chiefly worked at tribute, but also at tutwork. He worked altogether for 48 years underground.
9. Camborne, July 14, 1862; Hemiplegia and aortic valvular disease.	51	- - -	- - -	- - -	Worked underground for 15 years, but did not state how long he had given up working and at what age he went underground.	Was employed as a "coacher," in pushing the trucks with stuff along the trams in the levels for 15 years, but never worked in particularly poor air or in close places; indeed "coaching," though harder work than that of miners, is generally done in good air.
10. Camborne, July 15, 1862; marked Miners' Asthma.	54	- - -	- - -	- - -	At 14, and worked for 13 or 14 years underground.	He has chiefly worked at tribute and generally in good air.

HISTORY.	PRESENT STATE.					
Duration and assigned cause of illness.	General condition.	Nervous system.	Respiratory Organs.	Circulatory Organs.	Digestive Organs.	Remarks.
Left work 4 months ago; working in poor air.	Thin and has lost 10 lbs. in weight recently.	- - -	Has no cough or expectoration, respiration feeble, res. on percussion natural.	Heart sounds feeble, pulse somewhat large but very compressible.	Complaining of want of appetite and heartburn, tongue white.	When working he did not get more than 2 lbs. of fresh meat per week, and not much milk, and had to live chiefly on bread and butter; he has taken little or no spirits, but some beer; he does not smoke.
Has been very asthmatic and unable to work for 12 years, and ascribes his indisposition to the irregularity in the times of taking his meals when a miner. His illness commenced with an attack of inflammation of the lungs.	Anxious countenance, pale, very marked difficulty of breathing, stooping gait, has always been temperate.	- - -	Great difficulty of breathing, aggravated at intervals, cough and expectoration, has spat blood several times, respiration puerile and with sibilant rhonchus in all parts. Chest morbidly res. at right side and dull at left.	Palpitation increased on exertion, heart sounds noisy, cardiac dulness extended.	Appetite and digestion defective, bowels regular.	
Gave up working 5 months ago; he worked last in East Pool at a close end where the air was bad. He was well enough while working; but after they had got through into the fresh air he took ill at once. He was taken suddenly 5 months ago with inflammation of the windpipe, and was compelled to lie by, and has not worked since.	Stooping gait, pale, thin, phthisical looking.	- - -	Complains of shortness of breath, cough, and spitting, and has spat some blood; chest very much contracted, very little movement, sparingly resonant especially on right side, and large veins on surface of chest; vocal thrill exaggerated at right side, especially at the apex, less than natural on left side subcrepitation, especially at right apex and more or less over whole chest. Counts to 30.	Heart sounds feeble, pulse 92 feeble. cardiac dullness not extended.	Appetite and digestion weak, sometimes coughs till he becomes sick.	He stated that when working he got about 3 lbs. of meat per week, which was made into a "pasty" with dough. He also took bread and butter, and about a quart of beer in a week, which he had done for 30 years, and never more than a quart at a time.
He was seized with an hemiplegic attack 5 years ago.	Paralysed on left side, and generally weak.	- - -	Breathing somewhat difficult.	No palpitation, heart sounds feeble.		
Had an apoplectic attack 6 months ago, and was left paralyzed in right arm, the leg is painful but not paralyzed; but his speech is so imperfect as to be unintelligible to those who are not accustomed to him. His power of deglutition is not affected. He had a similar fit 5 years ago.	Much stouter than miners generally are. Vacant expression of countenance.	Remains of paralysis on right side, especially of right arm. That arm cool; pains in corresponding leg, but no dragging.	Respiratory sounds and movements natural.	Pulse quick and free from thrill, loud musical murmur heard over the whole front and much of the back of the chest, but most intense at the upper part and the right side of the sternum. The second sound inaudible; has never suffered from rheumatic fever or pains.		
Gave up working underground from failure of health 25 or 26 years ago, and states that he was then thought to be going into consumption; he suffered from extreme weakness, with pain in the stomach and bowels and back, and "heaved up green corrupt stuff." His appetite was good. He had no cough and no expectoration. He was laid by for 4 or 5 months, and went to work at grass after, and has done pretty well since though suffering occasionally, and sometimes unable to work 3 or 4 months at a time. Has been engaged at a shaft in "landing." Has been worse for 3 or 4 years.	Spare, pale, sallow.	- - -	Bad cough with expectoration, and sometimes of blood, once brought up from a pint to a pint and a half at a time. Difficulty of breathing especially at night. Respirations 28. Very imperfect movements of chest, resonance on percussion somewhat unduly clear. Some crepitation at right apex. Throat relaxed.	Pulse 72 feeble. Heart sounds feeble, without murmur.	Complains of pain in the stomach and back, bowels somewhat relaxed, appetite defective, digestion fair.	Has always been temperate in his habits, never exceeded at one time a pint or two of beer, has very seldom taken any spirits. While he worked as a miner he had 4 or 5 lbs. of fresh meat in a week for a family of 6 or 7; sometimes had pork in addition.

District, Date, and Disease.	Present Age.	FAMILY HISTORY.			PERSONAL	
		Ages, occupations, state of health, and cause of death of brothers.	Age, occupation, &c. of father.	Ages, occupations, &c. of other relatives.	Age at which he first worked underground.	In what mines he has worked, kind of work, and character of air.
11. Camborne, July 15, 1862; commencing Phthisis.	37	He has lost brothers in early life.	Father a grassman, living, and in health.	Has lost sisters in early life.	At about 15, and worked for 22 or 23 years.	He has chiefly worked at tribute, and in good air. He was working in North Wheal Bassett when he got ill.
12. Camborne, July 1862; commencing Miners' Asthma; worn out.	47	- - -	- - -	- - -	At 11 or 12, and worked for 35 or 36 years.	Has chiefly worked at tutwork, and has frequently worked in bad air. He last worked in bad air at West Bassett in 30th, and also the 114th fathom levels. The mine was not hot.
13. Camborne, July 1862; advanced Phthisis and albuminuria: Dr. Harris.	21	- - -	Father died of miners disease between 60 and 62; he had worked in a very draughty place, and was ill, and suffered at the chest for 15 months.	Father's brother was a miner and met with an accident which injured his sight, he worked after above ground, and died after being 2 years ailing of an acute illness of 3 weeks duration. Another uncle died of consumption, and 6 of his children died of the same disease. A sister has died of consumption.	At about 16, and worked 2½ years.	He has worked at tribute, at North Roskear, for 2½ years and in good air.
14. Camborne, July 15, 1862; Dr. Harris, symptoms of Angina pectoris.	44	- - -	- - -	- - -	at about 17.	He has worked chiefly as a "sumpman," but also as a miner, and when so, at tribute and rarely at tutwork. He has latterly been engaged in "forking out" mines which have been abandoned, and were again in work. In his work he had plenty of air, indeed it has been in draughty places, but it is very wet work, and no clothing would keep him dry. He has latterly been working at a mine at tribute.
15. Camborne, July 15, 1863; commencing Miners' Asthma.	28	- - -	- - -	- - -	About 15, and worked as a miner for about 11 years.	Has chiefly worked at tribute, but occasionally at tutwork, and has sometimes worked in bad air and sometimes in very bad, when working in a close end. The mines in which he has worked in bad air, were Wheal Bassett, and Carn Brea, and the latter was the worst.

HISTORY.	PRESENT STATE.					
Duration and assigned cause of illness.	General condition.	Nervous system.	Respiratory organs.	Circulatory organs.	Digestive organs.	Remarks.
Enjoyed good health till March last, except that he had suffered from cold and had cholera 7 years ago. He was then sweating and very hot, and went into a wet place and got a chill. He has been laid by ever since he first got ill, and has tried several times to resume work, but has not been able to do so.	Dark complexioned, fairly muscular, pupils large, lips purple, delicate and phthisical looking, counts to 20, complains of general debility.	- - -	Complains of cough and expectoration, respirations 36, chest imperfectly expanded, especially at the upper part, and on the right side. Some deficiency of the resonance on percussion especially at the right apex, with bronchial respiration, cough and vocal resonance both before and behind; no rhonchus anywhere.	Pulse 92 feeble, and heart's sounds feeble.	Appetite and digestion fair bowels natural.	Has taken a pint of beer once or twice a week, and occasionally a glass of spirits. He has usually had 4 or 5 lbs. of animal food for a family of 3 or 4.
Enjoyed good health till about 7 years ago. When he got ill he was not working in bad air, but ascribes his attack to getting warm with working and then ceasing to work and being chilled.	Dark complexioned, old, looking, and complains of great weakness, rendering him incapable of working. Pale, sallow, very thin, and anxious looking.	Pain and lightness in the head, and occasionally has fallen down before going to work and after coming away.	Shortness of breath, little cough or expectoration, and never spat any blood. Imperfect expansion above and especially on the right side, respirations 32, feeble, especially at right apex, no marked cough or vocal resonance, throat relaxed.	P. 112, feeble, heart's sounds feeble.	- - -	He has not taken any beer for 3 years, and when he took it, it was never more than a pint at a time. He used to get 4 lbs. of fresh meat each week for a family of 7.
He has been ill since November 1860.	Fair complexion with reddish or auburn hair.	- - -	Advanced phthisis, with albuminuria and anasarca.			
Worked steadily as a miner till 6 months ago, and then left from suffering from his present illness. He thinks the dampness of his sump-work injured him, but he did not suffer till after he had given that up, and worked at tribute for 5 years. He has also had a fall of 5 fathoms in a shaft, 14 years ago, but does not think it injured him after the shock was over.	Moderately stout and healthy looking, says he has gained flesh since he has ceased to work underground.	No complaint	No signs or symptoms of disease of respiratory organs.	Complains of very severe pain, which he first experienced when coming out in the morning; the pain is felt behind the top of the sternum, and extends through to the back, and down the arms to the elbows, and especially on left side; when it comes on he has to stop immediately, and after a little while it goes off. He does not feel faint at the time, and has never had any fit or insensibility. The pain is still very severe when it comes on, but he can now "fight it off;" cardiac sounds very loud, no murmur, pulse regular but feeble, equal at wrists, no morbid pulsation or deficiency of res. on percussion.	No complaint.	He has always been a very temperate man, not more than a pint of beer in a week, and a glass of spirit in a month. He has usually about half a pound of fresh meat per day, and has lived chiefly on bread and butter.
Worked steadily and enjoyed good health, till 12 months ago.	Great general weakness, especially felt in climbing ladders; very sallow.	- - -	Complains of tightness across the chest, with cough, but without much expectoration. Pain also in chest, respirations 28, chest generally sparingly res. and respiration feeble. Vocal thrill less distinct on left side. Throat relaxed.	Dyspnœa, especially in climbing ladders; pulse 72, very feeble. Heart's sounds feeble.	- - -	He has rarely taken any beer, not more than 2 quarts in a month. He has usually had about 3lbs. of fresh meat in a week for himself and 5 others.

District, Date, and Disease.	Present Age.	FAMILY HISTORY. Ages, occupations, state of health, and cause of death of brothers.	Age, occupation, &c. of father.	Ages, occupations, &c. of other relations.	PERSONAL. Age at which he first worked under ground.	In what mines he has worked, kind of work, and character of air.
16. July 17, 1862; Miners' Asthma, slight mitral defect, false cartilage in knee joint; general debility.	61	- - -	- - -	- - -	At about 27 years of age; worked as a farm labourer in early life.	He has worked in United Consols and Jewell mines in Gwennap, where it is very hot, especially in the 80, 100 and 200 fathoms levels in United mines. In the lower workings, it is so hot that the men work naked, and though the water is hot, they throw themselves into it. He also had to climb the ladders after working, and was often so exhausted by it, that he could not speak on coming to the surface, and his heart beat violently. They work for spells of 6 hours, but it is so hot, they can only remain in the hot places for an hour or an hour and twenty minutes; they then come out and fire the blast, and wait for $\frac{1}{4}$ of an hour or 20 minutes till the smoke clears away, and then go to work again. They drink only water when below, and sweat profusely, and pass but little water. They smoke when they are resting after the blast. The mines are also dry and dusty. After working in the mines, they spit quite black stuff, and the smoking helps them to bring it up.
17. Camborne, July 17, 1862; advanced Miners' Asthma, Emphysema pulmonum.	50	He has 6 brothers; 1 of them is working as a miner in America, and 1 is living at Camborne, and was a miner, but is in worse health than he is himself.	Father a miner, and died at 65 of asthma.	Mother died at 65 of natural causes. A sister died of asthma and rheumatism at 30.	At 15 or 16, and worked about 35 years.	He has chiefly worked at tutwork and at Stray Park, and usually in good air; has worked in bad air, and especially for 3 months at Camborne Vean, 12 or 14 years ago, but states that he did not suffer materially at that time. He has been last working at tribute at Stray Park, and in good air.
18. Camborne, July 17, 1862; Miners' Asthma.	33	Brothers who grew up are all living and healthy.	Father worked at mines on surface, and died at 50.	Sisters who grew up all living and healthy.	At 14, and has worked ever since.	He has worked almost always at tutwork driving shafts, and generally in good air. He has worked at North Wheal Crofty and at Stray Park. In the last mine he worked in bad air 5 months ago. It was about 160 fathoms from grass, and a long way down from the shaft, and "the air was so bad candles would not burn except when held on one side and the wick pulled out, and then they made a great smoke, and they would sometimes go out entirely, and good matches would not take light when struck 3 or 4 times over. There were no "deads," but there was no air. The mine was cold and very wet, and they had much wet to go through to get to their work." He worked there 3 months and then had to give up from bad health. There were 4 other men working with him, but all had to give up several times, but he kept on till at the end of 3 months he broke down entirely, and after a time went to another mine, Crane, where he is now on tutwork.
19. Redruth, July 17, 1863; Mitral valvular disease.	31	- - -	Father formerly a miner, but has not been underground for 30 years, and is still living, but discontinued mining from ill health; since that his health has improved.	-	At about 15, and worked as a miner for 15 years.	Has been for a year and a half in America, and worked in the "Amenable" coppers of Lake Superior, and returned about a year and a half ago. He has chiefly worked at tribute, and worked in foul air before he went abroad.

HISTORY.	PRESENT STATE.					
Duration and assigned cause of illness.	General condition.	Nervous system.	Respiratory Organs.	Circulatory Organs.	Digestive Organs.	Remarks.
He enjoyed good health till 20 years ago, when he got sciatica and was laid up for 15 months, from taking cold. After that he has not suffered in the same way, but has not gone underground since. He has since worked as an engineman at the "sump shaft." He is now suffering from an affection of the knees which came on suddenly from his spraining himself very slightly in stepping aside to avoid some persons when he was walking. He felt something crack in his knee, and has been incapable of walking much since.	Pale and thin, and very weak. Never had rheumatic fever or rh. pains.	Suffers from lightness of head.	Chest narrow and contracted, movement slight, vocal thrill feeble, res. on percussion impaired, respir. somewhat harsh, dyspnœa on exertion.	Suffers from palpitation, increased on exertion, first sound prolonged at the apex, and second sound somewhat ringing. Cardiac dull space extended.		He states that he has always lived temperately, having only had a pint or 2 pints of beer once or twice a week, and sometimes not at all for a month. He generally took it on pay nights, when he had to go to the public house to get his note cashed; sometimes also he took a little brandy or gin. He has had about 2 lbs. of meat per week in the form of pasty. He has also taken milk, but chiefly bread and butter.
Has not been able to do anything for 3 months, but was ailing; short breathed and very liable to take cold before that. His first attack came on after washing one morning at 3 o'clock in cold water, when he came from the mine.	Face very sallow, expression of countenance anxious; eyes pale; lips livid; stooping gait. He has never had rheumatism or any serious disease, but about 20 years ago fell 12 fathoms, but did not suffer after he had got over the immediate effects. Dark complexioned.		Complains of shortness of breath, cough, and spitting. The spit was at first sometimes quite black. It has also been sometimes bloody, but is now white. Respirations 36, short and imperfect; large veins on chest, movement very imperfect. Vocal thrill fair at right but defective on left side. Respiration attended with subcrepitation on the right side, and especially at the upper part; no marked cough resonance; very feeble on left side; counts to 18; throat relaxed.	Pulse 88 very feeble; heart displaced downwards; cardiac sounds extremely feeble; does not suffer from palpitation.	- - -	He states that he has always lived regularly; has taken a quart of beer once or twice a month, and sometimes a little spirit. He has had about 3 lbs. of fresh meat per month, and has lived chiefly on bread and butter, and milk, and eggs.
He is still working, but says that he suffers much at the chest, and ascribes his illness to having worked in bad air 5 months ago.	Spare, sallow, with stooping gait. Has a scar from an injury of the shoulder 5 years ago.	- - -	Respirations 28, irregular and laboured; chest sparingly resonant on percussion; very defective movement, and vocal thrill very feeble; sonorous rhonchus with inspiration and expiration in all parts, and especially in dorsal regions; counts to 20.	Pulse 72, very feeble; cardiac dulness somewhat extended. Heart's sounds feeble. States that he has had much ladder work, having to go up and down from 150 to 200 fathoms; now has 150.	Appetite and digestion bad. Bowels regular.	He states that he has always been temperate, and has taken a pint of beer once, twice, or three times a week, sometimes a little spirit. He has usually got about 2 lbs. of butcher's meat per week. He smokes, for it helps to get up the "corruption."
Has not been able to work for 7 months. His health failed before he went to America, but he got worse while there, when working at a 15 fathom level. Three months after he vomited blood.	Fair condition. He states that he had swelling and erysipelas of the hands before he got ill, but denies having had decided rheumatic fever or swelling of the ankles.	- - -	Dyspnœa encreased on exertion.	He labours under symptoms of disease of the heart, and there is a slight systolic murmer, audible chiefly at lower part of sternum and about the middle and on the right side of that bone; more feeble at the upper part of the sternum, second sound flat. Pulse quick, somewhat vibratory; palpitation and vomiting of blood.		

District, Date, and Disease.	Present Age.	FAMILY HISTORY. Ages, occupations, state of health, and cause of death of brothers.	Age, occupation, &c. of father.	Ages, occupations, &c. of other relatives.	PERSONAL. Age at which he first worked underground.	In what mines he has worked, kind of work, and character of air.
20. Redruth, July 17, 1862; Miners' Asthma, with slight mitral valvular disease.	49	He has 2 brothers, miners, both of whom are living and healthy.	Father a miner and died at 49 of miner's complaint, after having been ill for 6 years. Father's father a miner, and died between 70 and 80 of old age. He left work 10 years before his death, though not from any illness at the time. Mother died of dropsy at 60. Father's sister died of asthma at 70.	Father's brother also a miner, and killed by a fall of stuff.	At 14, and worked steadily till he gave up, 20 years ago. He has worked as a miner 15 years.	He has chiefly worked at tutwork, and has "worked in very bad air, when the candles could not be got to burn unless placed about 9 feet behind where they were working, or by teazing out the wick, and holding the candle on one side, and then there was a great smoke, and when he came up, what he spat was as black as ink." About 5 years before he left working underground, he had inflammation of the lungs with blood spitting, which came on when he was working in "poor air" and "cold damp," and he has never been well since. He worked at the 5 consolidated mines, copper; he worked at the different levels, from the adit to the 160 to 210 fathom. The mines were dry, and dusty, and hot, but he has also worked in cold and wet mines.
21. Redruth, July 17, 1862; Miners' Asthma; passed blood by stool.	42	Brothers all living except one, who was killed.	Father a miner, died at 65, and worked till 4 or 5 months before his death.	- -	At 20, and was engaged at the dressing floors before.	Has chiefly worked at tutwork, and has worked in bad air.
22. Redruth, July 17, 1862; Phthisis, without family predisposition; acquired by working in bad air.	32	The family originally consisted of 11, of whom only 6 besides himself grew up. One brother was a miner and died at 39, after an illness of 5 months; four others are miners and living, but one is very ailing and "was given up five years ago as in a decided consumption," but after a time he passed a large worm and got much better, and is now able to work a little at surface.	Father a mechanic, and living at 81.	He has several paternal uncles living and healthy, a brother of his mother was a miner, and died of cholera. Mother living at 74, he has a sister living, a maternal aunt is living at 70, and 2 paternal aunts between 50 and 60.	At 9 or 10; at first he drove a machine for blowing air to the men 50 or 60 fathoms from the surface; became full miner when about 12.	He was last working at tutwork at a "rise" in New Clyjah mine at 40 fathoms from the adit (the adit running from 28 to 40 fathoms,) and about 100 from the shaft, "in very bad air, where, indeed, they got no air but what was blown to them, and only a puff now and then. When first they went in the morning the candle could not be got to burn, and they took off their coats and beat the air about and then went into the level, and after a time returned, when the candles could be got to burn, but only by holding them on one side; sometimes the lucifers could not be got to take." He worked in this place for 3 months, and then they sank a "winze" to join the rise for a month, and after that for a month they drove straight on; altogether they had worked 5 months when he was taken ill with pain in the side. He continued to work for a fortnight, and then knocked off entirely.

HISTORY.	PRESENT STATE.					
Duration and assigned cause of illness.	General condition.	Nervous system.	Respiratory organs.	Circulatory organs.	Digestiv organs.	Remarks.
He has been entirely laid by for about 7 years, but ceased working underground 20 years ago from failure of health from working in poor air, and cold damp and wet. He had then been ailing for 5 years. He also states that the ladders tried him and the exposure after being heated; soon after he left work he had dropsy, he still finds his feet occasionally swell when he is suffering from cold. When he first left working underground he was told he was in an advanced consumption, and for about 9 months he was very ill and nearly confined to bed. After another 12 months he was able to work on the roads, and he has done light work, since, till 6½ or 7 years ago.	Stooping gait; dark complexioned; sallow; anxious looking. Height 5 ft. 6¾ in. Formerly weighed 9 stone, but now only 6 st. 14 lbs.; eyes pale.	Complains of headache.	He complains of shortness of breath, and pain on the left side, increased on exertion, and cannot draw a full breath. He has also a very bad cough and much spitting, especially in the morning; it is yellow or dark coloured, and very difficult to get up. Respirations 28; very imperfect expansion, and especially at upper part of chest; large veins on surface of chest sinking in above the clavicles; very slight movement; respiration chiefly diaphragmatic; vocal thrill very imperfect, especially below; chest sparingly res. on percussion above and at the right apex, both before and behind; deficiency of the res. on perc. also, low down at the left back and side; loud sonorous and sibilant rhonchus in all parts of chest, and especially at upper part of right side, both before and behind, and at lower part of left side and back, where also there is some subcrepitation. Cough res. undue at right apex, and increased vocal thrill there.	Pulse 80, very feeble; cardiac dullness increased in extent. Palpitation at all times, but much aggravated on exertion; cardiac pulsation visible to the left of the zyphoid cartilage. The first sound of the heart is noisy and prolonged, attended with a slight murmur. The second sound flat.	Appetite very defective, and bowels confined; digestion fair; hepatic dullness extending nearly to the nipple; tongue furred.	He states that when working as a miner, he used to take about 3 quarts of beer per week, and sometimes more on pay-days. He also sometimes took spirits. He had about 2½ pounds of fresh meat per week, and took it with bread and potatoes, in the pasty.
His health failed 3 years ago. He ascribes his illness to having taken cold when sweating from working in a hot place, in coming through cold water on his way to the shaft. He had previously been working in bad air where the candle would not burn without being held on one side, and sometimes without being placed behind him; occasionally the candle went out, and the lucifers would not take. He was first seized when in bed one morning with a violent shivering and symptoms of bronchitis, and was laid by for 8 months.	Facelivid, high shouldered; anxious countenance.	- -	Has not spat blood, chest narrow and contracted, and especially above, and very little movement with the respiratory acts, vocal thrill slight. Chest everywhere sparingly resonant, but especially on the right side. Loud inspiratory and expiratory sounds both before and behind, no rhonchus, but some cough; res. at right apex both before and behind. Counts only to 6 or 12. Breathing and cough not worse during last 6 months.	Heart's sounds somewhat noisy.	Has passed much blood by stool, and has had much pain in the bowels.	He was a teetotaller for some years before he got out of health. He took about a pound of meat per week, and lived chiefly on bread and butter.
Left working underground 17 months ago, and was quite well and strong a month before that. He ascribes his illness to having worked in very bad air in a "rise," and afterwards in a "winze" and "close end. He was first taken with a pain in the right side, shortness of breath, cough and spitting, and occasionally of blood, and he has got worse ever since.	Height 5 feet 6, weighs now 6 stone 14, before his illness weighed 8 stone 4. Pale and moderately stout, not much sweating at night. Has lost his right eye "by a stone flying against it."	- -	Chest wide, respiratory movements imperfect on right side. Respiration chiefly diaphragmatic; vocal thrill natural. Some falling in at right apex, with dulness on percussion over a large space there and bronchial respiration and subcrepitation without marked cough res., but with exaggerated vocal thrill. Sputum muco-purulent and bloody. Signs less marked at left apex. Respirations 32. Cavernous sounds at right upper mamary region. Counts to 24.	Some little palpitation, and especially when in bed. Pulse 120.	His appetite is "middling, but he cannot get proper food." Bowels confined. Digestion fair.	When working he used to get about 2 lbs. of fresh meat per week, and spent about a shilling a month in beer, chiefly on pay days. He states that "as far as he knows none of his family had anything the matter with their chests, except they were miners."

District, Date, and Disease.	Present Age.	FAMILY HISTORY. Ages, occupations, state of health, and cause of death of brothers.	Age, occupation, &c. of father.	Ages, occupations, &c. of other relatives.	PERSONAL Age at which he first worked underground.	In what mines he has worked, kind of work, and character of air.
23. Redruth, July 17, 1862; Paraplegia, from cold.	50	- - -	- - -	- - -	At about 17 or 18, and worked at surface for 5 years before that.	- -
24. Redruth, July 17, 1862; commencing Miners' Asthma	46	He has two brothers miners, one in California, the other in Australia.	Father was a farmer, and died at about 70.	Mother living, and above 70.	At about 18	He has been almost always engaged in working at tribute, and never worked in poor air for the last 20 years; but before that worked for 3 months in bad air at Carn Brea.
25. Redruth, July 17, 1862; probably Interlobar Pleural Abscess on left side, opening through the lungs.	48	- - -	- - -	- - -	At about 15 or 16.	He has chiefly worked at tribute and never in bad air for the last 10 or 12 years.
26. Camborne, July 19, 1862; slight Cardiac disease, probably mitral, sequence of rheumatic fever.	36	The family originally consisted of 12, and only 5 are now living, 1 brother died at 26, the others died in early life.	Father a miner and died after an injury at 53.	Sister died at 23.	At 17 -	Has chiefly worked at tutwork in sinking shafts and generally in good air. He last worked in Great Wheal Vor; part of the shaft was very wet and cold. He has worked at a depth of 335 fathoms and had to climb the ladders all the way.

HISTORY.	PRESENT STATE.					
Duration and assigned cause of illness.	General condition.	Nervous system.	Respiratory organs.	Circulatory organs.	Digestive organs.	Remarks.
Has been entirely laid by for 1 year and 7 months, but has been ailing for 7 years. He ascribes his illness to having worked 7 years ago in a level where there was a great quantity of water. It was a tin "mine, in the granite and very cold, and the adit was stopped up and the levels by "deads" or "attles," so that he was half-leg deep, and was not using much exertion at the time. He worked for 7 hours, and then when he came out felt as if he had been beaten with sticks, and in 2 or 3 days his limbs became dead and numby and he was hardly able to move them, but could feel a little." He got worse for year.	- - - -	Lower extremities, and especially the left, very numb, and very little power of moving them; arms not affected; great weakness also in the loins. Has also had difficulty of passing water and stools, but is now better in those respects.	Respiratory sounds feeble.	Heart's sounds natural.	- -	Health otherwise good.
Gave up work about a year ago. He states that 12 years ago he had inflammation of the chest brought on by putting on after working, the clothes in which he had walked to the mine in the rain, and which were still wet. He has never been quite well since, and readily takes cold. Has never had rheumatic fever.	- -	He suffers from difficulty of breathing, but has no cough or expectoration. Surface of the chest, especially on the left side, tender to the touch, very little movement, vocal thrill feeble, respiratory sounds very feeble. Dulness on percussion and absence of respiratory sounds at the lower part of the left side, some deficiency of the res. on percussion and of respiration at the upper parts of chest.	- - -	Fluttering at the heart, cardiac pulsation visible to the right of the false ribs in the epigastrium. Heart's sounds extremely feeble.		
Left work 12 months ago in consequence of suffering from pain in the left side and shoulder. The pain commenced suddenly; he went to bed quite well on Sunday night and was taken ill at 5 o'clock on Monday morning. The pain was followed rapidly by shortness of breath, cough, and expectoration, and he was nearly confined to his bed for 6 or 7 months. After 6 or 7 weeks he spat a quantity of matter which came up suddenly after a severe fit of coughing; he usually lay on the left side, and if turned over on the right side he immediately became nearly choked by the cough. At first what he spat was bloody and very offensive and then it declined in quantity and became trifling about 4 months ago, and he has greatly improved in health since.	- - - -	- - -	Respirations 28, general impairment of expansion in all parts of chest and deficiency of res. on percussion and of respiration, especially in left lower lateral and dorsal regions. Deficiency of resonance and of respiration also in right dorsal region, counts to 30.	Pulse 88, cardiac dulness natural, heart sounds noisy, pulsation very visible to right of false ribs in the epigastrium.		
Had quite good health till 4 years ago, except that 12 years ago he had an inflammatory fever, from which, however, he entirely recovered; he has been unable to work for 6 weeks. He ascribes his illness to having put on, after working hard and getting heated, the clothes which he wore on entering the mine and which were wet from having been left in a wet place when he began to work.	Great debility	- - -	He complains of shortness of breath, increased on exertion; dry and hard cough, spitting scanty, sometimes black, never bloody. Respiration 24, very little movement, deficiency of res. on percussion on right side, and very feeble respiration.	First sound of heart prolonged, pulse 72 feeble.	Want of appetite.	

District, Date, and Disease.	Present Age.	FAMILY HISTORY.			PERSONAL	
		Ages, occupations, state of health, and cause of death of brothers.	Age, occupation, &c. of father.	Ages, occupations, &c. of other relatives.	Age at which he first worked underground.	In what mines he has worked, kind of work, and character of air.
27. Redruth, July 17, 1862; Phthisis, family predisposition.	30	All his brothers are living.	None of his relatives have been miners, 2 of his father's brothers were masons and died of consumption.	His father is living and healthy. A sister died young. Mother living and healthy. An aunt of his father's side died of consumption.	At about 15	He stated that he had for the most part worked at tribute and in good air. But he worked in poor air driving an end at West Bassett.
28. Camborne, July 19, 1862; Mitral valvular disease and dropsy. Dr. Harris.	21	Never any brother.	Father a miner aged 47, and healthy.	Mother living and healthy; 6 sisters all living and healthy.	At 13, and has been a miner for 8 years, but did boy's work for the first 2 years.	He has chiefly worked at tutwork driving ends, and has worked in poor air where the candles would not burn, and the smoke after blasting lay about for from 2½ to 3 hours. The air was very bad when he went to work in the mornings. He has never sustained any severe injury or had rheumatic fever. He has worked at Camborne Vean, Wheal Frances, and Wheal Harriet, and last at North Crofty.
29. Camborne, July 19, 1862; advanced Phthisis, with hereditary predisposition. Dr. Harris.	44	Has 2 brothers both living and healthy, at 37 and 40 and both miners; one retired; the other still going underground.	Father was a farmer's labourer and died at 26 of consumption.	His grandfathers and grandmothers lived to 78 or 80. Mother died from effects of an injury at 60. A paternal aunt living at 64. 2 maternal aunts and uncles now living about 60.	Went down at 17, and worked regularly till he was 35. Became a captain 9 years ago.	Has worked chiefly at tribute and generally in good air, but has worked in a little bad air but not for many years.
30. Par, July 1862; Dyspepsia, slow fever.	37	Brothers all living.	Father, a miner, was killed in a mine when 30 years of age.	Mother living, sisters all living.	Went down at 16, and worked at grass after he was 7½.	He first worked at Par Consols at tutwork, in driving an end and there had good air; he left in 9 years and went to Fowey Consols, and has latterly worked chiefly as a tributer and generally in good air.

HISTORY.	PRESENT STATE.					
Duration and assigned cause of illness.	General condition.	Nervous system.	Respiratory organs.	Circulatory organs.	Digestive organs.	Remarks.
He thinks his health failed from working in bad air and getting cold. After leaving West Basset he tried another mine, but could not get on. He was first taken with sickness and vomiting in the evenings after returning from work, then got cough and expectoration and afterwards spat some blood and his health became affected. Has been away from work upwards of 12 months.	Tall, thin, flushed countenance, large pupils, very phthisical looking. Suffers from night perspirations.	- - -	He complains of a dry hard cough and expectoration of thick and heavy matter. Respirations short and quick; some deficiency of resonance on percussion at the right apex and chest, elsewhere morbidly resonant, and inspiration harsh and expiration prolonged. Bronchial respiration and cough res. at right apex.	Pulse not much quickened.	Bowels much relaxed and have been so for some time.	
His health began to fail 2½ or 3 years ago with beating at the heart and bad breath, but he had no cough or spitting. He was working at the time at North Crofty at 160 under the adit. He first felt the palpitation 15 or 16 months ago when "beating the borer," he also felt it in coming up the ladders, he had to come up about 190 fathoms and used to stop about twice in coming up and was very much out of breath, and his heart beat violently at the time. His present illness commenced with swelling of the ancles and increased palpitation, and he has not been able to do any work for 6 months. The immediate cause of his illness he however thinks was cold taken in walking through the rain from the shaft at North Wheal Crofty to the changing house, a distance of 200 yards.	Face flushed and lips livid, extremities cold, livid, œdematous.	- - -	Respirations short and hurried, and respiratory sounds very feeble.	Cardiac dulness considerably extended. Loud systolic murmur, heard most intensely at the apex and followed by a ringing second sound. Pulse very feeble.	- - -	Is not aware that any of his relatives died of heart disease.
He ascribes his illness to having got cold when underground only 2 or 3 fathoms. He changed his clothes all but his flannel, and thinks he got a chill on coming to the surface from his flannel being wet, he has been suffering ever since. Worked very hard while a miner.	Dark complexioned, sallow, and lips very livid, voice husky. He complains of night perspirations.	- - -	Pleuritic effusion on right side, large cavern at right apex.	Pulse small, quick and feeble	Bowels at present regular, but he has suffered from diarrhœa.	His habits have always been regular, and he has got a sufficiency of food. This patient has since died.
He enjoyed good health till after last Christmas when his health failed, as he thinks from having been doing very badly and consequently he could not get sufficient to live upon. The air was light but not bad, the candles would burn well enough, he continued to work till 5 months ago, when he was taken with pain in the bowels, and the food lay heavy at his stomach, and he vomited sometimes; he gave up and was at home for 3 months; lately he has been suffering from "slow fever," he has several times tried to work but cannot go on, and is extremely weak, but for the last 2 weeks has been able to go about a little.	Pale, very sallow and extremely languid looking, icteroid tinging of conjunctivæ, pains in the loins. He complains of burning in the palms of the hands and in the soles of the feet, along the limbs and at the top of the head; he feels weary and cannot sleep well, and when he awakes is not refreshed by the sleep he gets, and feels worse on rising than when he went to bed, he feels better some days than others, but without any regularity.	No headache	No cough or expectoration except in the morning, and no difficulty of breathing; has pains about the chest, especially at night, respirations 32, percussion and respiratory sounds natural.	Fluttering at the heart; pulse feeble 72, heart sounds flat.	Very little appetite and the food does not agree, lying heavy and being sometimes vomited and followed by pain in the stomach; bowels confined, only acted upon by medicine; tongue red at the tip and dorsum and furred at the back, very offensive breath, some tenderness to the touch at the lower part of the right side in the region of the liver.	

District, Date, and Disease.	Present Age.	FAMILY HISTORY. Ages, occupations, state of health, and cause of death of brothers.	Age, occupation, &c. of father.	Ages, occupations, &c. of other relatives.	PERSONAL. Age at which he first worked underground.	In what mines he has worked, kind of work, and character of air.
31. Par, July 19, 1862; Palpitation.	27	- - -	- - -	- - -	At about 15	Has worked at tribute, chiefly at Fowey Consols.
32. Par, July 19, 1862; marked Miners' Asthma and debility.	53	A brother, a miner, died at 58, another also a miner, at 50, and a third is living but very ill at 50.	Father, a miner, was killed at 41.	Grandfather was a miner and lived to 70.	At 16, and worked for 42 years.	Chiefly at tribute and in very warm mines, the air light and the workings very dusty.
33. Par, July 19, 1862; Palpitation and general debility, worn out.	62	Of 5 brothers all were miners and died at 58, 56, 54, 50, and 40.	Father a miner, and died at 62 of miner's asthma.	Mother died of decline at 62, 1 sister living at 70, 3 sisters died 61, 58 & 28; the last died in childbirth.	At 10 and did boy's work till 15 after which he worked as full miner for 37 years.	He has worked at tribute nearly all his time, when his health failed he was working at 160 fathoms from adit, and in a warm, dry, and dusty place; he worked 12 years in the last mine.
34. Par, July 19, 1862; Phthisis, predisposition not ascertained.	33	Two brothers living, one a soldier, the other a miner.	Father a miner, living and healthy, but was not bred to it.	Grandfather was a farmer and died an old man. One sister living.	At 10 and worked 21 years.	He has worked for the last 14 years at the Fowey Consols, and has worked in poor air where the candles would not burn, and in places that were very hot.
35. Camborne, July 1862, August 10 1862; marked Miners' Asthma. Victoria Park Hospital.	27	- - -	Father, miner, died of consumption at about 50, he being the only member of his family who was a miner.	4 uncles, none of whom are miners, are alive, from 30 to 40 years of age. Grandfather was a miner and worked till he met with an accident by which he was killed when nearly 70.	10 or 11, and was first employed in "washing" for his father.	Worked first at Tin Croft for about 7 years, and was a tributer, and worked in good air. He then went to Condurrow and worked there about a year at tutwork, and suffered from "cold damp" and poor air. Then he went to Great Wheal Seaton and worked both at tutwork and tribute a long way from the shaft and 130 fathoms from surface. The candles would not burn at all, except by continually picking out the wick with a pin and putting the candle on the side when there was smoke enough to choke them; sometimes they would go out entirely, and they could only see by putting the candles 2 or 3 feet behind them. He worked there for 4 years; from 6 to 12 months before he gave up, began to suffer. He had pains in the heart and shortness of breath, especially felt in climbing the ladders and beating the borer; then beating at the heart increased on exertion, weakness in the legs and pains in the calves, pain in the head, sickness at the stomach, and an entire loss of appetite. He also could not sleep at night, and felt heavy and stupid in the morning and more tired than when he went to bed at night. These symptoms have continued more or less ever since, but he is better than he was.

HISTORY.	PRESENT STATE.					
Duration and assigned cause of illness.	General condition.	Nervous system.	Respiratory organs.	Circulatory organs.	Digestive organs.	Remarks.
Was well till after he had worked 5 or 6 years, when after working in damp and poor air, 38 fathoms from adit, his health failed, and after 3 years he had to give up; he suffered from beating at the heart, pain at chest, and could not climb the ladders; he was away 2 years, got better, and has returned to work a year ago, but still suffers.	- - -	- - -	Shortness of breath, but the respiratory sounds are natural.	Suffers from palpitation, no murmur.	- - -	
Enjoyed good health till 12 years ago, when he was laid by for a month; after that he resumed his work and continued at it till 8 years ago, when he again failed and was away 2 years, and then again returned; he has been now laid by 2 months, and ascribes his illness to hard work, and especially to having worked in a cold damp mine in the granite, after having been in a warm one in the killas; he also says the climbing the ladders injured him; he is getting gradually worse, and suffers especially in winter.	Pale and anxious expression of countenance, extremities cold.	Complains much of want of sleep at night.	Respirations 24, loud and prolonged respy. sounds and sonorous rh. in all parts, very little movement, res. on per. morbidly clear; cough violent and much expectoration but never of blood; his difficulty of breathing and other symptoms are aggravated in paroxysms.	Pulse 92, feeble, heart's sounds very feeble.	Appetite and digestion very bad, bowels regular.	
Worn out by prolonged work, and recently has had to give up work.	- - -	- - -	Breathing and respiratory sounds fair.	Palpitation, heart's sounds somewhat harsh and prolonged.	- -	Is allowed by the parish 2*s.* per week, and has no other means of support.
Has been incapable of work since Christmas, lost his voice about 18 months ago, and his health failed before that; he suffered from shortness of breath; ascribes his illness to working in poor air and hot places.	Has lost much flesh and strength, and is thin, pale and phthisical looking, and very weak.	- - -	Cough and expectoration and has spat blood; consolidation at left apex, cavern at the right; voice very feeble and husky.	Heart's sounds noisy.	Appetite and digestion good, bowels relaxed.	
Unable to work for about 2 years, but ailing for a year before; and he thinks his illness was brought on by having to work in a nearly upright pitch, and with hand over hand, and in a close end; and this he did for 4 or 5 years. It was also very hot, so that he worked naked to the waist; the place was very dry, and there was "a terrible lot of dust and no air at all."	Dark complexioned, dark hair, and grey eyes; somewhat small and spare. Throat red and relaxed. Height 5.9½ Weight 9.10½ Suffers from night perspirations.	No complaint	Not at present any cough or expectoration, but suffers from shortness of breath, pains across the chest, and has spat much blood. Respirations 32. Chest narrow, very little movement, vocal thrill somewhat defective on left side. Undue sensitiveness to touch. Sparingly resonant on percussion in all parts. Respiratory sounds feeble, but without rhonchus. No undue cough resonance.	Pulse at wrist and sounds of heart feeble, 112. Palpitation increased on exertion.	Appetite fair and food agrees well. Has passed blood by stool. Tongue clean but white.	He states that he has chiefly lived upon bread and butter and some meat, perhaps 3 or 4 lbs. of meat per week for himself, wife, and 3 children, with milk, eggs, and cabbage. He sometimes takes ale or porter, about 5 or 6 pints per month, but never spirit; he does not smoke much. He also gets fish occasionally.

District, Date, and Disease.	Present Age.	FAMILY HISTORY. Ages, occupations, state of health, and cause of death of brothers.	Age, occupation, &c. of father.	Ages, occupations, &c. of other relatives.	PERSONA Age at which he first worked underground.	In what mines he has worked, kind of work, and character of air.
36. Par, July 1862; commencing Phthisis. Hereditary predisposition. August 30, 1862. Victoria Park Hospital.	27	A brother working at surface, living, between 30 and 40. One brother never underground died of decline at 19.	Father a miner, died at 45 of decline.	Father's brothers never miners, and all died young. Mother's brother living, a miner, at 60, and the others lived to a good age. Mother's father was an old man when he died. A sister living between 30 and 40. Mother died of decline at 50. 3 sisters died of decline.	13, worked at stamps before.	Worked first at Pennance Wood, a tin mine, "now knocked" for 1 year. Then went to Paine Mill, a tin and copper mine, for another year, and after that went to Fowey Consols copper mine, where he has worked ever since. He has never worked in bad air, but has worked in very warm places. This was in the 240 fathom from the adit, at an end a long way from a shaft. In this place they could only wear thin shoes and a cap, and nothing on the body. He has also worked in a very hot winze 180 from the adit and 20 or 30 from the draught, but the draught came from below and was warm. At this place they could only remain in half an hour, and then had to go out and throw water over themselves There were other workings in the mine, as a winze driven off from Buddlas shaft, in which it was so hot that the people working could not remain in for more than 5 or 10 minutes at a time. The mine is dry, but not dusty. The deepest level now worked is 270, but they were working at 300, of which the ore is now exhausted.
37. Commencing Miners' Asthma. August 1862.	39	Had no brothers who grew up.	Father killed at 50, was a miner all his life. His injury was followed by abscesses in his limbs, and he gradu- fell away.	Father had no brothers; mother had two, both miners, and both died at about 40. Father's father was killed at Ding Dong at an early age. He was a miner all his life. Mother's father was a tin dresser and lived to upwards of 70. Has 2 sisters aged 45 and 38.	At 12, and was occupied as a "roller" till 16, and then became a full miner.	Worked at tribute at Darlington 9 years, copper. Then at Wheal Margaret 2 years, tin. Then at Wheal Reeth Consols, tin. He now works there at the 140 fathom level. Generally has had good air, but has worked in some close places.
38. Mesenteric disease - August 1862.	17	- - -	Father living at 42, a "shaft man," ailing.	Mother's brothers all living and healthy. Father's only brother was a miner, and died at 36 of miners' disease, having been ill 7 years. One uncle, miner, killed. Mother's grandfather miner and died about 70. Mother living and healthy. Mother's sisters all living.	At 14, assisted his father.	Wendron Consols, tin, 25 fathoms. Crahe Downs.
39. Halwin; advanced Miners' Asthma. August 1862.	58	One brother, a miner, died at 56; ailing for some time, and died worn out by mining.	Father miner, and lived to 80.	Several uncles miners, and all died about 50 to 60. One at 54 of miners' decline.	- - -	He first worked at Porkellis, till the mines were given up about 1825, and then went to Tresavean Gwennap, and still lived at Hallwin, Wendron, walking 4½ miles to the mine and then back. When at mine had to use ladders to 230 fathoms, and the workings were very hot.
40. Halwin; Miners' Asthma, paralysis of speech and partial paraplegia; commencing general paralysis. August 1862.	49	Had two brothers miners, both of whom were killed.	Father miner, and died at 77.	- - -	Worked first underground at 18.	Worked at Wheal Lovel (tin) 7 years; worked also at Tresavean, and had to walk 3 miles to the mine.

HISTORY.	PRESENT STATE.					
Duration and assigned cause of illness.	General condition.	Nervous system.	Respiratory organs.	Circulatory organs.	Digestive organs.	Remarks.
When taken ill he was working at tribute at 180 fathoms, and that was warm but not very hot; he wore drawers and a "dickie," and the air was good. He ascribes his illness to having taken cold from getting warm with work and then being detained in the shaft waiting for the engine to bring them to the surface when they had finished working. They might have used the ladders, but the man-holes were awkward, too small for large men. 16 weeks ill.	Thin, pale, and worn, large boned, fair complexioned; voice husky; weak, and has suffered from night sweats. Height 5 ft. 8½ in., weight 10 st. 2 lbs.	No headache or other symptoms.	Cough and expectoration, and has spat some blood. General deficiency of resonance on percussion at the upper part of chest, with some cough, resonance there.	Pulse somewhat quick and feeble, palpitation of the heart and sounds somewhat rough at apex.	Appetite and digestion good, and bowels regular. Tongue large with white fur and a transverse fissure.	
...s been ill 3 weeks, and says ...e took cold from working at grass in underground ...othing, repairing the neck of the shaft. Has always had to climb ladders.	Moderate height and spare, fair complexioned and with curly hair, thin, delicate looking. Has no pains in the limbs.	Complains of slight pains in the head occasionally.	Tightness across the chest and shortness of breath, audible wheezing, cough, and spitting. Has never had hæmoptysis; chest somewhat narrow, little movement, vocal thrill feeble, sparingly resonant; very feeble respiration.	Palpitation on climbing the ladders; action of heart feeble, sounds at apex somewhat noisy, pulse at wrist feeble, quick.	Appetite fair and digestion generally good; bowels have been confined, but are now relaxed by medicine.	
...year and five months, commenced with slow fever and symptoms of cold, cough and expectoration and perspirations at night; not been confined to bed except for a day or two at a time.	Very much emaciated.	-	No cough or expectoration now but has had. Chest contracted, deficient in res. especially above and on right side, and quite dull low down on the same side. Resp. harsh; never spat blood.	Pulse feeble and quick.	Abdomen large and tender, and pain on right side. Diarrhœa. Stools usually 3 or 4 times daily, sometimes only once. Very little appetite, digestion deficient, tongue furred.	
...rn out by hard work, ailing for several years and not able to do any work for four. Illness commenced with cough, spitting, shortness of breath, and some spitting of blood occasionally; returned to Wendron C. when the mines were re-opened, and had worked there for about 8 years before he laid by, but he was never well from before he left Tresavean, and could not have continued to work there.	Very greatly emaciated, pale and thin, old looking than his age.	Some little headache occasionally.	Difficulty of breathing and loud wheezing. Much cough and expectoration, and it is occasionally bloody. Deficiency of res. on per. at each apex, especially the left. Some cough res. there, and wheezing in all parts of the chest.	Pulse quick and feeble. Heart's action irregular and sounds flat, but no murmur.	Appetite fair, has constant diarrhœa and night sweats. Tongue clean and moist.	
...ssigned his illness to working in cold damp. ...ut has also worked in poor air 86 from adit. Ill 6 years.	Thin and pale	Intelligence somewhat impaired, and cannot talk intelligibly. Loss of power of movement to a considerable extent, and impaired sensation in lower extremities. Never any fall or fit.	Does not suffer from cough or expectoration, but has done so. Has now loud wheezing at chest and rhonchus on auscultation.	Heart's sounds and pulse very feeble; has spat blood.	Appetite and digestion fair.	Living in a very bad cottage; 2 rooms, the upper slanting to roof, 2 small windows incapable of being opened, 9 persons sleeping in the room; himself and his wife and a baby, a married daughter, son-in-law, and baby, and 2 boys nearly grown up, and a girl.

District, Date, and Disease.	Present Age.	FAMILY HISTORY. Ages, occupations, state of health, and cause of death of brothers.	Age, occupation, &c. of father.	Ages, occupations, &c. of other relatives.	PERSONAL Age at which he first worked underground.	In what mines he has worked, kind of work, and character of air.
41. Porkellis; commencing Miners' Asthma, with consolidation at upper part of chest. August 1862.	41	Seven brothers all living, of whom six are miners.	Father miner, and died at 71.	Mother 73, died.	Twelve, and entered into concern at 16.	Tresavean 21 years, and had 4 miles to walk to the mine; then Wendron Consols for between 2 and 3 years; working last at Bassett and Grylls at 40 fathoms. Tin.
42. St. Just, Mr. Searle; Albuminuria, anasarca; after syphilis, and in a man who has lived too freely. August 1862.	29	Two brothers living and healthy at 32, 25.	Father miner, and died in Cuba at an early age.	Mother's brother a miner, and alive at 60, another a tailor at between 50 and 60. Father's father died between 70 and 80, a tin dresser. Does not know anything of his mother's father. Mother living, between 60 and 70; 1 sister died young; 1 sister living at 28.	Fifteen or sixteen, working at surface before.	Worked first at Botallack and was in good health; he went then to Cuba and afterwards to Michigan. He was away 2 years and 8 months; worked in Michigan at 10 fathoms and 50 fathoms from the surface, there they only have ladders, and the air was bad; cold damp. At Botallack he worked at the 100 level under the sea, and the air also was bad. He worked last at Higher Botallack, and after 3 months took ill. The effects of the bad air were lightness of the head, bleeding at the nose, sick stomach, but no chest symptoms except shortness of breathing.
43. St. Just, Mr. Searle; slow fever, commencing Miners' Asthma, mitral valvular disease. August 1862.	38	- - -	Father day labourer, alive and healthy at 70. Mother's father a labourer, and died at 80. Does not know anything of father's father. Mother died at 68.	Father's brothers, 3; 2 miners, and all 3 died early. Mother's brothers all day labourers, and all dead.	At 9 years old went to work at grasswork, and at 13 went underground, became a tributer at 17.	Worked at Balleswidden for 17 or 18 years at tribute; had tolerably good air. Worked in poor air at Trehaney at the 80 level sinking a winze; the air was very bad and the candle would not burn, and had to give up after a month, but from the impossibility of getting the candle to burn, not that he was ill. Worked also in poor air at Balleswidden. He was working at Botallack when he got ill, at the 160; hot and dry, but not much dusty; was 1 year and 10 months at Botallack.
44. St. Just, Mr. Searle; advanced Miners' Asthma. August 1862.	63	1 brother a smith, living. 7 brothers miners; 6 died at 50, 50, 60, 66, 66, and 70, 1 living at 69.	Father, blacksmith, died at 70.	Mother died at 80.	Went underground at 15 or 16.	Worked first at Wheal Owles for 2 or 3 years, then became captain and kept a public house, still however continuing to go underground. Worked last at Levant, and there for 15 years, at 130 and 150. Had poor air in different mines, the candles would not burn and the smoke lay long in them. The air in Levant was dry, dusty, and hot.
45. Treweller Chapel; recovering from Pleuropneumonia of right lung, or from "Typhoid." August 1862.	24	- - -	- - -	- - -	12, worked before at stamps, at Levant for 2 years before.	Had poor air in Botallack at the 60 for 5 months, but did not suffer.

HISTORY.	PRESENT STATE.					
Duration and assigned cause of illness.	General condition.	Nervous system.	Respiratory organs.	Circulatory organs.	Digestive organs.	Remarks.
Ascribed illness to working in cold damp and poor air. Ailing at intervals for some time, but worse for 2 or 3 years, and now laid by.	Thin and pale, and has become more so very recently.	Headache occasionally.	Shortness of breath and cough and expectoration, never spat blood, pains across chest; chest narrow, sparingly res. especially above and on the right side, and impaired movement. Cough res. above; no rhonchus, but feeble respiration.	No palpitation, heart's action and pulse feeble, sounds of heart flat.	Appetite defective, digestion fair, but pains in stomach and bowels occasionally. Tongue clean.	
16 weeks, but ill before, and ailing for 6 years since his return from America. He assigns his attack to cold damp; the candles would not burn and the smoke of gunpowder lay in the mine. In America he worked in a Native or Amenable copper mine. Ascribes his last attack to cold taken after working in a close end; but he had when in America a syphilitic sore, and secondary symptoms occurred 6 months ago.	Very pale, dropsical in abdomen and lower extremities.	No headache	Slight shortness of breath, little cough; but before he had a severe cough and much expectoration; never had hœmoptysis. Deficiency of res. on per. in the lower and posterior part of the chest, with deficiency of respiration and subcrepitation.	Sometimes a little beating at the heart. Pulse 96 very feeble, heart displaced upwards, noisy sounds.	Appetite and digestion good, tongue clean, bowels confined, abdomen distended.	Addicted to habits of intemperance; drinking much, both spirits and beer, and smoking.
Was well till 5 weeks ago.	Complains of weakness, cannot sleep at nights, and sweats profusely; very pale and thin and feeble. Has lost much flesh recently.	No headache	Shortness of breath, cough, and expectoration, but less than before; chest narrow and contracted; vocal thrill very feeble. Very feeble inspiration and slightly prolonged expiration. Harsh breathing posteriorly. General deficiency of resonance on percussion. Can count to 20.	Perhaps a murmur at the apex of the heart, certainly the sounds somewhat prolonged. Pulse very slow, 64, and extremely feeble.	Appetite and digestion fair, but complains that he cannot get a sufficiency of nutritious food; seldom animal food; breath affected; bowels regular.	No privy to the house; altogether wretched; 1 room below and 2 above; inhabited by himself, his wife and 3 children; no drainage of any kind.
Ailing for 5 or 6 years, and gave up a year ago. Ascribed his illness to getting chilled when heated and sweating.	Thin, pale, aged, great efforts to breathe; has fallen away much in last year; rheumatic pains especially in shoulders, white hair and partly bald.	Headache -	Suffers from shortness of breathing, cough, and expectoration, worse if he takes cold; he never spat blood, but thinks he vomited some, 20 years ago. Audible wheezing, wide chest, but perfectly flat, arched back, very little movement, somewhat unduly resonant, very feeble and weak, especially on left side, where the respiration sounds are almost inaudible, expiration prolonged; counts to 12; depression above the clavicles.	Beating at heart, increased by exertion, ascending a hill, or going upstairs. Pulse very feeble but not quickened, heart sounds somewhat noisy, but action feeble.	Appetite and digestion good. never passed blood by stool, tongue white, abdomen tumid.	Acknowledged to have drank too much when a publican.
Always delicate, but laid by 3 weeks and in bed 2, now getting pretty well again. Ascribed his illness to exposure to cold when under influence of drink.	Pale and thin	Eyes glassy	Had an attack apparently of palpitation, pain in left side, shortness of breath, cough, and expectoration, but did not spit blood. Chest generally sparingly res. There is now general deficiency especially at upper parts and low down at right side, with defective breathing.	Natural -	During his illness his bowels were relaxed and confined; now has a good appetite and digestion, and bowels are regular.	Wretched cottage, 3 rooms; 8 persons living in them, including a grown son and daughter. No drainage. The man acknowledged to being addicted to habits of intemperance, drinking much ale, porter, brandy, and rum, but said he had not drunk much for 2 months before he got ill.

District, Date, and Disease.	Present Age.	FAMILY HISTORY.			PERSONAL	
		Ages, occupations, state of health, and cause of death of brothers.	Age, occupation, &c. of father.	Ages, occupations, &c. of other relatives.	Age at which he first worked underground.	In what mines he has worked, kind of work, and character of air.
46. Treweller Chapel, Hemiplegia of right side with Chronic Asthma. August 1862.	69	- - -	Father a miner and died at 82.	- - -	At 10 years of age.	Worked all his life underground till he was taken with the first fit; in bad air at Wheal Carne.
47. St. Just; Phthisis; no apparent predisposition. August 1862.	45	6 brothers all living as far as he knows, but 2 in America, all older than himself, all miners.	Father a farmer, lived to 75.	Father had 4 or 5 brothers, farmers, who lived to be between 60 and 70. Mother had no brothers. Does not know ages and occupations of grandfathers. Mother alive at 90. 1 sister living at 30, and healthy. An aunt on mother's side is living at 80.	20, at surface of mines before.	Worked for 3 or 4 years in different mines in St. Just and St. Ives parishes. For the last 25 years he has been a tin dresser and ascribes his illness to having caught cold in his work from exposure. He also thinks the arsenic with the tin and copper ores has done him harm.
48. St. Just; advanced Miners' Asthma. Paralysis agitans. August 1862.	52	- -	Father, miner, died at 41 from injury followed by chest symptoms.	Father's father was a smith and died at about 60.	At 9 years of age.	Has worked in Balleswidden and in Boscean, and has been in poor air, but has generally been in the shafts.
49. St. Just; Obstinate dyspeptic symptoms threatening organic disease. Jaundice, contracted chest, and suspicion of heart affection. August 1862.	52	- - -	Father, miner, died at 63.	Mother died at 83.	At 15 years of age.	Worked in bad air at Balleswidden 11 or 12 years ago, and then at the 70 level, had bad air also at the sea level at Park Noweth, but was then young and did not suffer, also at Wheal Cock at the 90 had bad air. Was working at Balleswidden when he was taken ill, and then had good air. When suffering from the bad air he felt difficulty in ascending the ladders, lightness of head and weakness of legs, but no shortness of breath or beating at the heart.
50. St. Just; advanced Miners' Asthma with consolidation at right apex. August 1862.	62	- - -	Fatheraminer, died at 56 of stomach complaint which continued many years, and he gave up mining and went to farming.	Mother died at 82.	At fourteen, not underground for 15 or 17 years.	Worked in Balleswidden and Crowns 30 years ago, in both had bad air; the mine was hot and there was much smoke, but he did not suffer being young. He worked last at Balleswidden, but the mine is different now, there is very good air in it.
51. St. Just; advanced Miners' Asthma. August 1862.	57	- - -	- - -	- - -	At between 9 and 10 years of age.	Worked in Balleswidden 25 years and had good air there; then went to Bosweddan, where it was very close; the candles would not burn, this was at 85 level; also he worked at bottom level which was very bad; while working in poor air he suffered from shortness of breath, weakness in body and limbs, cough, spitting and brought up black and thick spit; after ceasing to work in the close places he got better.

REFORM CLUB PALL MALL

HISTORY.	PRESENT STATE.					
Duration and assigned cause of illness.	General condition.	Nervous system.	Respiratory organs.	Circulatory organs.	Digestive organs.	Remarks.
8½ years ago had a fit brought on by cold, taken in coming home from Penzance, and was left without the use of the right side. Had another fit about 4 years ago.	- - -	- - -	Very asthmatic, wheezing in all parts of chest, and cough, and expectoration, and shortness of breath.	Heart sounds natural.		
He worked in poor air in Balleswidden, but only for a month. He has been ill for 6 months; his attack commenced with pain in right side; ascribes his illness to having taken cold from exposure after work.	Pale, thin, and emaciated, night perspiration, great debility.	Headache -	Tightness across chest, pain, cough, and expectoration, never spat blood; expectorates less than before and it is white matter, he has less cough. Dulness on percussion at upper parts of chest, especially at right apex, cav. rh. at right apex and bronchitic respiration at left apex, bronchitic rh. in other parts of chest.	No beating at heart, but quick and feeble pulse.	Defective appetite and digestion, bowels usually relaxed 3 or 4 times daily. Tongue furred.	
Had peritonitis 7 or 8 years ago and has never been well since, being laid by frequently. His present illness commenced with great shortness of breath, and that was followed by a violent cough and something seemed to break and he "brought up a large black mass, and after that a quantity of spit as black as ink," and he has continued to bring this up since.	Pale, thin, and aged looking. Paralysis agitans in head, trunk, and limbs.	No headache	Very narrow chest and very slight movement, chest somewhat dull in all parts, wheezing in all parts, subcrepitation in right mamary region, but without marked cough reson.; never spat blood.	Pulse very feeble, no palpitation, heart's action feeble but sounds noisy, especially at apex.	Appetite and digestion both very defective, bowels regular, suffers from flatulency.	
7 months; illness began with jaundice 2 years ago, and then he was in good health.	Pale and thin and old looking.	No headache	Does not complain of chest symptoms, but his chest is very narrow and contracted and deformed. There is also general deficiency of resonance on percussion, with little expansion and harsh breathing; never spat blood.	Does not complain of palpitation, but the first sound of the heart is noisy at the base, but without murmur.	Appetite defective, and his food lies heavy, and he suffers from flatulency but does not vomit. Bowels torpid. Fulness and tenderness in epigastrium, pain after eating, passes matter by stool.	
He left working underground 15 or 16 years ago being then ailing and thinking his health would not stand it any longer; he has been seriously ill 5 months and ascribes his attack to having taken cold at surface; he has latterly been a "stuff" manager at surface.	Thin, pale, and old looking.	No headache	Chest narrow, contracted, and sparingly resonant; slight vocal thrill and subcrepitation at upper part of right side and in lower dorsal regions; spat blood many years ago, but not since he came to surface; cough and expectoration.	Pulse and heart's action and sounds feeble.	Appetite and digestion impaired; bowels confined.	
Laid by 4 years; ascribed his state to general breaking up of power from hard work and poor air.	He complains of weakness and general breaking up and shortness of breath; thin, pale and old looking.	Nothing -	Shortness of breath, cough and spitting, and occasionally of black matter, ordinarily greenish and yellow, viscid and muco-purulent; contraction of chest, very little expansion, and great impairment of resonance on percussion, harsh breathing, suffers from rheumatic pains in different parts of body.	No complaint of palpitation; hearts' sounds noisy.	Tongue clean; appetite and digestion impaired; bowels variable, confined or relaxed.	

District, Date, and Disease.	Present Age.	FAMILY HISTORY.			PERSONAL	
		Ages, occupations, state of health, and cause of death of brothers.	Age, occupation, &c. of father.	Ages, occupations, &c. of other relatives.	Age at which he first worked underground.	In what mines he has worked, kind of work, and character of air.
52. St. Just; Obstinate dyspeptic symptoms, chronic inflammation or organic disease of stomach. August 1862.	61	Has two brothers living, both miners, aged 53 and 55.	Father was a miner, and died of consumption at 67.	Father's brothers were grassmen, and lived to 70 and upwards. Mother died of decline at 67; one sister living andhealthy, aged 63 or 64.	At 9 years of age; when about 20 years of age he left, and was away for about 5 years, engaged in assisting to erect a beacon on the Wolf rock.	About 15 or 16 years ago he worked in very bad air at the 20 level in St. Just United; after he had worked for some time his health failed, he became very nervous, and his food did not agree with him and he was compelled to give up working. He did not do anything for 12 months, and then did a little farming work for another 12 months, after which he again went underground, but he has never been the same man since; he last worked at Bosweddan, and had done so for 6 or 7 years before he gave up. The air was not good, but not so bad as he had been in before.
53. St. Ives, Mr. Rosewall; commencing Miners' Asthma, with consolidation at the right apex. Phthisis, hereditory predisposition. August 1862.	26	A brother living, a miner.	Father miner, died of phthisis at 51.	Father's brothers miners died at 40 and 50. Mother's brothers were all miners, and are all dead. Mother died of decline.	At18, engaged in farm work before.	First worked in Wheal Providence, tin; afterwards at W. Margery, copper; and was working in the latter when taken ill. He never worked regularly in poor air, but it was very damp where he worked; he has also worked at West and East Carradon, and was first taken ill in the bottom, which was very wet; the working was 50 fathoms from the adit, and about the same distance from the shaft.
54. St. Ives, Mr. Rosewall; advanced uncomplicated Miners' Asthma. August 1862.	61	He has 5 brothers, of whom 4 are living at 54, 56 or 57, 42 or 43, and 40. 1 died at 61.	Father, miner, died at 49 of decline, from working in poor air.	Mother died at 70.	At14, worked at stamps before.	Worked in St. Ives parish all his life and chiefly in St. Ives Consols. He worked also at Wrey Consols, and had bad air there, but did not suffer from it; at Trelyon Consols, where the air was poor, at 20 fathoms, the candle would not burn, and required to be set on one side and put behind the workmen. He was working tutwork there, but has chiefly worked at tribute, and was so employed at St. Ives Consols when taken ill.
55. St. Ives, Mr. Rosewall; commencing Miners' Asthma, with Bronchitis. August 1862.	59	- - -	Father, miner, killed at Dolcoath.	Father's brother, miner, died between 60 and 70. Mother's brother a miner, died at 70. Mother died at 91.	12, engaged in farm work before.	Worked in many different mines during his life; was in poor air in Dolcoath at the 150 where he worked 12 months; at E. Wheal Crofty at 90, 2½ years; at North Roskear at 40, 3 years. This was 30 years ago, and he did not suffer from any of them, but then went to S. Roskear at 50 from the adit, and then he suffered after working for 6 months; experienced weakness and pains in the stomach, chest, and head, but not lightness of head or shortness of breath; was ill 4 years. When taken with his present illness he was working at Wheal Margery and had tolerably good air at 70 fathoms.

HISTORY.	PRESENT STATE.					
Duration and assigned cause of illness.	General condition.	Nervous system.	Respiratory organs.	Circulatory organs.	Digestive organs.	Remarks.
His health was giving way for the last 6 or 7 years, but he has been entirely laid by for a year and a half.	Very old looking for his age; pale, thin, anxious expression of countenance; nearly confined to bed.	No complaint	He has no shortness of breathing or cough or expectoration, and there is nothing detectable in the chest.	Pulse very feeble.	For 3 months has had severe pains in the stomach and in the left side and back; the former increases on taking food, and he has vomited almost every meal and within a few minutes of the time of swallowing it. He had some dyspeptic symptoms before, he has never vomited or passed blood, the bowels are very much confined; the abdomen is somewhat full and tender in the epigastrium, shrunken elsewhere.	
Six months, but was laid by 12 months ago for 3 weeks, with cold, he however got quite well beforehispresent attack. He ascribes his illness to having taken cold from working in a very wet place, 100 fathoms from the adit and 50 from the shaft. His illness commenced with pain in the right side, shortness of breath, cough and expectoration; he has several times spat some blood and once fully a pint.	Pale and thin, and much wasted within the last year; dark complexioned, sallow; complains of great weakness in the back and loins, formerly had night perspirations, not now.	No headache	Voice husky, pain in the right side extending up to the right shoulder and across the chest. Cough during the day only slight, but severe every morning and evening; not much expectoration, at first it was black but is not so now; chest narrow and contracted and imperfectly expanded, very little movement, feeble vocal thrill, especially at left side.	Pulse 80 feeble, hearts' sounds and action very feeble; respirations 24, general deficiency of res. on percussion especially above and at right apex; very feeble respiratory sounds everywhere and especially at right apex, and with undue cough res. and the heart's sounds loudly conveyed.	Appetite and digestiongood, bowels confined, tongue clean.	
He never suffered at all from working underground, and never till his present illness from any cause except from intemperance. He ascribes his attack to having taken cold from working at the surface at Werms Downs in the wind and rain, repairing the neck of the shaft. He has been ill 12 months. Illness commenced with pain at the right side, and after 4 or 5 months cough and expectoration came on and he spat blood in considerable quantity, and he has never been well since.	Old looking, sallow, and pale, and dark complexioned. Complains of perspirations at night with fits of coughing, but generally sleeps well.	General nervous tremor, but no complaint of headache, &c.	Very great shortness of breath, cough, and expectoration, but not much, and what he spits is not now bloody. Chest narrow, contracted, and shrunken; depression above the clavicles and large veins on the chest; very little movement, and extremely feeble respiration, vocal thrill rather exaggerated, no rhonchus in any part.	Pulse 100 and feeble, reduced by digitalis, heart's action and sounds very feeble.	Appetite and digestion good, bowels regular and have been so all along.	Had worked in 150 fathom level and 200 from shaft, and it was extremely warm.
He has been ill 4 years, suffering from weakness and pains in the chest. He cannot ascribe his illness to any obvious cause, but thinks he has been breaking up from over work. He still goes underground, but gets gradually worse.	Dark complexioned, pale, aged, very evidently asthmatic.	- - -	Complains of pains across the stomach, shortness of breath, and husky cough, no hœmoptysis at present, but spat some little blood a year ago, he has not now any expectoration. Somewhat defective expansion, general deficiency of res. on percussion, and feeble respiration in all parts, with rhonchus, feeble vocal thrill.	Pulse feeble, heart's sounds feeble, cardiac pulsation visible over a large space and in the epigastrium; counts to only 9.	Appetite and digestion good, bowels confined, tongue clean.	

District, Date, and Disease.	Present Age.	FAMILY HISTORY.			PERSONAL	
		Ages, occupations, state of health, and cause of death of brothers.	Age, occupation, &c. of father.	Ages, occupations, &c. of other relatives.	Age at which he first worked underground.	In what mines he has worked, kind of work, and character of air.
56. St. Ives, Mr. Rosewall; Hypertrophy of Heart and commencing mitral valvular disease. August 1862.	56	- - -	Father worked an engine and afterwards went abroad	Father had not any brothers who were miners. Mother's brothers were miners and went to Cuba and United States, and died there. Father's father a miner, and died between 70 and 80.	At 16, worked at stamps before.	Worked in various mines, and latterly in St. Ives Consols.
57. St. Just; Miners' Asthma and general debility—worn out. August 1862.	62	- - -	- - -	- - -	At 7 years -	Has worked in various mines in St. Just parish, Wheal Owles, Levant, and Balleswidden. The latter had only one shaft then, and the air was very bad and he worked there for years. The mine is now a very good one, but this was many years ago. He worked also in Park Noweth when he was 22 years of age in repairing the shaft, and of 9 men employed with him only 3 are living; they were sinking the shaft, and below the level of the pump, and had to bring up the water in a bucket, and were constantly up to the waist in water and were much chilled.
58. Bodmin Land, Liskeard, Aug. 24, 1862; commencing Miners' Asthma.	53	- -	-	- - -	At 17; farm work before. Has chiefly worked at tribute.	Has worked for the last 15 years at South Caradon, and, except for a period of 13 months has been all along in very good air; but before that time, worked for 3½ years in East Caradon and had very bad air, and was frequently laid up for a short time in consequence. He suffered from pains flying about different parts of the body, but especially in the heart, stomach, and head, and had little appetite, and the food which he took did not agree with him; he has never been thoroughly well since that time. The mine was then a new one, and he was working a long way from the only shaft. Now they have several shafts, and the air is good.
59. Redruth, Aug. 23, 1862; general debility; Rheumatic pains; commencing Miners' Asthma.	60	-	-	-	At 17 years of age.	Worked at first in Dolcoath, where the air was rather close sometimes; has since worked at different times and in different mines, in a good deal of bad air and in cold and damp, but did not suffer much at the time for he was young. His health failed first about 10 years ago, he then had inflammation of chest and liver and fever, and became jaundiced. He went away for four years, doing some farming work, and then got better and went to West Frances, but could not do much; while there he was suddenly taken ill when underground, and has not been able to do anything since four years in February last.
60. Bodmin Land, Liskeard; commencing Miners' Asthma; dyspepsia; deafness. August 24, 1862.	45	- -	- -	- - -	At 8 years of age.	Has worked in the different mines; in those of the Caradon district for the last 7 years; 4 or 5 years ago he worked in Mark Valley for a twelvemonth, and the air was very bad.

HISTORY.	PRESENT STATE.					
Duration and assigned cause of illness.	General condition.	Nervous system.	Respiratory organs.	Circulatory organs.	Digestive organs.	Remarks.
Ailing 10 or 11 years, and was working in Consols when he first got ill. He was not working in particularly bad air, but was sinking a winze about 25 yards from a shaft. He first suffered from beating at the heart and could hear his heart beat, and any one else beside him could have heard it, the beating came on gradually, and he has not had rheumatic fever or any kind of accident. He first felt the palpitation when ascending the ladders. He drove the engine on the surface for 3 or 4 months, and then had to give up entirely.	Dark complexioned and sallow, stout, and robust looking.	- - -	Chest very flat in front, very slight respiratory movement, imperfect res. on percussion, and feeble respiration every where.	Complains of beating at the heart, weakness of stomach, and lightness of the head. Pain in the region of the heart, pulse feeble, cardiac dulness considerably extended, vibration sound with systole, but no distinct murmur.	Appetite and digestion good; bowels regular.	The two men who worked in St. Ives Consols stated that the air in the mine was generally good, but in some of the levels away from the shaft it was very close and extremely hot, so that they could not wear any clothing at all except thin trousers and boots; and some parts could hardly be worked at all. The mine is generally dry.
Knocked off work 4 years ago; ascribes his illness to having worked in very wet level.	Aged and infirm.	Nothing -	Shortness of breath, cough, and expectoration; has spat some blood; breathing attended by loud wheezing, and bronchitic rhonchi in all parts of chest. Sputum very viscid.	Heart's sounds noisy and weak, pulse feeble.	Nothing.	
Has been ailing more particularly for four years; suffering from cough, expectoration, shortness of breath, and beating at the heart; but has continued to work at the mine, though frequently laid by; now unable to work for 3 days.	Very pale and thin, and anxious looking.	No complaint.	Cough, expectoration, and shortness of breath; chest narrow and contracted, and somewhat morbidly resonant, especially on right side. Respiratory sounds very feeble, and defective movement. Never spat blood.	Beating at the heart; heart's sounds somewhat prolonged and harsh at the apex.	Appetite and digestion impaired; bowels regular.	
4 years entirely laid by. Complains of pains in the hands, wrists, knees, and ankles, and in the back and chine.	Very weak, thin, pale, very sallow, and with sunken head, and worn looking.	No complaint.	Much cough and expectoration, but has never spat blood; wheezing in all parts of chest, with forced inspiration; res. on per. somewhat too clear; does not complain of shortness of breathing.	Heart's sounds and action, and pulse at wrist feeble.	Appetite good; digestion fair; tongue furred; has passed blood frequently by stool, and has prolapsion of the rectum; bowels confined and relaxed at intervals.	
Ailing for 2 years, but still working.	Worn looking, thin, and pale.	Very deaf -	Complains of shortness of breath, and tightness across the chest; the respiratory sounds are very feeble.	Heart's sounds rough at apex.	Appetite defective.	

District, Date, and Disease.	Present Age.	FAMILY HISTORY.			PERSONAL	
		Ages, occupations, state of health, and cause of death of brothers.	Age, occupation, &c. of father.	Ages, occupations, &c. of other relatives.	Age at which he first worked underground.	In what mines he has worked, kind of work, and character of air.
61. Bodmin Land, Liskeard, August 24, 1862; commencing Miners' Asthma.	52	- - -	- - -	- - -	At 14 years of age.	Has worked in different mines. About 5 years ago worked in Wheal Wrey lead mine, and the air was "very bad," and he suffered in consequence. He has also worked in "bad air" in West Caradon, and in air which was "not good" in South Caradon; is now working at East Caradon, and the air there is not "very good"; when he worked in bad air he suffered at the chest.
62. Liskeard, August 24, 1862; advanced Miners' Asthma.	39	3 brothers living, at 46 a miner, at 36 a miner, at 27 policeman; 2 sisters living, at 50 and 42.	Father a farmer living at 72, but paralytic. Father's father died of consumption at between 40 and 50; mother's father died at 80. Father's mother died at 70; mother's mother died at 80; mother died at 71, of some chest complaint.	Father's brother a farmer living at 60, but somewhat delicate; mother's brother a smith, suffers from asthma.	At 20; was employed in farm-work before.	Worked at different mines in the neighbourhood of Liskeard, both copper, iron, and lead. Worked last in West Caradon, and had done so for 5 years, when he became too ill to go on, after having been ailing for 2 years. He has chiefly worked at tribute, and has worked in some bad air. He felt the effects of the bad air in the chest and bowels; he had shortness of breath, pain in the left breast, cough, and frothy expectoration. His appetite and digestion were impaired, and he had pains in the head, and loss of power in the limbs.
63. Liskeard, August 24, 1862; Miners' Asthma and Consumption.	28	A brother a mine agent, living at 36.	Father miner died at 60; was injured by a fall, and gradually fell away afterwards.	Father's brother living at 75, a clerk at a mine; another brother died from drinking. Died about 70 years of age. Never had any sister; mother living at 73 and healthy.	16	Worked for 5 years in the Bedford United, and did not suffer at all till 2 or 3 months before he left. He was then working in a "rise" where the air was very bad; the candle would not burn unless it was held on one side; it was 12 fathoms below the adit, and that was at a depth of 15 fathoms, and the "rise" was very far from the shaft. Of 4 men who worked with him, 1 broke down in about a week; 2 others in about 2 weeks, but the fourth and himself stood it out, though they had to be away for a day or two. The work was completed in about a month, but he and another have never been able to do anything since, underground.

HISTORY.	PRESENT STATE.					
Duration and assigned cause of illness.	General condition.	Nervous system.	Respiratory organs.	Circulatory organs.	Digestive organs.	Remarks.
He is still going to mine, but has been ailing for the last two years, and ascribes his illness to having worked in foul air.	Very aged looking, gray, and somewhat bald; pale, thin, and with a stooping gait.	Suffers occasionally from headache.	Complains of cough and expectoration, but has never spat blood. Has also shortness of breathing; chest narrow, contracted, and unduly resonant in some degree. Respiratory sounds harsh.	Heart's sounds feeble; pulse slow and very feeble.	Appetite and digestion defective; bowels regular.	
He has been ailing for several years. He first felt weakness in his limbs in climbing, and got so ill that he was not able to go underground, and remained at surface, acting as an agent. He then after 3½ years got better, and went underground for a year, when he became too ill to work; has not been underground now for 4 years, or able to do anything.	Dark complexioned, and very sallow. Complains of being very weak, and is thin and worn looking, with an anxious countenance; voice husky. Had formerly night perspirations, but does not suffer at present.	No complaint.	Complains of shortness of breathing, cough, and expectoration, and has several times spat blood; he is better now than he was when he first gave up, and than he is in cold and damp weather. Respirations 20; counts to 6 or 8. Chest rounded, and the intercostal spaces filled out; res. on per. unduly clear; very little movement; great effort made to fill the chest, with little effect; wheezing in all parts of chest.	Heart's sounds noisy, but without murmur; no material palpitation; pulse 84, jarring.	Appetite and digestion impaired; bowels confined.	
He has not been underground for 7 years, and ascribes his illness to having worked in bad air. Its effects commenced with headache, loss of appetite, wasting, weakness and pains in the limbs and swelling of one ankle; he also spat blood and phlegm since he went underground. He has been a watchmaker and jeweller, and has kept a school, but got so ill last winter, that he had to give up all work. Thinks he took cold from putting on a damp shirt, after working.	Very nervous and weak; suffered much from night perspirations in the spring, but is better in that respect now; pupils large; he cannot work from shortness of breath.	No complaint.	Not much cough, but has expectoration, and occasionally of blood; pain in the left breast; chest moderately expanded, but flat above; fairly res. on per.; respiration feeble above, harsh below, both before and behind; never spat much blood at a time; counts to 16 or 20.	Pulse somewhat quick and feeble; heart's sounds noisy.	Appetite and digestion good, and bowels regular; tongue clean.	

DISEASES OF MINERS IMPERFECTLY REPORTED.

Age of miner.	At what age he began to work underground, and previous occupation, if any.	How many years he worked underground.	Whether he chiefly worked at tribute or tutwork.	History.	Nature of illness and general condition.
58	1. 18	- - -	- - -	Gave up working from ill health, about 28 years ago, and has worked at surface since.	He suffered from palpitation, and for 3 years was not able to do anything, he then got better and was able to do light work at the surface, but suffers at intervals. He also complains of pains and tenderness in his legs. Resonance on percussion impaired, but respiration fair; heart's sounds noisy but without murmur. Dark complexioned, fairly nourished.
	Dolcoath, July 13, 1862. Palpitation, dyspnœa.				
38	2. 18	- - -	- - -	Worked underground till 4 months ago, and then gave up from his health failing.	Complains of pains in the front of the chest and the surface is tender to the touch; pain and weakness also in the loins; some deficiency of resonance on percussion at right apex, with feeble breathing and cough; res. there. Heart's sounds noisy but without murmur, pulse feeble and quick. Thin, pale, sallow, anxious, and phthisical looking, eyes glassy.
	Dolcoath. July 13. Phthisis.				
57	3. 17	- - -	- - -	Still going underground.	3 years ago had dropsy and swelling of the limbs and was laid by for 3 months; he still suffers from weakness in the loins and thighs, but has a strong arm and is able to work. Heart's sounds noisy, pulse quick and weak.
	Dolcoath, July 13. Formerly Albuminuria and Dropsy.				
45	4. 30	- - -	Shaftman working in wet and draughty places.	- - -	Suffering from rheumatic pains in loins and right side of chest, respiratory sounds feeble, some prolongation of systolic sound at apex of heart.
	Camborne. Rheumatism.				
35	5. 18	17	Working at tribute at Balleswidden.	- - -	Psoriasis.
	In Truro infirmary.				
22	6. 15	- - -	Worked 4 years underground, and then had his arm broken by a fall of ground and was much crushed in the body. Since that he has had spitting of blood and has not been able to do anything for the last 3 years.	Weak and suffering at the chest, especially from palpitation.	There is some deficiency of the resonance on percussion at the right apex, but no undue cough or vocal resonance. He has considerable palpitation, and the heart's sounds are noisy. Sallow and thin.
	Camborne, July 15, Dr. Harris. Effects of injury.				
32	7. 11	- - -	Tutwork - -	Suffering from palpitation.	Has had 2 attacks of "slow fever," one 5 years, the other 6 months ago; chest full and rounded and respiration harsh; heart's sounds feeble; has not spat blood. Pale and thin.
	Clifford and United, Aug. 23, 1862. Commencing Miners' Asthma.				
35	8. 10	- - -	Both - -	Spat some blood at Christmas.	Complains of pain in the side, shortness of breath, and beating at the heart, has no cough or murmur. Pale and thin.
	Clifford and United, Aug. 23, 1862. Commencing Miners' Asthma or Phthisis.				
44	9. 15	- - -	Tutwork - -	Had typhus fever 10 years ago, has suffered for 3 or 4 months from cough and spitting, but has never spat blood, or suffered from palpitation.	Very worn and ill looking; breathing harsh.
	Clifford and United, Aug. 23, 1862. Commencing Miners' Asthma.				
44	10. 15	10	Tribute. Worked in foul air in Kea Park (the candles would not burn), and got a chill followed by rheumatic fever, and has not been able to go underground since, now 19 years ago. Is now working at surface.	Has suffered since he had rheumatic fever at the chest, and still does so severely, occasionally.	Breathing short and very feeble respiratory sounds; cough, but not much expectoration; sounds and action of heart feeble, and pulse at the wrist also feeble. Appetite and digestion good, and bowels regular.
	Clifford and United Mines, Aug. 23. Miners' Asthma.				

Age of miner.	At what age he began to work underground, and previous occupation, if any.	How many years he worked underground.	Whether he chiefly worked at tribute or tutwork.	History.	Nature of illness and general condition.
	11.				
38	12	22	Had a bad hurt 3 years ago, his thigh being broken and his head cut, and has never been well since.	Now suffers from weakness and pains in the back and limbs.	
Clifford and United Mines, Aug. 23. Effects of injury.					
	12.				
44	17 working at surface before.	27	Both tutwork and tribute, about equally.	Ailing, but still working; had inflammation of lungs 2 or 3 years ago.	Pains about the chest and beating at the heart, especially felt on exertion; harsh respiratory sounds; some prolongation of first sounds of heart at apex, perhaps a murmur.
Clifford and United Mines, Aug. 23. Palpitation, dilatation of heart.					
	13.				
39	14 stamps before.	25	Chiefly tribute -	Ailing and unable to work for 4 months.	Two years ago, when working with a pick, he over reached himself and felt something give way on the right side of the chest, and brought up about a pint and a half of blood, and has suffered ever since. Complains of shortness of breath, cough, and expectoration. At the time the hæmoptysis occurred he was away for a week; and again a year ago he was laid by; has now been unable to work for 4 months. No marked signs of pulmonary or cardiac disease.
Clifford and United Mines, Aug. 23. Commencing Miners' Asthma.					
	14.				
51	16	35	Tutwork chiefly -	Caught cold from working in warm places and then going into cold places. Has been laid by for 3 weeks.	Complains of cough and spitting, but has never spat any blood, and has no palpitation of the heart. General deficiency of the resonance on percussion at the upper part of the chest, with feeble respiratory sounds; heart's action and sounds feeble, and pulse at the wrist feeble. He is very deaf.
Clifford and United Mines, Aug. 23. Miners' Asthma.					
	15.				
44	18 surface before.	26	Tribute - -	Fell away 24 feet 7 months ago, and was severely hurt in the head and back; has not been able to work since; was quite well before.	Heart's sounds noisy and harsh; very weak in the back, stooping gait, walks with feeble step; no appearance of injury to spine, and no loss of sensation in lower extremities.
Clifford and United Mines, Aug. 23. Partial Paraplegia from injury.					
	16.				
46	12 - - -		- - -	Working at surface for 15 or 16 months.	Suffers from weakness in the stomach, expectoration and cough; the expectoration is especially in the morning and is frothy; has never spat any blood. Tongue morbidly red, appetite defective, digestion fair, bowels regular; some palpitation; respiratory and percussion sounds impaired, especially at left side; heart's sounds feeble. Sallow and spare.
Dolcoath, July 13. Miners' Asthma and Dyspepsia.					
	17.				
52	14 - - - -		- -	At surface for the last 10 months.	Very readily takes cold and suffers from shortness of breath, cough, and expectoration; on palpitation, appetite and digestion delicate, bowels confined; feeble respiration, and resonance on percussion somewhat unduly clear; heart's sounds and pulse feeble. Sallow and spare.
Dolcoath, July 13. Miners' Asthma and general debility.					
	18.				
28	14 - - -		- -	At surface for last 7 months.	Two years ago took cold from working in water, and had typhus fever, and has never been well since. Suffers from shortness of breathing, cough, and expectoration of dark matter, but never of blood; appetite and digestion fair, but bowels relaxed; pulse small, feeble, and quick; resonance on percussion impaired at each apex and harsh, and with undue cough, res., especially at right. Thin and sallow.
Dolcoath, July 13. Threatened Phthisis, diarrhœa, debility.					
	19.				
16	13 - - -		Rolling and assisting the men.	- - -	Eruption of psoriasis on all parts of body.
Calvadnack, Psoriasis.					

MINERS AT WORK AT WENDRON CONSOLS MINE, 18th AUGUST 1862.

Age.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork.	Has he had any illness and of what character.	Condition and Appearance.
34	16	18	Both	Has had nothing serious the matter with him since he worked underground.	Healthy looking, but sallow and pale.
41	16	25	Tutwork	Nothing	Healthy.
26	16	10	Both	Nothing	Healthy.
21	13 full man's work at 16 or 17.	8	Tutwork	Nothing	Healthy.
23	14	9	Both	Nothing	Healthy.
21	17	4	Tutwork	Nothing	Healthy.
20	13 full man's work at 18 and grass work 2 years.	7	Tutwork	Complains of shortness of breathing and cough.	Delicate looking.
37	25 farm work before.	12	Both	Nothing	Healthy.
25	13 man's work at 15.	12	Tutwork	Complains of dyspeptic symptoms.	Thin, but fairly healthy.
19	15 man's work at 16.	4	Tutwork	Nothing	Healthy, but thin.
30	16 man's work 17.	14	Both	Had typhus in 1857	Thin, but fairly healthy.
24	17 man's work 19.	7	Both	Nothing	Healthy.
22	15 man's work 20.	7	Tutwork	Nothing	Healthy.
22	17 man's work 18.	5	Both	Nothing	Healthy.
19	16 man's work 17.	3	Both	Nothing	Healthy, but marked with small-pox.
18	16	2	Both	Nothing	Healthy, but pale.
22	20	2	Tutwork	Nothing	Healthy.
25	18	7	Tribute	Had a fall, otherwise nothing.	Healthy, but pale.
18	15 still doing boy's work.	3	Tutwork	Nothing	Healthy.
63	20 surface work at mines before.	43	Tribute	Laid by with inflammation of lungs 10 weeks when 25 years of age. Suffers now from shortness of breath and cough and expectoration.	Fairly healthy for the age.
42	16 grass work before.	26	Tutwork	Nothing	Healthy.
53	13	20	Tutwork and Shaftman.	Nothing	Healthy.
27	19	8	Tutwork	Nothing	Healthy.
24	11 first blew an air machine. Full miner at 15.	13	Tutwork	Nothing	Healthy.
40	20	20	Shaftman	Nothing	Fairly healthy.
32	15	17 7 or 8 years in Australia.	Both	Was ill when abroad	Healthy.
28	17	11	Tutwork	Nothing	Healthy.
42	15	27	Tutwork and pump and shaftman.	Nothing	Pale, thin, and delicate looking.
41	24 farm work before	17	Tutwork	Nothing	Healthy.
55	20 grass work before	35	Both	Nothing	Fairly healthy
20	15 16 full miner.	5	Tutwork	Nothing	Healthy.
47	20 stamps before.	27	Both	Has had brain fever and has been ailing for some time with cough and expectoration.	Pale, thin, and very delicate looking.
31	17 stamps before.	14	Both	Nothing	Aged looking and thin.

Age.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork.	Has he had any illness, and of what character.	Condition and Appearance.
62	15	42 stone cutter for 6 years.	Tribute -	Nothing - -	Healthy.
36	16 streaming before.	20	Both - -	Has had inflammation of lungs and ailing since.	Somewhat delicate looking.
21	14 took concern 16.	7	Tutwork -	Nothing - -	Healthy.
33	16 full miner at 23.	17	Tutwork -	Nothing - -	Healthy.
39	17	22	Tutwork -	Nothing - -	Healthy.
34	10 took into concern 15.	24	Both - -	Nothing - -	Healthy.
38	30 stampsand streaming before.	8	Both - -	Nothing - -	Healthy.
40	17 or 18	23	Both - -	Nothing - -	Healthy.
26	14 full miner 16.	12	Both - -	Inflammation of chest.	Fairly healthy.
19	13 full miner 18.	6	Tutwork -	Nothing - -	Healthy.
18	12	6	Tutwork -	Nothing - -	Pale.
17	- - -	3 or 4 months	Tutwork -	Nothing - -	Sallow and pale.
23	19	4	Both - -	Nothing - -	Pale.
26	15 full miner 19.	11	Both - -	Inflammation of chest.	Thin and somewhat delicate looking.
24	14 full miner 16.	10	Chiefly tutwork	Nothing serious -	Pale and somewhat delicate.
19	- - -	3 months	Tutwork -	Nothing - -	Healthy.
30	11 took concern 18.	19	Tutwork -	Typhus 9 years ago	Thin, but fairly healthy.
Calvadnack. 17	14	3	Tutwork -	Pain of side -	Healthy.
Calvadnack. 29	18	11	Tutwork -	Nothing - -	Pale.
26	17 full miner 19.	9	Tribute -	Nothing - -	Healthy.
26	11	15	Tribute -	Inflammation of chest 12 years ago.	Healthy and robust.
28	18	10	Both - -	Nothing - -	Healthy.
20	15 full miner 17.*	5	Both - -	Nothing - -	Healthy.
18	17 worked at stamps before.	1	Tutwork -	Nothing - -	Healthy.
19	14 took into concern 17.	4	Both - -	Nothing - -	Healthy.
19	11 14 man's work.	8	Tutwork -	Nothing - -	Healthy.
19	16	3	Tribute -	Nothing - -	Healthy.
54	15	39	Shaftman -	Has been ailing 3 or 4 weeks.	Worn and thin.
37	17	20	Tutwork, stone mason part of time.	Laid by 2 years ago for 5 weeks with inflammation of chest.	Very delicate looking.
22	10 man's work 16.	12	Tutwork -	Nothing - -	Healthy.
55	15 a farmer for 14 years since that.	26	Tutwork -	Nothing - -	Worn, but healthy.
54	26 farm work before.	28	Tutwork -	Ailing a little at times.	Worn.
53	24 streaming before.	29	Tutwork and shaftman.	Nothing - -	Fairly healthy for age.
45	16	29	Tutwork -	Nothing serious -	Fairly healthy.
45	15 in Australia for 4 years.	30	- - -	Nothing serious -	Fairly healthy.
25	15	10	Tutwork -	Nothing - -	Very healthy looking and robust.
25	18	7	Both - -	Nothing - -	Very healthy looking.
33	18 grass work before.	15	Both - -	Nothing serious -	Healthy.
40	20 stamps before.	20	Both - -	Suffering occasionally from diarrhœa and shortness of breath and beating at heart.	Delicate.
16	12 rolling and assisting men.	4	Tribute -	Nothing - -	Pale and sallow looking.

* Worked at farm-work 6 months from not being able to get work.

Age of miner.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork.	Has he had any illness, and of what character.	Condition and Appearance.
15	12 assisting men.	3	Tutwork -	Nothing - -	Healthy.
20	14	6	Tutwork -	Nothing - -	Healthy.
39	15 grass work before.	17	Both - -	Nothing - -	Sallow, but fairly heathy.

MINERS AT WORK AT LEVANT MINE, 19th AUGUST 1862.

20	19 filling trucks.	1	- - -	Nothing -	Healthy.
18	9 14 full miner.	9	Tribute -	Inflammation of left side a year ago.	Healthy.
22	12 17 full miner.	10	Both - -	Nothing -	Healthy, but thin.
39	12 17 full miner.	27	Both - -	Inflammation of chest a year ago.	Healthy.
22	11 17 full miner.	11	Tutwork -	Nothing - -	Healthy.
40	12 18 full miner	28	Both - -	Nothing - -	Healthy.
42	17 19 full miner.	25	Tutwork -	Nothing - -	Thin, pale and worn looking.
29	10 18 full miner.	19	Tribute -	Nothing - -	Healthy.
20	10 full miner 17.	10	Tribute -	Laid up with rheumatism several years ago, has not had any shortness of breathing and beating at heart since.	Healthy.
16	14	2	Boy's work -	Nothing - -	Pale and thin.
26	9 full miner 18.	17	Tribute -	Nothing - -	Healthy.
14	10	4	Boy's work -	Nothing - -	Pale.
44	10 full miner 14.	34	Tribute -	Nothing - -	Worn and short breathed, but no cough or expectoration.
18	10 man's work at present.	8	Tribute -	Nothing - -	Healthy.
13	10	3	Boy's work -	Nothing - -	Somewhat delicate looking.
46	12 full miner at 18.	34	Tribute -	Nothing - -	Worn looking.
21	9 full miner at 14.	12	Tutwork -	Suffering from cold	Pale and thin.
14	9	5	Nothing -	Boy's work -	Healthy.
16	12 doing man's work.	4	Tribute -	Nothing - -	Healthy.
25	13 full miner at 18.	12	Tutwork -	Nothing - -	Healthy.
45	11 18 miner's work.	34	Tribute -	Nothing - -	Worn for the age.
11	- - -	10 months.	Boy's work -	Nothing - -	Somewhat sallow looking.
16	13	3	Boy's work -	Nothing - -	Healthy but sallow.
17	11	6	Boy's work -	Nothing - -	Healthy but sallow.
40	11 full miner at 17.	29	- - -	Nothing serious -	Worn.
45	9 full miner at 17.	36	- - -	Nothing - -	Healthy, but sallow and thin.
18	12 or 13 full miner at 16.	6	Boy's work -	Had fever and inflammation of lungs after being 5 months underground, 4 or 5 years age.	Thin and pale; suffers from cough and expectoration, but has never spat blood.
18	10 full miner at 15.	8	- - -	Has suffered from headache, cough, and expectoration.	Pale and thin.
31	12 full miner at 16.	19	Both - -	Has lost an eye in blasting.	Healthy.
29	14 full miner at 20.	15	Both - -	Nothing serious -	Thin and pale; marked with small-pox.
35	10 full miner at 17.	25	Both - -	Nothing - -	Healthy looking and robust.
19	9	10	Tribute -	Had a slow fever before he went underground, nothing since,	Thin and sallow.
15	14	1	Boy's work -	Nothing -	Sallow, but healthy.

Age.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork.	Has he had any illness, and of what character.	Condition and Appearance.
18	11	7	Boy's work -	Has had fever attended with diarrhœa, sickness, and pain of head.	Pale, sallow, and very delicate looking.
38	15	23	- - -	Was hurt and laid up by cold, cough, and expectoration, and was away 3 or 4 years, better now.	Thin and pale.
25	11 full miner at 18.	14	Tutwork - -	Hurt his leg in rolling.	Rather thin, but healthy.
21	12	9	Tutwork - -	Nothing - -	Healthy.
45	15	30	Both - -	Ailing - -	Pale and rather delicate.
34	16	18	Both - -	Nothing -	Pale, but healthy.
51	11	40	Both - -	Suffers from cold -	Pale and thin.
14	12 tramming till 14.	2	Both - -	Ailing - - -	Pale and delicate looking.
26	10	16	Tutwork -	Nothing - -	Pale, but healthy.
16	12	4	Tutwork -	Nothing - -	Healthy.
50	20 at surface before.	30	Both - -	Rheumatic pains -	Healthy.
19	13	6	Both - - -	Nothing serious -	Healthy.
42	14	28	Tribute -	Two attacks of inflammation of the side; one last Christmas, the other 2 or 3 years ago.	Thin, pale, and old looking.
23	18 stamps before.	5	Tutwork -	Nothing - -	Healthy, but sallow.
31	20 grass before.	11	Tutwork -	Injured by blasting, and lost an eye.	Pale and thin.
15	13	2	Tribute -	Nothing - -	Pale, thin, sallow, and decidedly delicate looking.
16	11	5	Boy's work -	A stone fell on his hand, and he was laid by for 2 days.	Pale and sallow.
11	- - -	2 months	Boy's work -	Nothing -	Healthy.
26	9	17	Both - -	Had a fall and broke his shoulder. Had slow fever last summer and was laid by for a month suffering from weakness, entire loss of appetite, sickness of stomach, pain of head, heat and sweating at night, and tremblings. Better at one time than another, but without any regularity; bowels not relaxed; not confined to bed, but not able to work.	Healthy, but thin.
32	11	21	Tribute -	Complains of lightness of head and weakness of stomach.	Sallow, but fairly healthy.
26	12	14	Tutwork -	Nothing - -	Thin and sallow.
18	16	2	- - -	Complains of pain in the head.	Thin and sallow.
24	10 full miner at 16.	14	Tribute -	Nothing - -	Pale, but healthy.
20	12 full miner at 16.	8	Both - -	Nothing - -	Healthy.
21	15 or 16	6	- - -	Nothing - -	Healthy, but sallow.
17	10 12 man's work.	7	Tribute -	Nothing - -	Pale, sallow, and thin.
21	9½ man's work at 16.	12	Both - -	Nothing serious -	Healthy.
14	9	5	Boy's work -	Nothing - -	Sallow.
60	13 or 14	47	Both - -	Nothing serious -	Very worn and aged looking, and suffers from shortness of breath, but without cough or expectoration, or beating at heart.
29	12 full miner at 16.	17	Tribute -	Nothing - -	Very thin.
16	12	4	Boy's work -	Nothing - -	Healthy.
32	20	12	Chiefly tribute	Nothing - -	Healthy.
33	15 full miner at 18.	18	Both - -	Nothing - -	Healthy.
45	21	24	Tribute -	Inflammation of chest twice. Pains in limbs and lumbago, and suffers from shortness of breath.	Worn.

Age.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork.	Has he had any illness, and of what character.	Condition and Appearance.
16	11 full miner at 15.	5	Tribute -	Cut of ankle, but nothing serious.	Healthy.
33	13 full miner at 15.	20	Tribute -	Blasted when working at Ding Dong 15 years ago, and sight injured.	Healthy.
13	8	5	Boy's work; assisting men.	Nothing but a slight cut.	Sallow and thin.
21	10 full miner at 17.	11	Tutwork -	Nothing - -	Healthy.
18	8 man's work at 10.	10	Tribute -	Nothing - -	Sallow, but healthy.
48	12 man's work at 15.	36	Tribute -	Nothing material -	Healthy.
54	12 man's work at 16.	42	Tribute -	Hurt by a shot 18 years ago; nothing since.	Thin and pale.
24	13 man's work at 17.	11	Tribute -	Nothing serious -	Healthy.
22	21¾ stamps before.	¼ of a year	Tribute -	Nothing - -	Healthy.
16	9	7	Boy's work -	Nothing - -	Healthy, but sallow.
18	9 man's work at 17.	9	Tribute -	- - -	Healthy.

MEN EMPLOYED AT SURFACE; LEVANT, AUGUST 1862.

Age.	Whether he ever worked underground.	If so, at what age he began to work underground.	How many years he worked.	What he chiefly worked at, Tribute or Tutwork, and character of air.	When he gave up working underground.	Why he gave up working.	Whether now quite well.	If ailing, how does he suffer.
71	Yes -	9	34 or 35	Both at Levant and Botallack.	27 years ago.	Worked at surface since. Doing nothing for last 2 years.	- -	Suffers from cough and spitting and shortness of breath, does not suffer from palpitation or pains in the limbs.
56	Yes -	8	32	- - -	16 years ago.	Became captain.	- -	Suffers from asthma, but less than when he came to the surface. He stated that he was only one of a hundred of those who started with him as miners; the mines then had only one shaft; they had always to go up and down by ladders, and had to work in close places in which the candle would not burn. He with eight others had once to work in a very wet and bad shaft and only one beside himself is now living.
52	No -	-	-	- - -	- -	- - -	- -	Healthy.
71	Yes -	15	21	Worked at tribute in Gwennap; away for 2 or 3 years.	35 years ago.	Became an agent.	Yes -	Healthy looking.
21	No -	-	-	Smith -	- -	- - -	Yes -	Healthy looking.
32	Yes -	20	7	Now sawyer	- -	- - -	Yes -	Healthy.
43	Yes -	19	13	Now sawyer	- -	- - -	Yes -	Healthy.

MINERS AT WORK AT ST. IVES CONSOLS MINE, 20th AUGUST 1862.

Age.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork.	Has he had any illness, and of what character.	Condition and Appearance.
37	30 previously engaged in farm work.	7	Trammer	Has not suffered -	Healthy.
46	13 working at stamps before.	33	Both -	Nothing - -	Healthy.
28	16 at stamps before.	12	Both -	Nothing serious -	Pale and thin.

Age.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork.	Has he had any illness, and of what character.	Condition and Appearance.
39	14 at stamps before.	25	Both	Nothing	Healthy.
21	9½	12	Both	Nothing	Healthy, but pale.
13	11 at stamps before.	2	Boy's work before he worked at the mine, but nothing since.	Had fever	Healthy, but pale.
14	12 at stamps before	2	Boy's work	Nothing	Pale and thin.
37	15 at stamps before.	22	Both	Nothing	Healthy, but pale.
28	18 farm work before.	10	Chiefly tutwork	Nothing	Healthy.
57	15 at surface before.	42	Tribute	Has suffered from pains in body and limbs.	Pale, but fairly healthy for age; very deaf.
32	22 stamps before.	10	Tribute	Nothing but colds occasionally.	Healthy.
26	14 stamps before.	12	Both; has worked in the mines in North and and South America for zinc, silver, copper, and cobalt.	Nothing	Healthy.
32	14 stamps before.	18	Both	Nothing	Healthy.
28	15 stamps before.	13	Tutwork.	Nothing	Healthy, but pale.
20	17 stamps before.	3	Tribute	Nothing	Healthy, but pale.
29	24 at farm work before.	5	Tutwork	Four months ago had "slow fever."	When ill thinks it was caused by his having taken cold, he felt weakness in the limbs and body, entire loss of appetite, and diarrhœa; he did not suffer from headache, cough, or expectoration, and was only a day or two in bed.
21	14	7	Both	Nothing	Healthy.
16	14 working at the frames before.	2	Tutwork	Nothing	Healthy, but pale.
18	15 at stamps before.	3	Tribute; worked as a smith 12 months ago for one month.	Nothing	Healthy, but pale.
27	16 at stamps before.	11	Both	Nothing	Healthy, but pale.
52	14 at surface before.	38	Both	Nothing	Pale and thin.
34	14 surface before.	20	Tribute	Has suffered from colds, but is never in good health.	Has suffered from difficulty of breathing, cough and expectoration, but has not experienced palpitation; pulse feeble; delicate looking.
20	14 at surface after 10.	6	Tribute	Nothing	Delicate looking.
51	16 at surface before, but has worked as a miller for 4 or 5 years.	31	Tutwork	2 attacks of inflammation of chest, 18 months and 12 months ago.	Still suffers from shortness of breathing (counts to 30).
56	13 from 11 at stamps.	43	Tribute	Has suffered at different times.	Thin and pale.
22	17 worked at surface before.	5	Tutwork	Nothing	Healthy.
46	16 or 17 at surface before.	29 or 30	Both	Has suffered from cold.	Pale and thin.
53	13 at surface before. Has farmed a little, when out of core.	40	Tutwork	Has had 3 or 4 attacks of illness.	Dropsy when 17; pale and worn.
54	12 at surface before.	42	Both	Nothing	Says he feels himself old; but is fairly healthy for the age.
59	14 at surface before.	45	Tutwork	Has had 3 attacks of rheumatic fever	Suffering from rheumatic pains, and has some shortness of breath; no beating at heart; delicate.

Age.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork.	Has he had any illness, and of what character.	Condition and Appearance.
38	16 at surface before.	22	Both	Has had 2 attacks of inflammation of lungs, and readily takes cold.	Thin and pale.
36	15 at surface before.	21	Tribute	Had severe cold and fever 6 years since, but says he is now well.	Very pale and thin.
42	21 surface before.	21	Tutwork	Nothing	Very healthy.
51	11 at sea 4 or 5 years, 20 years ago.	36	Both	Nothing	Healthy.
23	13	10	Tribute	Nothing	Healthy. Marked with smallpox.
42	14 at surface before.	28	Both	Nothing	Thin and pale.
33	26 shoemaker before.	7	Tribute	Nothing	Pale, but healthy.
25	19 at farm work before.	6	Tribute	Nothing	Very pale, thin, and delicate looking.
22	14 at stamps before.	8	Tutwork	Typhus fever some months ago.	Healthy.
22	19 engaged in the dressing floors.	3	Tutwork	Nothing	Has spat blood before he went into the mine, but not since. Pale, thin, and delicate looking.
50	15	35	Both	Lost an eye by an accident.	Very pale, thin, and worn.
23	13 stamps before.	10	Both	Nothing	Very pale.
25	13 stamps before.	12	Both	Nothing	Pale, but healthy.
44	10	34	Tribute	Nothing	Worn and pale.
18	12 at a rope-walk before.	6	Tribute	Nothing since, but fever before he went to mine.	Pale, but healthy.
22	16 stamps before.	6	Both	Nothing serious	Pale, but healthy.
33	12 stamps before.	21	Both	Nothing	Pale, but healthy.
23	17 at stamps before.	6	Tutwork	Nothing	Pale, but healthy.
30	14 at stamps before.	16	Both	Nothing	Pale, but healthy.
18	12 stamps before.	6	Tutwork	Nothing	Pale, but healthy.
17	15 at dressing floors before.	2	Tutwork	Nothing	Pale, but healthy.
62	14 at surface after 8.	48	Both	Not lost 4 cores from illness in his life.	Short breathed, but tolerably well and healthy for the age.
60	16 or 17	44	Both	Slow fever several times.	Worn, but fairly healthy for the age.
18	14 at surface before.	4	Tutwork	Nothing except a fall.	Pale, but healthy.
18	16 stamps before.	2	Tutwork	Nothing	Pale, but healthy.
45	17 stamps before.	28	Tutwork	Nothing	Thin and pale.
28	14 at surface before.	14	Tribute	Fever 4 years ago, but nothing else.	Pale, but healthy.
22	11	11	Both	Nothing	Pale and thin.
46	15 farm work before.	31	Tutwork	Nothing	Pale, but healthy.
24	18 farm work before.	6	Tutwork and tramming.	Nothing	Healthy.
24	15 at surface before.	9	Both	Had an injury, but nothing else.	Pale, but healthy.
27	15 at stamps before.	12	Both	Nothing	Pale, but healthy.
31	16 surface before.	15	Both	Nothing	Pale and thin.
34	18 at farm work before.	16	Tribute	Nothing	Somewhat pale, but healthy.
47	18 at school before.	29	Both	Nothing	Pale, but healthy.
37	18 at stamps before.	19	Both	Nothing	Pale and thin.
33	14 at school before.	19	Both	Slight accident, but nothing else.	Pale and thin.
36	20 shoemaker before.	16	Tutwork	Slight accident, but nothing else.	Pale, but healthy.

Age.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork.	Has he had any illness, and of what character.	Condition and Appearance.
44	16 at stamps before.	28	Both - -	Has had fever 2 or 3 times, but is now tolerably well.	Pale, but healthy.
33	15 stamps before.	18	Tutwork -	Slow fever and inflammation of chest 2 or 3 times.	Healthy looking.
52	18 stamps before.	34	Tutwork -	Nothing - -	Thin and pale.
31	12 stamps before.	19	Both; has been 3 years in Michigan.	- - -	Healthy, but pale.
23	14 at frames before.	9	Both - -	Nothing - -	Thin and pale.
45	16 farm work before.	29	Tribute -	Nothing serious -	Thin and worn.
19	14 at stamps.	5	Tutwork -	Nothing - -	Healthy, but pale.
22	14 stamps before.	8	Tribute -	Nothing - -	Thin and pale.
17	12 stamps before.	5	Tutwork -	Nothing - -	Healthy, but pale.
24	15 farm work before.	9	Both - -	Nothing - -	Healthy, but pale.
16	10	6	Boy's work -	Nothing - -	Healthy, but pale.
18	11 stamps before.	7	Both - -	Nothing - -	Very pale.
41	11 stamps before.	30	Tutwork -	Nothing - -	Healthy, but somewhat pale.
56	15 farm work before.	41	Tribute -	Nothing - -	Fairly healthy looking for the age.
23	13	10	Tribute -	Nothing - -	Healthy, but pale.
35	12 stamps before.	23	Tribute -	Nothing - -	Healthy, but pale.
29	13 stamps before.	16	Both - -	Nothing - -	Healthy, but pale.
46	18 at frames before.	28	Both - -	Has had injury, but nothing else.	Pale and thin.
54	13 stamps before.	41	Both - -	Nothing - -	Healthy, but pale.
38	12 stamps before.	26	Both - -	Nothing - -	Healthy, but pale.
22	15 at surface from 11.	7	Both - -	Nothing serious -	Healthy, but pale.

MEN EMPLOYED AT SURFACE, ST. IVES CONSOLS, WEDNESDAY 20th AUGUST 1862.

Age.	Whether he ever worked underground.	If so, at what age he began to work underground.	How many years he worked.	What he chiefly worked at, Tribute or Tutwork, and character of air.	When he gave up working underground.	Why he gave up working.	Whether now quite well.	If ailing, how does he suffer.
36	Yes -	18	5	Worked in some foul air.	13 years ago.	From failure of health and being appointed agent.	Fairly healthy.	Recovered his health after being 6 months at surface.
47	Yes -	10	32	Worked in some foul air.	5 years ago.	Became captain.	Yes.	
33	Yes -	11	15	Has worked in America, worked in foul air.	4 years ago.	Became captain.	Yes.	
51	Yes -	25	Worked for 9 months as trammer.	Working at stamps.	- -	- - -	Yes.	
62	Yes -	In early life.	5	- - -	- -	- - -	Yes -	Fairly healthy for age.
68	Yes -	17	43	- - -	8 years ago.	- - -	- -	For 10 years together never off his core, but was shaftman all his life; short breathed, but fairly healthy for the age.
23	Yes -	13	18 months	Now a sawyer	- -	- - -	- -	Healthy.
79	Yes -	14 or 15	5 or 6	A smith -	- -	- - -	- -	Healthy.

Age.	Whether he ever worked underground.	If so, at what age he began to work underground.	How many years he worked.	What he chiefly worked at, Tribute or Tutwork, and character of air.	When he gave up working underground.	Why he gave up working.	Whether now quite well.	If ailing, how does he suffer.
21	No	-	-	Working at stamps since 11 or 12.	-	-	-	Healthy.
32	No	-	-	Working at stamps.	-	-	-	Healthy.
51	No	-	-	Enginedriver	-	-	-	Healthy.
40	No	-	-	Carpenter	-	-	-	Healthy.
54	No	-	-	Sawyer	-	-	-	Healthy.
54	No	-	-	Smith	-	-	-	Healthy.
51	No	-	-	Smith	-	-	-	Healthy, but pale.

MINERS AT WORK AT WHEAL OWLES, ST. JUST, 21ST AUGUST 1862.

Age.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork.	Has he had any illness, and of what character.	Condition and Appearance.
22	16 working at farm work before.	6	Tutwork	Nothing but a little lightness of head.	Healthy.
19	7	12	Both	Nothing	Healthy.
17	12 at surface before.	5	Tutwork	Nothing but fever 12 months ago.	Somewhat delicate looking.
28	12 at surface before.	16	Tutwork	Nothing	Healthy.
16	12 at school before.	4	Tribute	Nothing	Healthy.
17	15 at grass work before.	2	Tutwork	Nothing	Healthy.
36	18 stamps before.	18	Kibble and skip filler.	Nothing	Healthy.
37	18 tin dressing before.	19	Kibble and skip filler.	Nothing	Healthy.
13	11 stamps before.	2	Boy's work	Nothing	Healthy.
40	12 stamps before.	28	-	Nothing but a broken leg.	Healthy.
44	8	36	Been 6 years in Australia.	Nothing	Healthy.
44	18 farm work before.	7	At farm work for 19 years.	Nothing	Very worn looking.
21	11 at school before.	10	Tribute	Nothing	Healthy.
28	13 stamps before.	15	Tribute	Nothing	Healthy.
37	12	25	Tribute	Has been injured, but nothing else.	Healthy, but very aged.
32	10	22	Both	Nothing	Healthy.
30	21 drove machine on surface for 8 years before.	1	Tribute	Nothing	Healthy.
17	10	7	Tutwork	Nothing	Pale, thin, and delicate looking.
19	15 helping smiths before.	4	Tribute	Nothing	Healthy.
49	10 stamps before.	39	Both	Has had rheumatic pains and fever, but nothing else.	Much worn for age.
48	14 or 15 farm work before.	34	Both	Suffering from shortness of breath, cough, and expectoration. In Australia 6 years and returned 2 years ago, and was ill while there.	Very asthmatic.

Age.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork.	Has he had any illness, and of what character.	Condition and Appearance.
40	10 stamps before.	30	Tribute -	Lost an eye from a fall.	Somewhat delicate and aged.
18	14 stamps before.	4	Tribute -	Nothing -	Healthy.
19	15 stamps before.	4	Both - -	Nothing except scrofulous abscesses of neck, which came when he began to work underground.	Cicatrices of abscesses in neck.
22	12 at stamps before.	10	Tribute -	Nothing - -	Healthy.
22	9	13	Tribute -	Nothing - -	Healthy.
18	10 stamps before.	8	Tribute -	Nothing - -	Healthy.
19	9 stamps before.	10	Tutwork -	Injured, but nothing else.	Pale, but healthy.
20	- - -	4 months	- - -	Nothing - -	Healthy.
19	13 farm work before.	6	Tutwork -	Nothing - -	Healthy.
50	12 at stamps before.	38	Tutwork -	Nothing serious -	Healthy.
20	14	6	Tribute -	Nothing - -	Healthy.
42	13	29	Tutwork -	Nothing - -	Healthy.
29	17 stamps before.	12	Tutwork -	Nothing - -	Healthy.
17	7	10	Boy's work -	Nothing - -	Pale, but healthy.
22	12 at stamps before.	10	Tutwork -	Nothing - -	Thin and delicate.
28	14 or 15 labouring before.	14	Tutwork -	Nothing - -	Healthy.
24	17	7	Tribute -	Nothing - -	Healthy.
19	9	10	Both - -	Nothing - -	Healthy.
22	10 farm work before.	12	Tribute -	Inflammation of lung 5 months ago, and again a fortnight ago.	Delicate.
25	15	10	Both - -	Has formerly suffered from palpitation, but not at present.	Healthy; no murmur.
21	8½	13	Both - -	Brain fever 18 months ago.	Healthy.
17	15 at surface before.	2	Tutwork -	Nothing - -	Healthy.
21	10	11	Tutwork -	Nothing - -	Healthy.
18	9	9	Boy's work -	Pains at left side and palpitation.	Pale and thin; somewhat noisy sounds of heart.
16	14	2	Boy's work -	Nothing - -	Healthy.
26	13 farm work before.	16	Both - -	Nothing serious -	Healthy.
20	12	8	Tutwork -	Nothing - -	Healthy.
46	10	36	Both - -	Nothing - -	Healthy.
49	12 farm work before.	37	Tutwork -	Has had 2 attacks of rheumatism, the first 20 years and the other 10 years ago. No murmur or palpitation.	Aged.
45	16	29	Both - -	Scrofulous abscess in the neck.	Cicatrices of abscesses of neck. Aged.
40	23 farm work before.	17	Labourer -	Injury of leg, &c.	Somewhat delicate.
18	16 at stamps before.	2	Labourer -	Nothing - -	Thin and pale.
31	At 10 for a time, but not regularly till after 14, at stamps before.	21	Both - -	Has had 2 accidents, and had rheumatic fever when 20 and 21 years of age.	Still suffers from palpitation, and there is some prolongation of the systolic sound at apex.

Age.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork.	Has he had any illness, and of what character.	Condition and Appearance.
25	24 at farm work before.	1	Nothing -	- - -	Thin, but healthy.
16	12 at stamps before.	4	Boy's work -	Nothing - -	Thin and pale.
15	14 stamps before.	1	Boy's work -	Nothing - -	Thin and pale.
24	14 stamps before.	10	Tutwork -	Nothing - -	Thin and worn.
25	17 stamps before.	18	Tutwork -	Suffers from shortness of breath, cough, and spitting, but never of blood.	Delicate looking.
48	17 at surface before.	31	Both - -	Took a violent cold 18 years ago, and this was followed by slow fever and he was ill 7 months, ascribed his illness to cold draughts, not bad air.	Thin and pale.
47	20 shoemaker before.	27	Both - -	Nothing - -	Somewhat delicate.
30	15 surface before.	15	Both - -	Nothing - -	Healthy.
28	15 at surface before.	13	Both - -	Nothing - -	Very robust, marked with smallpox, which he had at 14 or 15.
18	9	9	Tutwork -	Nothing - -	Abscess in neck 3 years ago. Thin and pale.
17	9	8	Both - -	Nothing - -	Pale, but healthy.
21	15 stamps before.	6	Both - -	Nothing - -	Healthy, marked with smallpox, which he had at 8.
40	16 farm work before.	34	Both - -	Nothing - -	Healthy.
30	9	21	Tutwork -	Nothing - -	Healthy.
31	12	19	Both - -	Nothing - -	Healthy,
63	13 dressing floors before.	50	Tutwork -	Nothing - -	Healthy.
35	13 stamps before.	22	Tutwork -	Nothing but fever 16 years ago.	Healthy.
22	18 stamps before.	4	Labourer -	Nothing - -	Healthy
23	17 stamps before.	6	Tutwork -	Nothing - -	Healthy.
15	9	6	Boy's work -	Nothing - -	Pale, but healthy.
22	12 stamps before.	10	Both - -	Fever years ago, but nothing else.	Healthy.
45	35 worked at farms before.	10	Kibble filler and tribute.	Nothing but a hurt	Somewhat delicate.
19	12 stamps before.	7	Boy's work -	Nothing - -	Healthy.
22	9	13	Tutwork -	Nothing - -	Pale, but healthy.
35	30 farm work before.	5	Tutwork -	Nothing - -	Pale, but healthy.
14	12 stamps before.	2	Boy's work -	Nothing - -	Healthy.
48	15 at farm work before.	33	- - -	Nothing - -	Healthy.
57	17	40	Both - -	Nothing - -	Healthy.
45	9	36	Both - -	Fever twice, 14 and 10 years ago.	Healthy.
35	12 farm work before.	23	Both - -	Suffers from indigestion.	Thin and pale.
14	12 stamps before.	2	Boy's work -	Nothing - -	Pale, but healthy.
13	10 stamps before.	3	Boy's work -	Nothing - -	Healthy.

MEN EMPLOYED AT SURFACE AT WHEAL OWLES.

Age.	Whether he ever worked underground.	If so, at what age he began to work underground.	How many years he worked.	What he chiefly worked at, Tribute or Tutwork, and character of air.	When he gave up working underground.	Why he gave up working.	Whether now quite well.	If ailing, how does he suffer.
60	Yes	14	2	A smith	44 years ago.	-	Yes	For the age.
29	Yes	11 or 12	6 months	A smith	17 years ago.	-	Yes	
46	Yes	14 stamps before.	12 years	-	38 years ago.	From injury by which he lost the sight of an eye.	Yes	Working at stamps since.
20	Yes	10 helping carpenter before.	3½ years	-	6½ years ago.	Suffered at the chest, but got better afterwards.	Ailing	Still asthmatic.
45	Yes	20	7	-	18 years ago.	Appointed agent.	Yes	Healthy.
71	Yes	18 at stamps before.	20	-	33 years ago.	-	Has had nothing serious the matter with him.	Healthy for the age.
38	Yes	14	6	First worked a machine and afterwards became captain.	18 years ago.	-	-	Healthy.
18	No	-	-	A smith	-	-	-	Healthy.
40	No	-	-	A smith	-	-	-	Healthy.
18	No	-	-	Works a machine at surface.	-	-	-	Pale and thin.
16	No	-	-	Drives machine at surface.	-	-	-	Very healthy.
15	No	-	-	Drives machine at surface.	-	-	-	Very healthy.
15	No	-	-	A smith	-	-	-	Eruption of impetigo on face.
36	No	-	-	A labourer at surface.	-	-	Ailing	Thin and pale.
47	No	-	-	Engine driver.	-	-	-	Healthy, but thin.

MINERS AT WORK AT BOTALLACK MINE, 21st August 1862.

Age.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork.	Has he had any illness, and of what character.	Condition and Appearance.
33	15 worked at stamps before.	18	Both	Nothing	Healthy.
26	16 worked at stamps before.	10	Tribute	Nothing	Pale, but healthy.
52	12 at frames before.	40	Both; was 3 years in America and returned 4 or 5 years ago.	Nothing	Pale, but healthy.

Age.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork.	Has he had any illness, and of what character.	Condition and Appearance.
22	10	12	Both - -	Palpitation of heart 2 years ago. -	Pale and thin, marked with small-pox which he had when 10 years old; no murmur.
14	11	3	At boy's work	Nothing - - -	Pale and thin.
30	17 at farm work before.	13	Tutwork -	Nothing - -	Pale, but healthy.
17	14 at stamps before.	3	At boy's work	Slight accident, but nothing else.	Thin, but healthy.
24	12 stamps before.	12	Tutwork -	Fell away and was injured, but nothing else.	Healthy.
24	11 at stamps before.	13	Tutwork -	Nothing - - -	Healthy.
16	8	8	Both - -	Had a severe fall, but nothing else.	Pale, but healthy.

MINERS AT WORK AT DOLCOATH AND BOTALLACK, July 1862.

61	16 or 18	41 or 43 Dolcoath.	- - -	He stated quite healthy.	Fairly healthy for the age.
80	15 to 20	60 to 70 Dolcoath.	- - -	Stated himself to be healthy.	Very deaf and has lost an eye and his sight is very defective; working till within the last few weeks and then gave up unwillingly.
46	- - -	— Botallack.	- - -	Laid by 12 or 14 years ago from working in a close place.	Delicate, pale, and sallow.
29	15	13 or 14 Botallack.	- - -	Ailing - -	Pale and delicate looking.
42	18	24 Botallack.	- - -	Lost an eye -	Pale and complaining of dyspeptic symptoms, flatulency, sickness, &c.
24	16	8 Botallack.	- - -	Nothing - -	Healthy.
35	15	20 Botallack.	- - -	Palpitation -	Still suffering from palpitation, and perhaps a murmur at apex.
62	10	52 Botallack.	- - -	Nothing serious -	Fairly healthy for age; still working.
69	9	60 Botallack.	- - -	Nothing serious -	Fairly healthy for age; still working.
35	15	18 Dolcoath.	- - -	Suffering from dyspeptic symptoms, had dropsy 3 years ago and was ill 3 months, still weak and especially in loins, and pains there.	Pale, sallow, defective appetite.
57	- - -	40	- - -	- - -	Still working.
29	14	15	Tribute, Camborne.	Never suffered except from colds and an accident.	Very deaf from accident, but otherwise healthy.

MEN EMPLOYED AT SURFACE, BOTALLACK, JULY 1862.

Age.	Whether he ever worked underground.	If so, at what age he began to work underground.	How many years he worked.	What he chiefly worked at, Tribute or Tutwork, and character of air.	When he gave up working underground.	Why he gave up working.	Whether now quite well.	If ailing, how does he suffer.
50	Yes	10	21	When about 19 years of age he worked in a damp end and suffered from difficulty of breathing, in consequence, left work for 2 months and took to weaving flannel and then went underground again, but continued ailing for 2 or 3 years. He continued well till he was about 30 when he took cold from checked perspiration and was laid by for some months, and not quite well for 3 or 4 years.	19 years ago.	Became agent	Yes	Fairly healthy.
65	Yes	18	40	- - -	6 or 7 years ago.	Came to work on surface.	He states so.	
46	Yes	17	9	- - -	20 years ago.	Became agent	Was till recently.	Pain in chest.
42	Yes	12	16	- - -	14 years ago.	Became agent	Yes	Healthy.

MEN EMPLOYED AT SURFACE, DOLCOATH, JULY 1862.

46	Yes	12	33	- - -	15 or 16 months ago.	From failure of health.	Still suffering.	Shortness of breath, cough, and expectoration; sallow and thin. Working at surface.
52	Yes	14	36	- - -	Nearly 2 years ago.	From failure of health.	Still suffering.	Shortness of breath, cough, expectoration, and failure of power in limbs; sallow and spare. Working at surface.
28	Yes	14	13	- - -	17 mths. ago.	Failure of health.	Still suffers.	Shortness of breath, cough, expectoration, and weakness of stomach. Working at surface.
58	Yes	18	12	- - -	Gave up 28 years ago.	Failure of health.	Still suffers.	Palpitation. Working at surface.
38	Yes	18	19	- - -	14 mths. ago.	Failure of health.	Still suffers.	General debility and palpitation. Working at surface.

MINERS AT WORK CLIFFORD & UNITED MINES, GWENNAP OR ST. DAY 23D AUGUST 1862.

Age.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork.	Has he had any illness, and of what character.	Condition and Appearance.
35	11 worked at stamps before.	24	Tutwork -	Nothing - -	Healthy.
54	12	42	Tribute -	Nothing - -	Worn, but fairly healthy.
57	16 at farm work before.	41	Tribute -	Nothing - -	Worn, but healthy.

Age.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork.	Has he had any illness, and of character.	Condition and appearance.
54	14 at stamps before.	40	Both	Has twice suffered from cold at chest; once 10 years ago and again 5 months ago.	Pale and worn.
38	12 at stamps before.	26	Tribute	Nothing	Pale, but healthy.
19	12 at farm work before.	7	Tribute	Nothing	Healthy.
39	12 at dressing floors before.	27	Tutwork	Nothing	Thin and worn.
45	15 at stamps before.	30	Tribute	Nothing	Healthy.
31	10	21	Tutwork	Nothing	Healthy.
36	14 at stamps before.	22	Both	Nothing	Healthy.
28	11 at dressing floors before.	17	Tutwork	Nothing	Pale, thin, and delicate.
38	14 at stamps before.	24	Tribute	Nothing	Healthy.
18	13	5	Tribute	Nothing	Thin and pale.
39	14 stamps before.	25	Tribute	Serious hurt of back, but nothing else.	Healthy.
41	13 at stamps before.	28	Tribute	Nothing	Healthy.
43	14 at stamps before.	29	Tribute	Nothing	Very worn.
29	15 at dressing floors before.	14	Tribute	Nothing	Healthy.
43	17 full miner's work at 17.	36	Tribute	Subject to headache	Very worn looking for age.
27	8	19	Tribute	From 2 or 3 months ago, but nothing else.	Pale, but fairly healthy.
17	13	4	Tribute	Nothing	Thin, but healthy.
20	10	10	Both	Nothing	Healthy.
46	15 at dressing floors before.	31	Tribute	Sprained his ankle, but nothing else.	Pale, but healthy.
35	15 at farm work before.	20	Both	Nothing but cold	Pale, but healthy.
44	17 at surface before.	27	Both	Inflammation of lungs 2 or 3 years ago.	Pains about the chest, cough, and expectoration, and especially when suffering from cold; beating at the heart; respiration harsh; some prolongation of systolic sound at apex.
19	16 at farm work before.	3	Tutwork	Nothing	Pale, but healthy.
35	15 at floors before.	20	Tutwork	Nothing	Healthy.
24	12 farm work before.	12	Tutwork	Had low fever with diarrhœa 4 years ago, and was confined to bed; has never been so well since.	Healthy.
47	17 at floors before.	30	Both	Has had slow fever twice, 5 years and 6 months since; was not confined to bed in the 2d occasion, but had diarrhœa and was ill 2 months; complains of palpitation; chest full and rounded, and respiration harsh; pulse and sounds of heart feeble; never spat blood.	Pale and thin.

Age.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork.	Has he had any illness, and of what character.	Condition and Appearance.
32	11	21	Tutwork	Nothing	Pale, but healthy.
42	13	29	Tutwork	Nothing	Thin, but healthy.
45	9	36	Tutwork	Nothing but fever about 9 years ago.	Pale and worn.
28	13	15	Tutwork	Nothing but colds	Pale, but healthy.
54	14 farm work before.	40	Tutwork	Nothing	Healthy.
23	10 stamps before.	13	Tutwork	Nothing but colds	Pale, but healthy.
28	14	14	Tutwork	Is blind of an eye from ablast; has also had fever recently and was confined to bed, and is still weak.	Delicate looking.
43	12	31	Tutwork	Nothing but colds	Worn and somewhat delicate.
19	15 at farm work before.	4	Tutwork	Nothing	Pale and sallow, and somewhat delicate.
40	12 at floors.	28	Tutwork	Nothing	Thin and sallow.
48	23 at surface before.	25	Fills kibbles	Nothing	Worn and somewhat delicate.
17	14 at stamps before.	3	Tutwork	Nothing	Thin and pale.
24	8½	16	Tutwork	Nothing	Thin and pale.
51	16 at stamps before.	35	Tutwork	Very delicate looking. Caught cold 3 weeks ago from working in very hot places where he was unable to wear his shirt and then going for relief into a cold place; has still cough and expectoration but has never spat blood, no beating at the heart, general deficiency of resonance on percussion at the upper part of the chest with feeble breathing and feeble sounds of heart; deaf.	
25	12	13	Both	Nothing	Pale, but healthy.
61	11 at floors before.	50	Tutwork	Nothing but colds, experiences shortness of breathing; cough and expectoration when suffering from cold.	Fair for age.
47	13 stamps before.	34	Tutwork	Nothing	Worn, but healthy.
48	15 floors before.	33	Tutwork	Nothing but slight injury.	Thin and pale.
55	12 at floors before.	43	Tutwork	Slightly injured, but nothing else, and has taken cold occasionally.	Worn.
25	12 at stamps before.	13	Tribute	Nothing	Healthy.
25	8	17	Both	Nothing	Healthy.
47	12 at surface before.	35	Tutwork	Nothing	Thin and worn.
21	9 at stamps before.	12	Both	Nothing	Healthy.
25	14 at stamps before.	11	Tutwork	Nothing	Healthy.
20	12 stamps.	8	Both	Nothing	Thin, but healthy.
17	12 at stamps before.	5	Tutwork	Nothing	Thin and sallow.
23	11 worked before in a stone quarry.	12	Tutwork	Nothing	Thin, but healthy.
44	18 at surface before.	26	Tribute	Had a fall of 24 feet 7 months ago and pitched on his head and injured his back, was much shaken and has not been able to work since; heart sounds noisy and harsh; weakness of back; quite well before.	
43	14 at surface before.	29	Both	Has had injury of his right hand; states he is tolerably well, but very much worn.	

Age.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork.	Has he had any illness, and of what character.	Condition and Appearance.
15	14 at floors before.	1	Boy's work -	Had smallpox, but nothing else.	Thin and pale.
18	13 at floors before.	5	Tutwork -	Nothing - -	Thin and sallow.
16	13 at floors before.	3	Both - -	Nothing but smallpox.	Sallow, but healthy.
61	12 at surface before.	49	Both - -	Suffers from shortness of breath, cough, and expectoration, and very readily takes cold.	Old for the age.
22	12 at floors before.	10	Tutwork -	Nothing - -	Thin, but healthy.
44	13 at farm work before.	31	Tribute -	Nothing - -	Healthy.
27	9½ full miner's work at 15.	6	Tribute 4½ years in Cuba.	Nothing - -	Pale and thin, and always so; fair.
61	20 farm work before.	41	Tutwork -	Nothing - -	Worn, but healthy.
49	20 at surface before.	29	Tribute -	Nothing - -	Healthy.
38	13 at stamps before.	25	Tribute -	Nothing - -	Healthy.
25	14	11	Tribute -	Nothing - -	Healthy.
41	12 stamps before.	29	Tribute -	Nothing - -	Worn, but healthy.
36	14 at stamps before.	22	Tutwork -	Nothing - -	Worn, but healthy.
38	14 farm work before.	24	Tribute -	Nothing - -	Healthy.
35	10 full miner at 14.	25	Both - -	Spat some blood last Christmas and has pain in the side, shortness of breathing, and beating at the heart; no cough and no murmur.	Pale and thin.
26	12 at farm work before.	14	Both - -	Nothing - -	Healthy.
28	14 stamps before.	14	Tutwork -	Had typhus from 8 years ago.	Healthy; marked with smallpox.
40	13 at farms before.	27	Tutwork -	Nothing - -	Healthy.
22	10 full miner at 15.	12	Tutwork -	Nothing - -	Healthy.
20	14 at stamps before.	6	Tutwork -	Nothing but smallpox a year ago.	Pale, but healthy.
29	14 at stamps before.	15	Tribute -	Nothing - -	Pale and thin.
38	11 at stamps before.	27	Tribute -	Nothing - -	Thin, but healthy.
50	11 stamps before.	39	Tribute -	Had inflammation when a boy, but nothing since.	Worn, but healthy.
44	15 at farm work before.	29	Tutwork -	Had his leg broken but nothing else.	Pale, but healthy.
45	10 full miner at 16.	35	Tutwork -	Nothing - -	Thin and delicate looking.
32	10	22	Both - -	Had slow fever with diarrhœa 2 years ago but has not otherwise suffered.	Thin and pale.
50	12 at surface before.	38	Tutwork in the Brazils for 5 years.	Nothing - -	Healthy for the age.
22	14 or 15 farm work before.	7	Tutwork -	Suffered from fever when working at Wheal Damsel, and has also had a sun stroke, and suffers from fullness of head and beating of heart; no murmur.	Thin and pale.
46	13 working at surface before.	33	Tutwork	Nothing but colds	Healthy.
15	10 stamps before.	5	Boy's work -	Nothing - -	Pale, but healthy.

Age.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork.	Has he had any illness, and of what character.	Condition and Appearance.
39	22 at surface before.	17	Tutwork -	Nothing but slight colds.	Thin and pale.
50	17 at floors before.	33	Tutwork -	Inflammation of chest and lungs 15 years ago and weakness and palpitation since; some cough and spitting but no shortness of breathing except when suffering from cold; no murmur.	Very worn.
54	19 at fan work before.	35	Tutwork -	Had inflammation of chest 10 years ago but no symptoms since.	Worn.
45	20 surface before.	25	Both - -	Has suffered from cold occasionally, but is now tolerably well.	Fairly healthy.
39	14 at stamps before.	25	Tribute -	Health failed 2 years ago.	Shortness of breathing, cough, and expectoration; decidedly delicate.
40	13 at stamps before.	27	Tutwork -	Nothing - -	Healthy.
22	10 at stamps before.	12	Tribute -	Nothing - -	Healthy.
54	17 at farm work before.	37	Tutwork -	Nothing intemperate.	Healthy.
38	15 at surface before.	28	Tutwork -	Nothing but colds	Healthy.
27	14 at stamps before.	13	Tutwork -	Had slow fever 12 months ago but was able to get all the time.	Thin and pale.
45	16 at stamps before.	29	Tutwork -	Nothing - -	Worn, but healthy.
44	15 at stamps before.	29	Tutwork -	Had typhus fever 10 years ago; now has suffered for 3 or 4 months from cough and spitting, but has never spat blood, and occasionally has beating at heart.	Very worn and ill looking.
27	12 at stamps before.	15	Tutwork -	Nothing - -	Pale, but healthy.
30	12 at floors before.	18	Tutwork -	Nothing but an injury.	Worn and thin.
29	13 stamps before.	16	Tutwork -	Nothing - -	Healthy.

MEN EMPLOYED AT SURFACE IN CLIFFORD AND UNITED MINES.

Age.	Whether he ever worked underground.	If so, at what age he began to work underground.	How many years he worked.	What he chiefly worked at, Tribute or Tutwork, and character of air.	When he gave up working underground.	Why he gave up working.	Whether now quite well.	If ailing, how does he suffer.
51	Yes -	16	8	Tutwork -	37 years ago.	Became a labourer at the surface and did not suffer from being underground.	Yes -	He states quite healthy and appears so for the age. When he first gave up going underground he went to an arsenic manufactory and was employed in preparing the pure arsenic from the rough drug. The flues of the furnace were cleaned out once a week, the fires were put out on the Saturday night, the men went into the chambers on the Monday morning; they had to go in by a man-hole and to go fully 18 feet from the opening, and the flues were then sometimes so hot that they could only remain for 5 or 10 minutes at a time. From 10 to

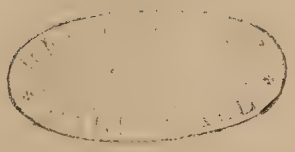
Age.	Whether he ever worked underground.	If so, at what age he began to work underground.	How many years he worked.	What he chiefly worked at, Tribute or Tutwork, and character of air.	When he gave up working underground.	Why he gave up working.	Whether now quite well.	If ailing, how does he suffer.
						15 tons of arsenic were removed each time the flues were emptied. He did not suffer at the time from griping pains, sickness, or diarrhœa, nor did his hair fall off, nor was his condition at all impaired, but he had a burning sensation occasionally at the pit of the stomach and across the chest, and spitting, and blotches appeared upon the face and body. If there were any places which were scratched they festered.		
44	Yes	15	10	Tribute	9 years ago.	Had worked in very bad air in Kea Park, the candles would not burn and he suffered at the chest. He took cold and had rheumatic fever, and has not been able to go underground since.	He still is occasionally very bad, but is at present better.	He suffers from shortness of breath and cough, but has very little expectoration, and the respiratory sounds and resonance are feeble; the heart sounds and pulse also feeble; appetite and digestion good, bowels regular.
38	Yes	12	20	-	3 years ago.	Injured by a fall, had his thigh broken and was cut and bruised very badly, and has never been well since.	No	He suffers from pains in the back and limbs and weakness, and is quite unable to work, but there is no evidence of injury to the spinal column.
19	No	-	-	Works at crushers.	-	-	-	Thin, but healthy.

MINERS RESIDING AT BODMIN LAND, AND LISKEARD,
examined in their own Cottages, 24th August 1862.

Age of miner.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork, and character of air.	Has he had any illness, and of what character.	Condition and Appearance.
29	10 at first occupied in rolling.	19	Tutwork: has worked in poor air, especially in South Carradon and WhealHooper, but did not suffer at the time.	Has not suffered, and is well.	Healthy looking.
25	12	13	Tutwork: has worked in poor air at WhealHooper for 2 months, and suffered in the head and stomach. Has also worked in poor air at East Caradon.	Has suffered, but is well.	Fairly healthy looking.
25	15 engaged in farm work before.	10	Tribute: has worked in rather poor air in Fowey Consols 2 years ago, and was laid by 2 months in consequence.	Suffering from palpitation of the heart.	Delicate looking; action of heart unduly powerful, but no murmur.

Age.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork, and character of air.	Has he had any illness, and of what character.	Condition and Appearance.
36	8	28	Both: never worked in materially bad air, but has suffered a little from it across the stomach.	Has suffered, but is now well.	Fairly healthy looking.
23	Has only just began to go underground, and was previously engaged in farm work.	- - -	- - -	Has not suffered, and is well.	Delicate looking.
34	10	24	Both -	Injured one eye and lost another by an explosion in South Caradon.	Healthy looking.
29	12	17	Both: worked for a short time in poor air in South Caradon.	Has not suffered and is well.	Pale and thin.
27	16 or 17 working at floors before.	11	Chiefly tribute, in South Caradon: worked in Wheal Ray which was not bad air, but the mine was dry and cold, and he suffered from the dust.	Has suffered at the chest, and is now asthmatic.	Complains of cough and expectoration and shortness of breath, and is pale and delicate looking.
35	26 engaged in farm work before.	9	Trammer -	Suffering from rheumatic pains in different parts of body, but healthy before he went to mine.	Delicate looking, pale and thin.
15	10	5	Both: has always worked in good air.	Has not suffered and is well.	Healthy looking.
42	30 engaged in farm work before.	12	Tutwork: has worked in poor air, and for 2 months in very bad air at West Caradon, 5 or 6 years ago.	Has had inflammation of the bowels and a stoppage, but he thinks it had nothing to do with his working underground.	Very delicate looking.
18	8	10	Tutwork: works at Craddock Moor, the air of which is "not so very well."	He has never suffered, and is now well.	Healthy looking.
48	12	36	Tribute: has been in Michegan. Has latterly worked in South Caradon, of which the air is not so bad. He however states that "all miners suffer from poor air, more or less."	Ailing and complaining of dyspeptic symptoms.	Pale, worn and aged.
50	11	39	Tribute: has been in Tenessee and Illinois. Suffered when he worked in Carn Brea when 24 years of age, and was then laid by for 8 months. Thinks he ultimately got quite over it. He has chiefly worked at tribute, and the "tributors get good air if it is to be got."	Has suffered and still complains of dyspeptic symptoms.	Decidedly aged and worn.

Age.	At what age he began to work underground.	How many years he worked underground.	What he chiefly worked at, Tribute or Tutwork, and character of air.	Has he had any illness, and of what character.	Condition and Appearance.
42	10	32	Both; but has also been engaged in working the pump. Worked in bad air in Gonemana some years ago, and suffered in some degree from it. He has also worked much in wet and cold shafts.	Has suffered from asthmatic symptoms and chronic diarrhœa, and states he is weak and delicate, which he ascribes to having to walk 3½ miles to the mine, and sometimes getting wet, and then having to put on his clothes wet after he has done working. There is a "dry" at the mine, but sometimes the man who has charge of it is not able to dry all the miners' clothes.	Pale, worn, and decidedly delicate looking.
29	20 drove engine before.	9	Tutwork: worked in bad air in West Caradon last Christmas.	Has not suffered, and is well.	Pale, sallow, and delicate looking.
20	11	9	Tutwork: worked in poor air in Mark Valley for 12 months and suffered in consequence from shortness of breath and tightness across the chest.	Injured by fall in legs and side.	Asthmatic and infirm.
37	23 engaged in farm work before.	14	A trammer: has worked a little in bad air at West Caradon.	Never suffered, and is now well.	Healthy looking, but pale.
17	15 worked at floors before.	2	Both: worked in bad air in Mark Valley, and felt it in his head.	Is now well -	Healthy looking.
21	11	10	Both: worked in very bad air in 65 level in Okle Tor near Calstock.	Has an eruption on the skin, and suffers in head and chest.	Delicate.
28	14	14	Tutwork: worked in bad air 14 or 15 years ago, and suffered in the legs and side.	Is now well -	Healthy looking.
22	9	13	Tutwork: worked in bad air in South Caradon, and lost his appetite, and became weak in consequence.	Is now well -	Pale, but healthy looking.
17	10 or 11	7	Tutwork -	Has never suffered, and is well.	Pale, but healthy looking.



DISEASES OF MINERS

IN

THE NORTH OF ENGLAND AND WALES,

THEIR FAMILY HISTORY, PERSONAL HISTORY, AND PRESENT STATE; WITH REMARKS.

BY

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DISEASES

Name.	Present Age.	FAMILY HISTORY. Ages, occupations, and state, &c. of brothers and sisters.	FAMILY HISTORY. Ages, occupation, &c. of father and mother.	PERSONAL. Age at which he first worked under ground.	PERSONAL. In what Mines he has worked, kind of work, and character of air.
1. Alston, August 3, 1863; Mr. Arnison. Advanced miners' asthma.	67	2 brothers, miners, and died of miner's disease at 40 and 45.	Father a miner and died of miner's disease at about 63, but had left mining and worked at farm labour for 7 or 8 years before his death.	3 months before he was 7 years of age.	He states that he has worked at several different mines in the neighbourhood of Alston, and sometimes in very bad air, where candles could only be got to burn by being held on one side or set behind him, and sometimes they would not burn at all. He worked lastly in very bad air at Nents Berry Green 10 or 12 years ago.
2. Clitheroe, Alston, August 3, 1863; Mr. Arnison. Advanced miner's asthma, with consolidation of upper parts of lungs.	55	A brother, a miner, died at 53 of miner's complaint, and a sister at 30 of consumption.	Father was a tailor, but he does not know at what age or of what complaint he died. He is ignorant also of the age at which his mother died, or of the cause of her death.	First went underground when 16 years of age.	He has worked in several mines in the neighbourhood of Alston, more particularly at Blaygill. He has also worked in Hartley Burn Colliery. When at Blaygill, he worked in 1836 in very bad air. They had indeed no air but what was blown to them from another part of the mine by a small machine. They were working at the low level 700 fathoms from the entrance. There was much water, and the candles would only burn when held on one side. The heat was also so great that they could scarcely wear any clothing. After they finished the level they worked in a rise, and got air when they got through to another level. There were 6 of them employed in the work, and they worked night and day for 3 years. While working 2 or 3 of them were taken ill, and one was seized with a fit from working in the bad air. All of them but himself are now dead. When working in bad air he lost his appetite, and his breathing was very bad.
3. Alston, August 3, 1863; Mr. Arnison. Obstructive and regurgitant disease of aortic valves; dropsy.	70, latterly a butcher.	Had 3 brothers, all miners; one died at 52, of some lingering disease; one 60 suddenly, probably from cardiac disease; one killed at 50 by rock falling upon him.	Father a miner, and died at the age of 60. Cause of death not known.	At 10 years of age.	He worked in Mr. Beaumont's mines at Allenheads. He suffered from rheumatic pains, chiefly in hip joints, when working in the mines many years ago.
4. Nenthead, Aug. 3, 1863; Mr. Carson. Advanced miners' asthma, with consolidation.	50	He has 4 brothers living, at from 42 to 61 years of age, and one brother died at 50 of miner's complaint. All were miners. 2 sisters living at 63 and 54.	His father was a miner and died of miner's complaint when between 50 and 60 years of age. Mother died at 62.	At 18, and has worked steadily since.	He has always worked for the London Lead Company, and has worked in bad air. "Indeed all miners have to work in bad air more or less."
5. Nenthead, August 3, 1863; Mr. Carson. Commencing miner's asthma. Living in his own cottage, with a small piece of garden.	49	He has a brother, a miner, living, and 2½ years younger than himself. He has lost a brother a miner at 45 by miner's complaint. He had 3 sisters; 1 died at 26 in childbirth, 2 are living at 55 and 42.	His father was a miner, and died of consumption after having brought up much blood. His mother took cold in washing, and died in consequence.	First went to work under ground at 15.	He has worked in a great deal of bad air at Beaumont's mines, and has also worked in bad air at West Allen. He has not worked for the London Company. Lately he has worked in good air. He goes a mile under ground, but there is an opening all through. He knows when the air is bad, by the candles not burning well or going out; and this is often the case when they go in the morning. Sometimes they cannot get in for 2 or 3 days together. The mines are now generally well drained, but they were not so formerly. The bad air affects him by taking away his appetite. He does not get sick and vomit, but he has had headache and dizziness, singing in the ears, and loss of power over arms and legs. Some of the mines are wet, and some dry, and some places are very hot.

OF MINERS.

HISTORY.	PRESENT STATE.				
Duration and assigned cause of illness.	General condition.	Nervous system.	Respiratory organs.	Circulatory organs.	Digestive organs.
He has never been well since he worked at Nents Berry Green 10 or 12 years ago. He was compelled to give up working entirely 4 years ago.	-	-	Breathing very much affected, and suffers from cough and spitting. Signs of emphysema and chronic bronchitis.		
His health broke up so that he was not able to do any work upwards of a year ago; but his health had been failing 9 or 10 years before. He ascribes his illness to working in "bad air and slavish work;" and says that he had a fit when working in Blaygill in 1845.	-	-	Breathing very bad and cough, but not much spitting. General contraction of the chest, and falling in at each apex, with bronchial respiration heard at the apices.	Heart sounds natural.	Appetite and digestion fair, and bowels regular.
Gave up working as a miner 20 years ago, but had had rheumatism, and worked in bad air. He worked as a miner 40 years. The cardiac symptoms have arisen within the last year.	Anasarcous, and especially œdema of lower extremities.	-	Breathing so difficult that he is incapable of lying down. Respiratory sounds everywhere harsh.	Loud double murmur heard at the base of the heart. The first murmur becoming louder and more prolonged at right side of upper part of sternum; the second sound louder on left side of lower part of that bone. Pulsation of carotids and of radials. Pulse large, full, rapidly disappearing (regurgitant).	
4 years ago he gave up work, but has been ailing more or less for 16 years. He suffered from shortness of breath, cough, and spitting, and has occasionally spat some blood.	Sallow and thin, eyes glassy.	-	Breathing very short, and can only count to 10. Cough and expectoration, and occasionally brings up dirty matter. Chest much contracted, especially above, and movements very defective. Deficiency of the resonance or percussion at the right apex, and bronchial respiration at the right apex, and sibilant and sonorous rhonchus to be heard in all parts of chest.	Pulse feeble and quick. The systolic sound of the heart at the apex somewhat grating.	Appetite and digestion impaired.
He first began to suffer with an attack of influenza, which he had 13 years ago; and though still working has suffered more or less since, and has been off for 3 months at a time, suffering from shortness of breath, cough, spitting, and has occasionally spat blood.	Eyes pale and glassy, and hair light coloured, but complexion very sallow.	-	Chest narrow, but full and rounded, morbidly resonant in front, and respiratory sounds feeble. Fallen in above the clavicles. Vocal thrill impaired, and especially at the right side Movements of the chest not materially impaired. Counts rapidly to 20.	Heart sounds flat.	Appetite and digestion impaired; bowels regular.

Name.	Present Age.	FAMILY HISTORY. Ages, occupations, and state, &c. of brothers and sisters.	FAMILY HISTORY. Ages, occupations, &c. of father and mother.	PERSONAL. Age at which he first worked under ground.	PERSONAL. In what Mines he has worked, kind of work, and character of air.
6. Nenthead, August 3, 1863; Mr. Carson. Miners' asthma, and curvature of the spine.	44	1 brother, a pitman, is living; and 2 others who were miners died at 51 and 45; the latter vomited much blood.	Father a miner, and died of miner's disease when 51. Mother died of paralysis at 67.	Went under ground when between 7 and 8 years of age.	Has worked all his life under the London Lead Company. When he first went to the mines the air was very bad, and often they could scarcely keep awake, they became so sleepy when working in it. He never worked where the candles could not be got to burn, but often where they required to be held on one side.
7. Nenthead, August 3, 1863; Mr. Carson. Miners' asthma.	51	He has lost a brother, a miner, at 54. He has his only sister still living at 57.	Father was a miner, and died worn out between 60 and 70. His mother died about the same age, with water on the chest.	First went under ground when 18 years old.	He has often worked in bad air. Sometimes the candles won't burn at all, at others they burn very badly, and the miners are almost suffocated. He has worked for the "Governor and Company" all his life.
8. Nenthead, August 4, 1863; Mr. Carson. Chronic rheumatism.	47	He has a brother, a miner, 40 years of age. Of his sisters 2 died early. He has 3 other brothers, who are living and healthy, from 36 to 41.	His father was a miner, and died of miner's complaint and rheumatism at 50. His mother died at 60 of dropsy.	First went under ground at 10 or 12 years of age.	Has always worked under the London Company, and generally in good air, and never in very bad or damp places; but has worked a good deal in draughts.
9. Allenheads, August 4, 1863; Mr. Hewitson. General failure of power, and asthma and dyspepsia.	66	Brother, a miner, died at 30, and a sister at 21. He does not know of what complaints.	Father was a miner, died at 30.	At 9 years of age.	Has worked in the mines at Allenheads, and constantly since he commenced working till he gave up.
10. Allenheads, August 4, 1863; Mr. Hewitson. Chronic bronchitis and emphysema, "miners' asthma."	56	Has a brother, a washer, aged 36; and brother at 51, a miner; 3 sisters living and healthy at 40 to 58 years of age. Has lost 2 brothers, miners.	Father a miner, died at 77 years of age. Mother living at 77.	At 9 years of age. He says he thinks the cause the miners suffer so much is that they go underground too soon. They should not go before 17, 18, or 20.	After commencing he worked steadily till he gave up. He says that the mines are not so bad as formerly, but there are still bad places in all mines, and the men have to work in bad air both in driving the levels and getting the ore. When that is the case the candles will not burn, or burn very badly. The effect of the bad air is to make them suffer from headache, and very dizzy, and so sleepy that they would willingly lie down and go to sleep. Often they are sick, and heave up on leaving the mine. He had never known any one have any kind of fit. The air did not affect his breathing, or make his heart beat.
11. Allenheads. Mesenteric disease and tuberculous ulceration of bowels; commencing phthisis; hereditary predisposition.	32	He has 3 brothers living, all miners, aged 26, 28, and 36. He has a sister living and healthy at 38, but has lost 2 by consumption at 18 and 40.	Father died at 53 of consumption brought on by mining.	Went underground first when 17 years of age.	Worked in the mines at Allenheads. When sinking the shaft at Breckon Hill some chance times the air was very bad; the smoke did not clear off; the candles burnt to a certain extent, but it was with a great deal of work to keep spreading the wicks and heeling the candles; and then it got so dark that they could not see two fathoms above them. He went to work at the shaft when it was 18 or 19 fathoms from the surface, and continued until they had got to 58 or 60. It was worked day and night at 6-hour shifts, and he worked at it for 4½ years. There were 12 men employed upon the working, and many of them suffered. The wet was always falling, and kept them drenched for the whole shifts of six hours, and he had pains in the back from it. While engaged in this did not feel altogether right, but might have taken cold; but he continued to work, and went afterwards to Allenheads mine, and worked in Henry's vein at 100 fathoms. That was at times only middling as to air. The level was ventilated by a furnace at the top, and that did a great deal of good. But some chance days it was very bad; the candles would not burn, and the men were "drove to leave work." The weather, he thinks, affects the mines. If a dull day, the air in the mine is dull. While working here he got worse, brought up his food, and lost his appetite, and his bowels were very costive, but after a time he had diarrhœa. This is about 16 weeks ago, and he has got a little better since, especially for the last 3 weeks.

HISTORY.	PRESENT STATE.				
Duration and assigned cause of illness.	General condition.	Nervous system.	Respiratory organs.	Circulatory organs.	Digestive organs.
He has had a curvature of the spine, and has been weakly all his life, but thinks the mine has made him worse, and this he ascribes to breathing the dust. The air is now far better than when he commenced working as a miner, for the levels are opened up so that one working opens into another. He has been out of the mines for 7 years, employed as a labourer at the surface.	Complains of general weakness; complexion very sallow, conjunctivæ tinged with bile.	- - -	Shortness of breath, cough, and some spitting, but has never spat blood. Counts to 12. The movements of the chest and the resonance in percussion are not materially impaired; but the respiratory sounds are everywhere harsh.	Heart's sounds somewhat loud.	Appetite and digestion bad. Bowels relaxed, but he has never passed blood.
Has been laid by for 2 years, and ascribes his illness to having worked in bad air, and to the dust and powder "reek" in the mines, and this is when they are far from a shaft.	Thin and sallow; eyes glassy.	- - -	Chest narrow and prominent in front; dullness in percussion at upper parts on both sides, especially the right; and bronchial respiration and loud cough resonance there; respiration elsewhere harsh.	Pulse feeble; heart sounds natural.	He complains of having a bad appetite, and that his food does not digest. Bowels regular; tongue large, flabby, and furred at the back.
Was first taken 4 years ago with pains and stiffness in the shoulders, and then the left knee became affected and was left stiff; and he now is quite lame in the hip, and unable to work.	- - - - -		His breathing, he says, is good, and he complains only of the rheumatic affection.		
Gave up work last Midsummer from failure of health, and ascribes his illness to working in bad air.	Much prostrated and aged.	Sense of fullness in the head and dizziness.	Suffers from difficulty of breath, cough, and spitting, but has never spat blood.	Complains of palpitation of the heart.	Appetite and digestion very much impaired, and occasionally has diarrhœa.
			These symptoms are all less severe at the present time.		
Gave up working 6 years ago, but his health was broken 7 or 8 years before that; and he ascribed his failure of health to having worked in much bad air and in bad places, and that he began work too soon.	Sallow and aged looking.	- - -	He complains of much difficulty of breathing; and during the spring suffered so much from his breath that he could not lie down, but he has never had any swelling of his ankles or body generally. Emphysema of the lungs and chronic bronchitis.	Suffers from palpitation. Heart sounds somewhat loud; pulse feeble.	
His health first failed 7 years ago. He took cold in May, and had an attack of influenza, and spat some little blood; was away from work 16 weeks, and then got "all right again." He has now been ill 16 weeks. He ascribes his illness to having been sinking a vertical shaft at Brecken Hill. It was very wet, and the air bad at times.	Sallow, thin, and pale; eyes glassy, and pale and pupils very large.	- - -	Has some little cough and spitting, but has never spat blood. Deficiency of resonance or percussion at each apex, especially the left. The clavicles project, and the chest falls in much beneath them, and especially on the left side. The respiratory sounds are somewhat bronchial at the upper part of the chest, and the cough and vocal resonance is exaggerated, and all these signs are most marked in the left side. Respirations 20 in the minute.	Pulse quick, and feeble.	Complains of pain in the stomach and bowels. Has a fair appetite; and does not now throw up his food or suffer from wind, but has constant diarrhœa. Stools 3 or 4 times daily, but without any blood in them. His tongue is morbidly red, and covered with patches of brown fur.

		FAMILY HISTORY.		PERSONAL	
Name.	Present Age.	Ages, occupations, and state, &c. of brothers and sisters.	Ages, occupations, &c. of father and mother.	Age at which he first worked underground.	In what mines he has worked, kind of work, and character of air.
12. Alston, August 5, 1863. Advanced miners' asthma; Emphysema and chronic bronchitis.	65	He has never had any brother. He has lost one sister when young, and 4 are living,—"some older, some younger than himself," but all healthy.	Father a miner, and died at 65 of miner's complaint. His mother died of consumption when quite young.	Went to work underground when 9 years of age.	First worked at Blaygill, and continued there for 4 or 5 years. The mine was very bad. He then went to work for the Company at Nenthead in different mines. In some places they were very bad. "The candles burnt badly, and many a day they could not get in, for the candles went out." He was in very bad air in a damp which went into the 4-fathom limestone. He worked for the Company all his life after he went to Nenthead. In the leading vein the air was, as "a rule, very bad," "when they fired the stour and reek was great and hung about and would not clear off."
13. Alston. August 5, 1863. Chronic bronchitis and emphysema, advanced miners' asthma.	70	- - -	Father was a smelter and died between 70 and 80. Mother died at 73. He never had a brother, but had one sister, who died 4 years ago at 70.	Went underground at 15.	He first worked at Cross Fell. There were about 100 men employed, and they worked in from a level, and then up, and again below. Some places were close, some wet, and some very dry, and the dry places were the worst. Indeed what tried him was the "stour and powder reek." He worked here 5 years, and then went to washing; worked on the surface in various ways for 5 years, and that was a great advantage to him. After this he went to the Nent Foss level, and was employed under the Hospital in sinking a vertical shaft from the surface to the level. This was 53 fathoms deep. And when that was done he went on working at the level, and drove about 700 fathoms. The air here too was very bad. In the shaft and level, on certain days, and especially in autumn, for a week together, it would be so bad with "choke damp" that they could not work at all. The damp rose suddenly at times, and they had a bell to give warning at the surface, and then they were drawn up directly. The candles would only burn when put two together and heeled, and sometimes not at all. The matches would sometimes not strike, and the holes would not fire. He did not feel this, for he was young then. After working 15 or 16 years he went to Nenthead, and worked under the Company at sinking a vertical shaft into a level, and then when they got to the level drove in, and here he worked abour 8 years. Here the air was not anything like so bad, for they had a "water blast." He had, however, very bad air in Long Cleugh, which he afterwards went to. There he worked in a level a mile and a half long with only one vertical shaft. Here the candles burnt badly, and the mine was "hot, dry, and stoury." It was this that broke him up; he took cold, and his health gradually broke up. He had the windy gravel, and passed his water badly, and had pains in the loins. His appetite failed; and miners' appetites are not good; not like pitmen's. He was forced to keep his bowels very open. His breathing also got touched, and he had beating at the heart. In three years he got so bad he could not work at all. When he gave up underground he got better, and is now much the same, except that he suffers much more in bad weather.
14. Near Rodderup, Alston, August 6, 1863. Miners' asthma, lapsing into consumption; hereditary predisposition.	42	He has a brother, a miner in Australia, aged 32. He had a brother killed in a mine; lost another by water in the head at 19 years of age; and another, a miner, died of consumption at 44. He has two sisters living and healthy at 25 and 30, and has not lost any.	His father was a miner, and died at 49 of "miner's bad breathing," and worn out. His mother died at 49 of dropsy.	First went to work underground when 18 or 19 years of age.	He went to work at Rodderup Fell Mine, and continued to work there till 8 years ago, when his health became so bad that he was no longer capable of working underground. Since that he has taken to farm work, having a small farm. He has worked in some very bad places. At one time he worked at the leading level 600 fathoms from day, and there were only two sumps to the level. Sometimes the candles would not burn at all, and at others burnt very badly, and only when heeled on one side, and the powder reek would not clear away. The air would be good and bad in a yard or two; and sometimes for two or three days together they could not get in to work at all. He worked three years at this place, and did not suffer materially himself, but other men used to complain of their heads aching, and he had known them become sick and vomit when they got into the fresh air. After this he went to another place in the mine, and was employed in getting ore, and that "length was very fair."

HISTORY.	PRESENT STATE.				
Duration and assigned cause of illness.	General condition.	Nervous system	Respiratory organs.	Circulatory organs.	Digestive organs.
He left work 14 or 15 years since, and was a little touched in his breath 5 or 6 years before that. "Many a man who goes as a miner is touched in the breath when quite young, but he won't say so." He was quite well when he first went to work at Nenthead, and he ascribes his illness to the "powder reek and stour in the mines."	Aged and feeble.	- - -	Suffers from cough and expectoration, but is now much better than he usually is in winter and bad weather. The resonance on percussion is abnormally clear in the front of the chest; and breathing laboured with wheezing in all parts of the chest.	Heart sound somewhat flat; pulse feeble.	He complains of an entire want of appettte.
His health was good till about 18 years ago, when he began to fail in breath, especially if he took cold; and this increased till he got so bad that he could not go on. This is now about 10 years ago. He ascribes his illness to "nothing in the world else than powder reek and bad air." Climbing, he thinks, did not much affect him. "He had only about 35 fathoms of it at any time—up and down. When his wind failed, however, then he felt it." He states that he has generally been regular and steady in his habits.	- - -	- - -	He has very short breath and cough, and a heavy spitting, but is now better than usual. In winter and bad weather he suffers sadly. He has never spat blood. Chest full and rounded; the resonance on percussion abnormally clear; the breathing generally harsh and sibilant and sonorous rhonchus in all parts of the chest. Can only count to 5 or 7.	Pulse somewhat full and jarring; heart's sounds natural.	Tongue clean, appetite poor, digestion fair, bowels regular.
He ceased working underground about 8 years ago, but he was "touched in the wind," but otherwise well for 3 or 4 years before he was compelled to give up. He was first taken suddenly ill with cold, and brought up blood, and had a bad cough and spitting. About 4 years he was taken much worse, and brought up more blood, and he has been suffering in the same way and getting worse ever since. He has not been able to do any work for some time, and suffered much in the last winter and spring. He ascribes the failure of his health to the "bad air and powder reek" of the mines.	Thin, tall, sallow, and pale; very weak. He occasionally suffers much from night perspirations.	- - -	He complains of cough and spitting, and is very short breathed. Chest everywhere contracted, and very slight expansion or movement with great effort. Vocal thrill everywhere exaggerated, especially under the clavicles. Contraction very marked under the collar bones; and the resonance on percussion diminished there, and especially on the right side; resonance moderately clear in the mammary regions. Loud bronchial respiration, and undue cough and vocal resonance at the upper parts, and especially on the right side, and respiration elsewhere harsh. Expectoration massive, muco-purulent, copious. Respirations 36 in the minute. He is only capable of counting aloud to 11.	Pulse 116 and feeble. Heart's action weak; sounds loud.	No appetite, and occasional vomiting of the food taken. Bowels not relaxed.

Name.	Present Age.	FAMILY HISTORY. Ages, occupations, and state, &c. of brothers and sisters.	FAMILY HISTORY. Ages, occupations, &c. of father and mother.	Age at which he first worked underground.	PERSONAL. In what mines he has worked, kind of work, and character of air.
15. Killhope Foot, Weardale, August 6, 1863. Slight miners' asthma; dyspepsia. On being asked whether he knew of any other man who was ill, he said that the neighbourhood was very "populous, and chiefly occupied by miners, and there was sure to be some of them bad, never without some bad, and both old and young but particularly old."	63	He had 6 brothers who were miners, and all are now dead; some died in early life, others were older than himself. He had 4 sisters, and they are all dead, and lived to be middle-aged.	His father was a miner, and died worn out by hard work. His mother was an old woman when she died.	He began to work underground when 7 years of age.	He has worked all his life in the mines in the neighbourhood, and has been at different times both in good and bad places. He last worked at Mr. Beaumont's mine at Burtree Pasture. He has worked in very bad places, but never in places where the candles would not burn, but he has worked where they required to be "sadly heeled" to get them to burn, and when working in those places he used to feel it in his breathing.
16. West Black Dean, August 6, 1863. Commencing miners' asthma; slight pleurisy.	31	- - -	- - -	Commenced working underground at 17.	Has worked always in Mr. Beaumont's mines, and sometimes in places where the air was good, sometimes where it was bad, but never where it was so very bad, except at Clints; there the candles would not burn sometimes, and the air would set in very bad, and they could not say when it would set in so. He worked there three years.
17. Chapel in Weardale, August 6, 1863; Mr. Hewitson. Miners' asthma.	67	He had 5 brothers, 4 of whom were miners and went as a soldier. and all are dead. His sisters also are not living.	His father was a miner, and died at 65, broken down with work. His mother was a middle-aged woman at the time of her death.	Commenced to work underground when 11 years old.	He has worked in Mr. Beaumont's mines all his days. "Every miner suffers more or less from dust, bad air, and powder reek, but he had been more favoured than some, and never worked in any very bad places, and there are few at his age that are not touched in the wind."
18. Chapel in Weardale, August 6, 1863; Mr. Hewitson. Advanced miners' asthma. He states that he was a very good man up to 53. "Many miners suffer in their wind by they are 30, if they begin young; and there are few at 40 who are not affected, and if he gets beyond that without suffering, if he gets ill he breaks up at once."	57	He had 2 brothers who were miners, and they died at 57 and 56 of miner's complaint. He had 3 sisters; 2 are living at 55 and 60, and the other died at 61.	His father was a miner, and was a very temperate man, though he was a publican, but he went to the election at Durham and got drunk, and was never well after. He died at 55; he was not touched in the wind before that. His mother died of old age at 82.	First worked underground when 18 years of age.	He has worked about Chapel all his life, and always in Mr. Beaumont's mines. He has worked in places where candles would hardly burn when heeled on one side, and many a time has had to come home because they could not keep a light at all. Sometimes the air was so bad that it almost made him fall, and "catched his breath and lodged there so that you could not get it coughed up." Sometimes it makes them sick and throw up, and causes headache and dizziness. Their "limbs become all of a dodder, and whiles they could not stand." Sometimes in coming up they would cough and bring up black spit, and then get easier. He never brought up blood. He has not had much climbing, and does not think that hurt him.
19. Weardale, August 6, 1863; Mr. Hewitson. Miners asthma.	54	- - -	Father, a miner, died at 74, worn out. Mother died at 76.	Went to work underground when 19, but was not regularly in; only in winter, and then out in summer, at first.	He has worked in the neighbourhood all his life, as at Burtree Pasture and Sedling, "and has been in bad and good places, much as all other miners are." Where he worked the air was fairish; the candles would always burn, but there are places in the fore end driving 2 miles from day, where they sometimes cannot work at all. He went in by a level, and then down a shaft about 90 fathoms. "All miners over 40 suffer more or less, though some may escape till a little later."
20. West Black Dean, August 6, 1863; Mr. Hewitson. Miners' asthma.	53	- - -	Father was a miner, and died at 57 of consumption contracted by sleeping in a damp bed. Mother died of liver disease at 66.	He first went underground when 14. "Not so young as many."	He has worked in the mines at Burtree Pasture, Breckon Syke, Kilhope, Elm Ford, and Level Gate, in this neighbourhood, all his life, and when young in very bad places, but lately he has never been in any bad places, though some are very dusty.

HISTORY.	PRESENT STATE.				
Duration and assigned cause of illness.	General condition.	Nervous system.	Respiratory organs.	Circulatory organs.	Digestive organs.
He considers that he was a "fair man" till 3 or 4 years ago, and thinks he has himself to blame for his illness, for he was a hard drinker when at the mines. He has not been able to work for the last month.	- - -	- - -	He is touched a little in the wind, and has some cough and a little spitting. The chest is fairly resonant on percussion, but the respiratory sounds are harsh. He is capable of counting aloud to 20.	Pulse very feeble. Heart's sounds somewhat noisy.	He has only a middling appetite. He complains of pain in the belly and wind, and is very qualmish, but does not throw up. Tongue very red and ragged, and in places covered with a thick fur. Bowels very confined.
He states that he worked steadily till 10 weeks ago. He ascribes his illness to cold, and has had cough and spitting and shortness of breath, but has not spat blood.	Pale, sallow, and thin.	- -	Still complains of cough, spitting, and difficulty of breathing, and pain in the left side in drawing a full breath. Some deficiency of the resonance on percussion, and of respiration at the lower part of the left side.	Pulse feeble -	Loss of appetite, but the food which he takes agrees with him. Bowels regular.
He left working underground about 14 years ago, and was not much the worse for it then, and he then worked as a labourer above, but has given up working for the last 4 years. He ascribes his failure to the infirmities of age, and to two attacks of cold and influenza that he has had.	Pale, thin, and sallow.	- - -	He complains of cough, spitting, and shortness of breath, and pains in the sides, but he has never spat blood. He is much worse sometimes than now, and especially in bad weather. Counts aloud to 30. Chest defectively resonant at the right apex, and abnormally clear elsewhere in front.	Pulse 92, feeble	Appetite and digestion very poor; bowels confined; tongue clear.
He worked steadily as a miner till he broke up. It will be 4 years next February, but he had been ailing for years before that. "Before he was as good a man as was, and ailed nothing in the world." He thinks he suffered from having "worked a good deal at night, together with bad air and powder reek." He has worked both in dry and wet mines. He also got cold from being heated in the mine, and then coming to the surface. There was no changing house. Since he gave up working has had several attacks of influenza, and then his breathing is very bad, but he is much better just now. He can tell when the weather is going to change.	Sallow, pale, and thin, and very old looking.	- - -	Complains of cough, spitting, and shortness of breath. Counts aloud to 20. Respirations 16 in the minute, very laborious, and almost entirely abdominal, the thoracic movements being very imperfect. Chest narrow and contracted, fallen in both above and below the clavicles, so that the clavicles project very much. Vocal thrill generally exaggerated. Chest generally sparingly resonant all over, both in front and behind. Respiratory sounds feeble in front of heart, and stridulous posteriorly.	Pulse 96, feeble and slow. Heart's action feeble, and sounds loud, and somewhat prolonged at the apex.	Appetitemiddling, and food lies heavy; tongue ragged and furred; bowels regular.
He has been laid by 2 years, and found his wind getting bad for 8 years before that. What he thinks hurt him was the dust and reek.	Sallow, pale, and thin.	- - -	Complains of cough and spitting, of being touched in the breath, and is very bad in winter, but just now is very well for him. He has never spat blood. Signs of emphysema and chronic bronchitis.	Does not suffer from beating at the heart. Heart's sounds somewhat loud.	
He has worked at the mines up to the present time. His health, however, failed 3 years ago, and he had cough and spitting and was off "16 weeks a year last April, suffering from a liver complaint and bad breathing." He is now much better than he has been.	Sallow, pale, and thin.	- - -	Complains of cough and spitting, and shortness of breathing. He has never spat blood. Counts aloud to 24. The resonance on percussion is impaired at the left apex, and the respiration is there bronchial, and the cough resonance increased.	Pulse feeble. Complains of palpitation. Heart's sounds somewhat loud.	Tongue much furred; appetite and digestion impaired; bowels regular.

Name.	Present Age.	FAMILY HISTORY. Ages, occupations, and state, &c. of brothers and sisters.	FAMILY HISTORY. Ages, occupations, &c. of father and mother.	PERSONAL. Age at which he first worked under ground.	PERSONAL. In what mines he has worked, kind of work, and character of air.
21 Ireshope, August 6th, 1863; Mr. Hewitson. Commencing consumption, perhaps mitral disease. Diarrhœa or dysentery. Hereditary predisposition.	37	He has lost 2 brothers, both miners, by consumption; one at 20 had only worked a short time; the other was 47. He has no brother living. He has also lost a sister by consumption in early life, and has 3 others living.	His father was a miner, and died at 68 of miner's complaint. His mother died at an early age of consumption.	Worked underground first when between 10 and 11 years of age.	He has worked all his life in the mines in Weardale, and is now working at Burtree Pasture. In some places the mine is very bad. The candles sometimes will not burn, unless held on one side. They feel the bad air in the chest, and get sleepy, and have headache, and some men say that it takes all the strength out of their limbs. He has been working today in the fore-end shaft, and felt very much oppressed with it.
22. Middleton in Teesdale, August 7, 1863; Dr. Ewart. Advanced miners' asthma	57	He had 2 brothers miners. One, a miner all his time, died at 64 of miner's complaint, but he stood it well. Another, not a miner, at 64. He has 2 sisters living, one at 50, the other at 62.	His father died at 68. He was not latterly a miner. Having been very asthmatic. Had to give up many years before. His mother died as 64, and her breathing was very bad.	Went underground when 14 years of age.	He has worked all his life in the mines in the neighbourhood, and has worked in different bad places when the candles would not burn for want of air, and they had to come out; and many times he has worked when the candles would only burn when "heeled." This has been the case throughout his time, more or less, but not so much so for the last few years, and he thinks the mines are better than they used to be. Indeed, if they were not, he could not stand it. The bad air and powder reek, and the two together, bring many down, and he considers that he stood it unusually well. The effects come on gradually. They begin to feel it about 30, some before. He first felt it about 30.
23. Middleton in Teesdale, August 7, 1863; Dr. Ewart. Advanced miners' asthma.	61	He has had 3 brothers. 1, a miner, is living at 62; 2, also miners, are dead; one at 22 pleurisy, & one at 44 worn out and with bad breath	His father was a miner, and died at 77, and was "not much touched in the wind," "worn out." His mother died at 82.	First went underground when 15 years of age.	Always worked in the neighbourhood, and for the Company. He has worked in bad places, and sometimes in very bad places, and this happened from time to time till he gave up. He had known that they had had to leave their work because the candles could not be got to burn. The bad air affected his breathing, and caused coughing, and sometimes spitting, but he never spat blood. It took away his appetite, and caused headache, made him sleepy, and took the power out of his limbs.
24. Middleton in Teesdale, August 7, 1863; Dr. Ewart. Miners' asthma (lapsing into phthisis), with consolidation at the upper parts of chest.	39	His 2 brothers were miners, and died at 43 and 45 years of age, "touched in the breath." 3 sisters are living, 35, 42, and 47; and 1 died at 40 suddenly.	Father was a miner, and died of the same complaint as his own. Mother alive at 76, & healthy.	First went underground when 18 years old.	He has worked in some bad places, and some very bad, from the air and "stour after blasting." Sometimes the air was so bad they could not get in to work at all. The effect of this was to make him quite weak in his limbs, and feel weak at the chest. It causes cough, but no material spitting, and no blood. Their appetites also fail, and sometimes their food does not agree with them.
25. Middleton in Teesdale, August 7, 1863; Dr. Ewart. Miners' asthma.	49	He has one bother, a miner, living and healthy at 51; one, also a miner, died at 40, but was then engaged in a coal pit. He has a sister living and healthy at 46, and 1 died at 25 after her confinement.	Father was not always a miner, but drove the donkeys in the levels, and afterwards worked in mines. Mother died when he was young and at an early age.	First went to work underground during winter when $7\frac{3}{4}$ old, and regularly when he was 16.	He began to work under "the Duke," but has now for long worked under the Company. He has worked in all sorts of places, good and bad, and wet and dry, and some very bad. There is bad air, both in fore-ends and rises, but he has taken more hurt from rises than anything else.

HISTORY.	PRESENT STATE.				
Duration and assigned cause of illness.	General condition.	Nervous system.	Respiratory organs.	Circulatory organs.	Digestive organs.
Has worked pretty regularly since he first went underground till December 1861, when he had inflammation of the bowels, since which time he has been ailing, though now better and able to work at the mine. He ascribes his illness to having worked in very bad air, and to the dust in the mine, and powder reek.	Delicate-looking, thin, and pale.	- - -	He suffers from shortness of breath, cough, and expectoration; and the chest is defective in resonance above, but there are no marked signs.	Suffers from palpitation of the heart, and there is some prolongation perhaps a murmur at the apex.	He has a poor appetite, and his food does not agree with him. He suffers from pain in the bowels, and has occasionally attacks of diarrhœa or dysentery.
He worked steadily till he gave up going underground a year and a half ago, and has entirely ceased work for a year. He gave up because he could not bear the cold of going backwards and forwards to and from the mine. He ascribes his state to the bad air and powder reek.	Sallow, thin, and pale.	- - -	Complains of shortness of breath, and some cough and expectoration. Chest narrow and contracted, and very little movement. Vocal thrill impaired at the left side. Chest generally sparingly resonant. Respiratory sounds short and harsh. Respirations 20 in the minute. Counts aloud to 15.	Pulse 80 feeble. Heart's sounds loud at the apex. Pulsation visible to the right of the left false ribs.	Appetite fair, but digestion bad. Bowels very much relaxed generally, but he does not pass blood. Tongue clean.
Worked steadily, with the exception of being away 2 years, till a year and a half ago, but his health began to fail 7 years ago.	- -	Nervous trembling in trunk and limbs.	Complains of shortness of breath, cough, and spitting. Chest contracted, and very imperfect movements. Vocal thrill generally defective. Clavicles very projecting. Resonance on precussion natural. Respiration short and harsh. Respirations 32 in the minute. Counts with some effort to 20.	Pulse 72, very feeble. Pulsation of heart visible to the right of the left false ribs. Jugulars much distended. Heart's sounds short and, grating, especially at the base.	Appetite defective, bowels regular.
Worked steadily till he got completely out of health, and no longer able, 40 weeks ago, but his health was failing before. He also had attacks of illness before.	Pale, thin, and sallow.	- -	Complains of cough, spitting, and shortness of breath. Chest narrow, and especially above; sparingly resonant on percussion everywhere, and very dull and increased vocal thrill over large space at the right apex where the respiration is bronchial, and there is loud cough resonance, and subcrepitation, both before and behind. Some deficiency at the left apex, and respiration somewhat bronchial. Counts to 12. Respirations 28 in the minute. Voice feeble. Has never spat blood.	Pulse very feeble 96. Heart's sound somewhat loud.	Appetite defective, bowels regular.
Worked steadily till he gave up. He began to fail after 45 or 46, and gradually got worse till a year and a half ago, when he had to give up entirely. He was taken worse suddenly with a faint, and fell on his back. His breath has been affected and he has not been able to work since. He ascribes his illness to the "stour and the air," and says that he hurt himself by "working too hard when he had a good bargain."	Lame from dislocation of knee when a boy. Very old-looking for the age. Face turgid. Hair very gray.	- -	Cough, expectoration, and difficulty of breathing. Chest everywhere sparingly resonant, and decidedly dull in percussion at the left side. Vocal thrill natural. Respirations short, and sounds generally harsh. Breathing very short. Counts only to 7 without drawing a fresh breath. Respirations 40 in the minute.	Pulse 120 and feeble. Heart's sounds loud at the apex.	Appetite not good. Bowels regular.

DISEASES

Name.	Present Age.	FAMILY HISTORY. Ages, occupations, and state, &c. of brothers and sisters.	Ages, occupation, &c. of father and mother.	Age at which he first worked under ground.	PERSONAL. In what Mines he has worked, kind of work, and character of air.
1, Minera, Denbighshire, North Wales, August 26, 1863; slight Miners' Asthma, emphysema, and dilated heart. I did not hear of any sick man at Minera, except this man and another, who was 35 or 36 years of age, and had had spitting of blood, &c. This man I could not see, as he was at work in the mine.	77	Had 8 brothers, some went to America, and were miners. He believes they are all dead, but none died in this country. He has lost his oldest sister, but two others are living & healthy.	Father a miner and died of fever at 75. Mother died at 80.	At 15 years of age.	He has worked in different mines in the neighbourhood, and formerly in some places where the air was bad, where candles would only burn when held on one side; and where the air was sometimes so bad that they had to come away from not being able to work at all. He has not worked in bad air since he came to Minera. He worked at Llyn y Pandie and Pen y Fron. When in the bad air it made him light in the head and dizzy, as if he had been drinking, but did not then affect his limbs or breathing. He has, however, suffered at times at the chest, and with bad breathing since.
2. Maes y Safyn, Mold, August 27, 1863; Miners' Asthma, Chronic bronchitis and dilatation of heart. Dr. Hughes, of Mold.	56	He has had 4 brothers, one is living and healthy at 63; 3others are dead; 2 elder and 1 younger than himself. They died 6 or 8 years ago. All were miners. He had 3 sisters, all of whom are dead. One died in childbirth, at 24; the other two were above 40.	His father was a miner, and died when he was young. He does not know at what age. His mother lived to 57.	At 17 years of age.	Has worked at various mines in the neighbourhood all his life till he gave up, and was last working at Maes y Safyn, but before worked at Llyn y Pandie, Pen y Fron, and at Pant y Mwyn. Some ten years ago he was working at Brongwyn mine under Captain Pillows, near Maes y Safyn when an accident occurred with choke damp and several men were killed. He had worked at the mine a year before the accident had occurred, and the air was generally good then. There were two shafts, one 80, the other 60 yards deep, and a level between them of about 80 yards, and they kept a furnace near the top of one of the shafts to draw the air, and they "blowed" it from the other. There was no day level to the mine, and only the two shafts. The furnace was an open brazier, with coals burning in it, and was put about 12 yards from the top of the shaft. On the morning of the accident, there was no wind, and the "fire drawed down." There was not much water anywhere, and it was quite dry where the men worked. The men went up and down by ladders and steps. The air was generally good till about nine days before the accident, when the men began to suffer in their breath, and the candles did not burn well, and could only be got to burn when held on one side. The outbreak of the choke damp was quite sudden. It was the morning shift, and the men were long in coming up, and several others went down to see what was the matter, and when they got down they found the "choke" was in the mine. He was one of the men who went down, and when he got down to the bottom of the 80 yards shaft he felt the "damp," and had to come up again. He got up part of the way, and then he could get no further, and they had to send down men to get him up. It was two hours before he could be got up. He says he was not sleepy at the time, but knew everything that passed, but had no power in his limbs, and trembled all over, and could not take hold of any thing or stir. He was ill for a fortnight after, and then got about again, but was never so good a man as before. His breath has been bad ever since, and his limbs weak. Seven men were killed (according to another miner six men and a boy, the son of one of the men, who had gone down with his father). After this the mine was stopped, but they began to work it again in six weeks. When working in bad air he says the "miners have not so good an appetite, but he never vomited his food, or saw others do so; sometimes they had pains in the bowels. On coming up after working they cough and spit black stuff, "as black as a cherry or billberry." He did not go again to the mine where the accident happened, but worked after at Maes y Safyn. There the air was good, but the mine was very wet.
3. Maes y Safyn, August 27, 1863, Bronchitis, threatened phthisis; probably predisposition. The cottage in which this man resided was built of stone, thatched, and on the hill side, in a pine wood. Two rooms, low; upper in roof. Proper privy, but no drainage.	30	Has three brothers, miners, all healthy. Some of the family died young. No sisters.	Father a miner, still living and healthy at 70. Mother died at 44 of illness brought on by cold of 3 years' duration.	First went to work underground when 28 years of age. Was employed as a carter before.	Has worked during two years in Maes y Safyn mine. The mine is generally dry, in some places wet. Not much dust anywhere. It is chiefly worked by "shooting." The air is generally good, but there is a place or two rather "dead." The air is "slackish." The candles always burn, but require a little listing.

OF MINERS.

HISTORY.	PRESENT STATE.				
Duration and assigned cause of illness.	General condition.	Nervous system.	Respiratory organs.	Circulatory organs.	Digestive organs.
He worked steadily till three years ago, when he was compelled to give up from failure of strength and shortness of breath, and it tried him both when at work and on the ladders.	Aged, but fairly healthy looking.	- - -	Complains of cough, spitting, and shortness of breath. Chest somewhat unduly resonant on percussion, and the respiratory sounds harsh.	Pulse somewhat full and vibratory. Heart sounds loud.	
He ceased working two years ago from his strength failing, and especially his limbs, so that he was not able to go up and down; and at the same time the Company working Maes y Safyn was changed, and he did not work under the new Company. He was lame in the hip, and his breathing was bad, and he had a cough and spitting. He first began to fail after the accident, and about 8 years ago he had an injury of the hip, and then he got rheumatism, and it settled in the hip, and he became lame, and after that his wind failed. He thinks his health failed from working in damp and cold. The air was generally good that he worked in at Maes y Safyn, but the mine was very wet. Some of the "flat ground" took great effect on his health. He was, however, in a "misfortune" 10 years ago, and has never been well since.	Worn and aged for his age.	- - -	Complains of cough, spitting, and shortness of breath. Breathing very short and frequent. The chest is much contracted, and deficient in resonance on percussion, especially above. The respiratory sounds are generally harsh, and attended with sibilant and sonorous rhonchus in all parts.	Pulse large and vibratory. Heart sounds loud, and especially at the base.	Appetite and digestion natural.
Has been confined to bed for a week, and ailing for a month, and ascribes his illness to having taken cold. Was always delicate, but has never spat blood. He thinks he took cold on the surface.	Pale, thin, and decidedly delicate looking, much prostrated.	- - -	Complains of cough, spitting, shortness of breath, and pains in the chest. Chest fairly resonant on percussion, but bronchitic rhonchus in all parts.	Pulse quick and feeble.	Appetite very defective. Tongue furred. Bowels regular.

II.

MEDICAL REPORT

On the Condition of Miners in Cornwall.

By James Bankart, F.R.C.S., of Guy's Hospital.

To the Right Honourable Lord Kinnaird.

My Lord,

Having been requested by you to visit Cornwall, for the purpose of examining the miners employed there, I now lay before you the result of that inquiry.

I visited Cornwall in July last, and spent thirty-five days in the different districts of Camborne, Redruth, St. Agnes, Penzance, Helston, Liskeard, and in Devonshire, in Tavistock and its neighbourhood. During this time I examined carefully upwards of 150 miners affected with various complaints. I also visited many of their houses, and saw a great many other men under different conditions, viz., as they came up from underground, on leaving work, and as they went to work, also during their work both underground and at the surface. Having descended one of the deepest of the mines (310 fathoms), I had an opportunity of judging of their means of descent and ascent in this and in nearly all the mines in these districts, as well as of the nature and peculiarities of their occupation. I had also in conjunction with Dr. Peacock the opportunity of making a post mortem examination of the body of a miner who was said to have died of what is called "miners consumption" or "miners complaint." The men are as a class, pale, thin, and sallow. This appearance is rendered more striking by contrast with the women and children, who are fresh coloured, stout, well developed, and in every respect a healthy looking class. The women are mostly employed at the surface, and their healthy appearance and colour are referable to their constant employment in the open air, and exposure to the sun. The children, of whom I saw a considerable number, present a very healthy appearance, and out of the number seen in the houses which I had occasion to visit, there were but two or three which were suffering from scrofulous diseases.

The unhealthy look of the men increases in proportion to their years, to the length of time they have been employed underground, and to the nature of their work during that time, and is especially evident in men beyond about 35 years of age. In those cases where men over that age present a fresh colour and healthy appearance, it generally happens either that they have left the mine some time, or that they have been working at the surface for a length of time, and have been exposed to the influence of the sun and fresh air.

During the time that I was in Cornwall it was remarkably fine warm weather, and this will account for a circumstance to be again referred to, viz., the small proportion of acute disease met with.

The cases which I examined were taken indiscriminately, and for an introduction to many of them I was indebted to the kindness of the medical men living in the districts, especially to Mr. Vincent and Mr. Hutchinson, of Camborne, Mr. Hitchins and Mr. Harris, of Redruth, and Mr. Couch, of Penzance.

Of these cases diseases of the respiratory organs and heart form a large majority. There is also large class, in which the men present but little evidence of disease beyond a sallow, anæmic, and unhealthy appearance, and who are nevertheless incapable of following their occupation. These men seem to be broken down in health, prematurely old, and debilitated from a number of causes which cannot well be separated from one another, so as to give to each its precise share in producing the ill effect.

Of the diseases of the respiratory organs, chronic bronchitis, and broncho-pneumonia and emphysema, form the largest proportion, and these occur in all stages from simple emphysema as a result of repeated attacks of bronchitis, to more or less consolidation and disorganization of the lung, the result of extensive disease of all the pulmonary tissues.

In the case of the post mortem examination to which I have referred, there was evidence of old inflammation of all the tissues of the lung, which was firm, solid, and black, and in portions cavities had been formed by its disorganization, whilst the pleura was converted into a thick white fibrous mass. No tubercular disease was found. The history in this case, so far as could be ascertained, was that of an attack of "miners complaint" in its severer degree.

Besides these cases, there are a few of tubercular phthisis, which present the ordinary symptons of that complaint. This disease does not appear to be very common, probably not so much so as in most other towns and districts of proportionate population. There is an explanation of the erroneous impressions that have been formed as to the large proportion of tubercular consumption amongst miners. It is as follows:—The complaint from which they commonly suffer, and from which they know themselves that they mostly die, is termed by the men "miners complaint" or miners consumption, and the medical men, in making out certificates of death, have entered the cause of death as miners consumption, or simply consumption, and this, in the hands of the Registrar, probably has been construed into tubercular phthisis.

The most numerous cases which, as I have said, are chiefly bronchitis and broncho-pneumonia and its results, are generally accompanied by more or less dilatation of the heart, anæmia, and general prostration of strength; they result from a combination of causes which it is difficult to isolate.

The history of these cases is almost always the same. Usually the man has worked some time in impure air before he feels any ill effect from it, or nothing beyond a little headache, when he has commenced work young and healthy; after a short time he experiences more or less headache, often severe, feels "sick at the stomach," his breath becomes a little short, and he cannot climb to grass so well, from a feeling of weakness in the legs and knees. He has, besides, palpitation of the heart, at first on climbing, afterwards both when at work and when climbing. If he continue to work in bad air these symptoms increase, and at last he is obliged to give up work for a time, and with rest and exposure to the fresh air at the surface for a few days, he recovers sufficiently to resume his work. This state of things is in many cases often repeated, the symptoms gradually increasing in severity, the attacks of illness becoming longer and more severe, the cough in the intervals continuing, and the breath becoming gradually shorter. At the same time dilatation of the heart goes on, expressed by the men as "going over to the right side." In many cases sudden severe attacks of pulmonary inflammation supervene upon this condition, probably from exposure to cold, after leaving work, heated and fatigued. The man is now confined to the house for months, and oftens finds himself after it quite incapable of working or climbing from palpitation of the heart and shortness of breath. This state of things is exemplified in many of the accompanying cases.

The younger the person exposed to these unfavourable influences, the more they appear to suffer, and several cases show that by early avoidance of the exposure to the effects of bad air, perfect recovery of health and appearance may be attained.

The acute attacks of illness usually occur in the winter, whilst in the warm summer weather those suffering from bronchitis and heart affection are relieved, and are then comparatively comfortable as long as they remain quiet. This was the case in many of the men examined, but they were in such a condition that an acute attack of bronchitis from whatever cause would in all probability be fatal to them.

The causes of the chief part of the diseases of miners are referable to the following:—

Hereditary tendency appears to bear but a small share, the women being remarkably healthy, and the children also up to the time when they commence work underground. That the chief causes are referable to the nature of their occupation is evident from the corroborative testimony of so many men, and in it many causes are combined in producing the ultimate mortality, and cannot be sufficiently isolated to have the exact share given to each, although the way in which each tends to produce the result may be pointed out.

1. *Age of commencing work underground.*—The average age at which the men examined commenced work underground, taken from 124 cases, was a fraction over 14 years. This includes several who commenced work comparatively late in life, from 20 to 30, and no less than 29 who commenced working underground between the ages of 8 and 11 years, several of them being as early as 8 years, and so unfit were they for it, that they had to be fastened round their fathers' waists by ropes during the time of climbing the ladders. The strain and fatigue of climbing alone must produce injurious effects on frames so immature as these, but still greater evils would arise from continued

deprivation of sunlight, and from working in an atmosphere, the best sample of which could be scarcely called pure, and fitted for the requirements of the body in the state of rapid growth and development. These cases also show that although boys usually work underground in the best ventilated parts of the mine, yet that many of them worked in an atmosphere positively unfit for respiration and suffered severely in consequence.

There is a great inducement for men to take their children underground with them before they are fit, as they help to increase the father's earnings, and it is very desirable that the children should be protected from the effects of the thoughtlessness of their parents, and that they should have the advantage of working above ground as long as possible.

2. *Defective ventilation.*—This appears to be one of the great causes of illness amongst miners, as gathered from the statement of the men themselves, more than 68 per cent. of whom give definite accounts of having worked in what they call "bad air," and of having suffered in consequence, many of them repeatedly and severely, the symptoms being in nearly all the cases similar.

When it is stated that their only test of the air being bad is that their candles will not burn except when placed horizontally, it may be fairly inferred that work is largely carried on in an atmosphere unfit to maintain the body in a state of health, but which only reveals its influence ultimately by the effects of insidious disease, and the gradual deterioration of general health resulting from defective nutrition. The statement of one man is to the effect that he worked in a level where they had artificial ventilation by means of an air pipe, and yet that the air was so bad that the candle would not burn except in the air pipe, and to fire the blast they were obliged to light it with a tobacco pipe, because the candle would not burn near it. This occurred only a year and a half ago; but it must be stated that the statements made by the men extend over a good many years and may not accurately represent the state of things at the present time. The quality of the air varies with the nature of their work. The tutwork men are employed in driving levels, in sinking shafts, and in rising to reach other levels, and consequently they work in the blind extremities of levels where the air has little or no circulation, except when artificial means are employed. These men suffer most from the effects of impure air. The tributers are employed in the open levels, and have the benefit of the best air in the mine and consequently do not suffer to the same extent.

The composition of "bad air" must be determined by chemical analysis, and it would be difficult to separate the effects of individual constituents. The causes of its impurity may be referred to exhaustion of oxygen, by respiration of the men, by the combustion of their candles, and explosions of gunpowder, also by the large quantity of decaying timber in the mine, and to exhalation of carbonic acid and other gases by the same agents, and to the suspension of solid particles of powder and candle-smoke.

3. *Climbing.*—The greater portion of the men go to and from work underground by means of ladders; in some few only of the mines is any mechanical assistance employed. The amount of time occupied by this process is very considerable, and is not only taken from their working time, but is occupied in a manner exhausting to the body, and their capability of working is diminished thereby. Besides the loss of time entailed by this process, climbing operates injuriously on the men in several ways. It powerfully excites the action of the heart, which is in many cases already over-distended from the effect of defective respiration, and whose capability of increased action is diminished in like proportion, and it eventually results in dilatation of the organ. The effect of this is seen in the remarkably feeble pulse and impulse of the heart found in nearly all the men examined.

Another injurious effect is, that the men come to the surface exhausted beyond what they would be from their work alone, and in a state of perspiration, and are thus suddenly exposed to the cold blasts of winds both in summer and winter, and have to walk through the open air for a variable but often considerable distance in their wet clothes before they reach the changing house.

These are conditions which are most favourable to the production of acute pulmonary affections, and it is not surprising that in winter these diseases should be prevalent.

4. *Exposure to Cold.*—This is a cause to which they are exposed in many instances in common with other labourers, but there are some conditions under which they are peculiarly exposed to this evil, and which do not appear to be necessary accompaniments of their occupation.

The chief of these is that just now mentioned in reference to climbing, where the miner suddenly comes up heated and tired into the open air in all seasons and weathers, and is exposed to this weather during his passage from the mouth of the mine to the changing house. It certainly appears probable that if the changing houses and baths, where they exist, were contiguous to the shaft which they come up, that a great deal of risk of exciting acute disease would be avoided.

Most of the mines are wet, and the miner works with his clothes for the most part wet through. The men employed in the shafts are more exposed to the combined influence of wet and cold than others, and they appear to suffer most from rheumatic affections. In some small mines the men have to walk in and out of the mine through the adit. One man attributes his illness directly to having to walk a distance of 100 fathoms through 20 inches of cold water to and from his work.

Besides these causes of disease, accidents take a considerable share in disabling men temporarily and permanently. Amongst these accidents,—falling away from the ladders, the falling of stones upon them, and the breaking of machinery, take their share; but the most distressing kind of accident is that arising from explosion of gunpowder, either from carelessness of the men or from the use of improper tools. By these explosions many men lose their sight, or even their lives, and the number of blind men in the towns, and of men with their faces marked with gunpowder, testifies to the frequency of these accidents, and to the narrow escapes of some of the men. The use of iron tools instead of copper seems to be an obvious cause of many of these explosions.

Their houses are for the most part substantially built, but not drained, and are close and ill ventilated. In accordance with this I was informed by the medical men that fever is not uncommonly found in them. Some other facts present themselves in the statements made by the men, which have an indirect influence on their health.

Payment of wages is made in notes usually, and to get these changed the men have to resort to the public-house, where they would not otherwise have gone there; and this is said by them to lead to the formation of habits of intemperance.

When a man commences work at a mine he works two months, and is then paid one month's wages, the other month's wages being kept in hand by the employer. They have subsist money advanced to them by the mine to a variable amount during their two months' work. Not having ready money to buy with, they contract debts with the shopkeepers, and consequently buy at a dearer rate than they would do with ready money. All miners employed on men's work have a sum, varying at different mines from 3*d.* to 9*d.* per month, deducted from their wages for the club, and similar sums for the mine doctor, and the barber. In case of accident they are attended by the surgeon, and receive an allowance from the club; but in case of illness without a "visible hurt" they get nothing from the club as a rule. A youth taking man's wages has a deduction made for the barber, although he may have no beard, and may never require shaving.

Although the result of this inquiry does not enable me to state the proportion or amount of disease present amongst miners, it is sufficient to show the chief diseases to which they are subject, and the causes to which those diseases are mostly referable; and amongst these it is evident, that although many depend upon causes to which they are exposed in common with men following other occupations, yet that others, and these the most dangerous to which they are exposed, are preventible causes, and for the most part not necessary accompaniments of their occupation.

JAS. BANKART.

10, Trinity Square,
February 4th, 1863.

Table of Cases of Disease among Miners examined in July and August, 1862, by Mr. Bankart.

Diseases of respiratory organs:		
Bronchitis, broncho-pneumonia, emphysema, and pleurisy		50
Miners' disease		40
Phthisis		12
Affections of heart:		
Valvular	5	
Muscular, &c.	11	16
Affections of abdominal viscera		11
Affections of nervous system:		
Paraplegia		2
Rheumatism		5
Effects of injury or previous illness		6
Disease of skin		1
Cases not classed		7
Total		150

Table of Ages of 148 Men examined.

10 years to 20 years	2
20 „ 30 „	22
30 „ 40 „	27
40 „ 50 „	39
50 „ 60 „	39
60 „ 70 „	16
70 „ 80 „	3
	148

Mean age, 44·35. Extremes, 13 and 75.

Table of Father's Age at time of Death.

20 years to 30 years	1
30 „ 40 „	6
40 „ 50 „	16
50 „ 60 „	17
60 „ 70 „	19
70 „ 80 „	10
80 „ 90 „	2
	71

Mean age, 55·63. Extremes, 28 and 86.

Table showing the Assigned Causes of Father's Death.

Miners' disease		15
Decline		10
Chest complaint		5
Disease of lungs, after 10 years' illness		2
Accidents in the mine	14	
Falling away from the ladders	2	16
Palpitation of heart		1
Bursting of a blood vessel		1
Apoplexy		1
Asthma		1
Typhus fever		2
Dysentery		1
		55

Table of Ages at which Miners now suffering from Illness first worked underground.

Years.		Years.	
8	3	16	15
8 to 9	2	17	10
9	8	18	8
9 to 10	1	19	2
10	5	20	3
10 to 11	1	21	1
11	10	21 to 22	1
11 to 12	2	22	1
12	8	23	1
13	8	25	1
13 to 14	1	26	1
14	15	30	3
14 to 15	4	40	1
15	19		
15 to 16	2		137

Table showing the Kind of Work at which the Miners examined were employed.

Tutwork	33
Tribute	10
Tutwork and tribute	42
Do. chiefly tutwork	7
Do. chiefly tribute	2
Employed in the shafts	4
Burning tin	2
5 years and more at the surface	5
	105

Table showing the Duration of Illness in 140 Cases.

	10 days	1	
	8 weeks	1	
	2 months	2	Total of 6 months
Under	4 „	4	and under 16
	5 „	4	
	6 „	4	
Under	7 „	3	
	8 „	1	Total of 6 months
	11 „	1	to 1 year 11
	1 year	6	
	1 „ and 1 month	1	
	1 „ 2 „	2	
	1 „ 4 „	1	Total 1 to 2 years 21
	1 „ 6 „	4	
	1 „ 8 „	2	
	2 years „	11	
Under	3 „	12	
„	4 „	7	
„	5 „	9	Total 2 to 8 years 49
„	6 „	5	
	7 „	6	
Under	8 „	10	
	9 „	6	
	10 „	1	
Under	12 „	5	Total 8 to 15 years 19
	13 „	3	
Under	15 „	4	
Over	15 „	2	
	16 „	1	Total over 15 years 24
	20 to 30 years	20	
	40 „	1	
		140	140

Table showing the Assigned Causes of Illness in 114 Cases.

Working in bad air	43
Do. and exposure to cold	13
Do. and powder smoke	2
Do. and cold-damp	1
Do. and intemperance	1
Do. and injury from lifting heavy weights	1
Do. and getting wet	1
Do. and exposure to changes of temperature	1
Do. and falling down a "stope"	1
Exposure to cold	20
Do. after working in a hot mine	2
Do. and intemperance	1
Do. in changing his clothes after sweating	1
Do. and wet	1
Working in cold-damp and exposure to cold in the shaft	1
Working in cold water	5
Walking through 20 inches of cold water for a distance of 100 fathoms, to and from work	1
Climbing	2
Climbing deep ladders and working in hot mines	1
Putting on wet clothes after leaving work	1
Partly working in very hot mines, and partly taking cold at chapel	1
Working in a dry and dusty mine	2
Taking cold going home from the mine	1
Exposure to fumes of arsenic and sulphur	2
Exposure to great heat and fumes of arsenic	1
Lifting heavy weights	2
Falling away from the level	1
A blow	2
Over work	1
An attack of fever and inflammation of the lungs	1
Taking cold (not referable to mining)	1
	114

Detailed Statement of Health, General History of Occupation, Place of Employment, Cause of Illness, Present Condition, &c., of various Miners in Cornwall.

By J. Bankart, F.R.C.S.

Number; District; Disease; Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
1. Camborne; Miners' disease; July 1862.	27	- - -	- - -	- - -	12	Tutwork and tribute.	He first worked at Tincroft mine, where the air was good, and there was a comfortable changing house. He remained there 6 years in good health, on tribute. Afterwards worked at Condurrow for a year and a half in a level where there was cold damp. Afterwards at Great Wheal Seaton 5 or 6 years, 130 fathoms from surface, 160 from any shaft or winze. Worked naked to the waist, as it was very hot. The air was very bad. The candle would only burn when placed horizontally, and a pin stuck through it. Worked 6 or 8 months in that level without anything being done to alter it There were 6 men working there, and they all complained of it. An air machine was then put in, but the air that was blown in was not sufficient to move the flame of the candle. "It did more harm than good, for they put in 16 more men; and we were all working in a space of 5 fathoms, 11 at night and 11 during the day." It was always hot, and there was so much powder smoke that they sometimes could not see, and they had to beat the smoke out with their jackets. Worked under those conditions for 12 months. Worked 5 or 6 years in that end altogether, and nothing was done to it.
2. Camborne; Phthisis; July 1862.	51	Dead, aged 50.	Father a miner, and died of miners' disease.	- - -	Between 14 and 15.	Tutwork -	At first only went under ground with the captains, being employed in a countinghouse. "We went into good air." Afterwards worked at Dolcoath and Stray Park for several years. Worked at North Roskear 15 or 16 years, in one level 7 or 8 years. The air was good, but it was very hot. It was 130 and 216 from adit. Worked naked all but his trowsers, and sometimes completely naked. Thinks he lost 2 quarts of sweat a day. "I was in my youthful days, and did not mind it; but I think I feel it now." Then worked at Carn Brea 8 years. Air very good, and not hot. Average wages 3*l.* a month.
3. Camborne; Emphysema; July 1862.	50	- - -	- - -	- - -	17	Tutwork and tribute.	Worked in various mines in good air, and always had good health. At West Wheal Seaton he worked in a very bad place, sinking from the adit to the 18 level. "There could not be a worse place, we could not carry a light." Since then, has worked at Kedavoom for 12 months in "tolerable" air, 1 month in a close place. Has worked at Tolcarne for the last 3 or 4 years, and is still working there.
4. Camborne; Miners' disease and Phthisis; July 1862.	38	- - -	- - -	- - -	9	Tutwork and tribute.	First worked at North Roskear for 4 years. "It was pretty good air for underground air, but we never expect good air under ground." Then several years at Carn Brea, six months in very bad air, "It was not deep and there were no winzes. We were about 100 fath. from shaft, and 60 from any air. The candles went out, and the smoke did not get away, but I was young then and did not feel it." Then worked in different parts of England, on railways and in the coal mines for 4 or 5 years. Met with an accident at North Roskear from some rotten planking giving way, by which he fell down 60 ft. into another level. He was confined to his bed for some time and unable to work for 3 or 4 months. Worked several months in bad air "rising" for ventilation, at Condurrow mine. Left this mine and went to Tincroft, where the air was good at first, but afterwards very bad. Worked in a level 90 from adit, 60 from any circulation, without any pipes, sollars, or air machine. Six men were working there: "that was the first place I began to fail in, from bad air as I thought. Sometimes I could hardly get to grass, almost dragging away to sleep as I went along the levels and climbed the ladders." When working there he got 5*l.* 10*s.* a month on tutwork. Complained several times about the air, and at last left the mine. Worked in several mines after that for a short time. The last one was Tincroft, where he worked until 18 weeks ago. Worked one month there in bad air. "Nothing did me so much harm as the one month in that place."
5. Camborne; Bronchitis, and injury to back. July 1862.	45	Dead, 50	A miner, died from miners' complaint.	- - -	19	Tutwork and tribute.	Worked in various mines. At Carn Brea worked in bad air in 90 fathom level, 50 or 60 from any draught. The candles did not burn well, and had to be turned on their sides. Did not feel any ill effect from it. He worked here early in life. Worked 6 years in Dolcoath. In the level 230 fathoms below adit, and 50 from any draught, he worked in bad air. It was a hot close place, and he used to work naked all but his trowsers. This was the last place he worked at, and has been at home 5 months. There is a good dry at Dolcoath, but says he used frequently to take cold in coming out of the mine.

History and Duration of Illness.	Cause to which he refers his Illness.	Present Condition.	Remarks.
Used to feel sick and drowsy when working in cold damp at Condurrow. Had lightness in the head, trembling, and pain in the legs when climbing. When at Great Wheal Seaton had palpitation of the heart from the bad air, "not from climbing." Felt the climbing the heaviest at that time. "They were 10-inch staves, and I could hardly lift one leg before the other." Had pain in the head, felt sleepy, was "bad at stomach," palpitation of the heart, and throbbing pain over the eyes. "I have been ill ever since, and have been off work for 2 years." Never had any cough. Spat up a cupful of blood 18 months since, dark in colour; also passed blood by stool, but not black. Never had any cough when he spat up blood.	Working in bad air and powder smoke.	Thin, sallow complexion. Deficient motion of chest. Respiratory murmur defective, with slight crepitation at left apex. Tenderness under the clavicles on pressure, also over the surface of the chest when but lightly touched. Chest somewhat deficient in resonance. Voice sounds natural. Respirations 25 (before being at all disturbed). Heart sounds feeble, but regular; impulse feeble, and somewhat diffused. Pulse 78, much increased by exertion. Tenderness on pressure over the liver. No adema of extremities. Hands cold and clammy. No cough or expectoration. Profuse perspirations by day and night.	States that he never drank to excess. The other men employed with him complained of the same symptoms. When asked why he was so foolish as to work in that bad end, he replied that work was slack, and he was loth to turn out. He got 50s. to 3l. a month. At that time had 3 or 4 lbs. of animal food for himself and family, 4 in number. Gets nothing from the club, because he has no visible wound. They get a shilling each from the union. The house is close, and not drained.
Has been ailing about 3 years. Felt himself failing for 8 or 9 months before he left the mine. Had shortness of breath and heaviness on the chest. He did not spit much, "sometimes black and green, sometimes like clots of blood." Has been losing flesh for 6 or 8 months. Spat blood three months ago. It continued for a fortnight. Has not been able to lie on his left side for 6 or 8 months.	Partly working in a very hot mine, and partly to taking cold one day at chapel.	Thin sallow complexion, long black hair, long thin hands. Motion of chest limited to the right side. Loud vesicular murmur over right chest, except at apex behind, where there is deficient murmur, some dulness, and an arterial murmur. The rest of right side resonant on percussion. Left side more or less dull all over it; very dull at upper part, except just below clavicle, where there is tympanitic resonance over a small space. Respiration tubular and cavernous at apex, with bronchophony. Heart sounds very feeble. Pulse 120 small. Respirations 32; in sitting posture tolerably easy. Expectoration greyish, flocculent, purulent.	Has never received anything from the club. Used to drink to excess sometimes, "but I was not a drunkard." "We used to go to the publichouse to get our notes changed, and I believe that is a great evil to the present day."
Was home ill for some months after working in bad air at West Wheal Seaton, 14 years ago. At that time he had cough and shortness of breath. States that the feeling of fatigue in climbing was extreme when working in bad air, but never at other times. Has been subject to cough, and takes cold very easily since that time. When he takes cold he spits up "black and greenish stuff," and sometimes slightly streaked with blood. Says he has been losing flesh for a year or two.	Working in bad air.	Complexion somewhat sallow, but otherwise a tolerably healthy looking man for a miner. Body in good condition. Chest resonant on percussion, vesicular murmur normal, slight crackling and prolonged expiration and whistling in front. Heart sounds normal.	Gets 3 lbs. of meat a week for the family (wife and 4 children). Says he is much less liable to take cold when he lives well.
10 years ago had inflammation of chest, and was ill 4 or 5 weeks. 4 or 5 years ago felt weakness in the legs on climbing, tightness at the chest, slight cough with expectoration of "black stuff," shortness of breath, giddiness and a feeling of drowsiness when the work was over. At that time he was working in bad air. 13 months ago, had a return of the same symptoms while at work in bad air and spat up about a table spoonful of blood He has never since been so well as he was before that. 10 weeks ago had a return of the same symptoms without hæmoptysis. He has been unable to work since.	Working in bad air and intemperance.	Sallow complexion, hands and feet cold. Has cough, but without very much expectoration. Spittle greenish, not frothy, floats in water in lumps. A month ago had profuse perspirations in the night, but not so much at present. At that time he expectorated more than now. Has lost 24 or 25 lbs weight during the last 12 months. Dulness on percussion, tubular breathing and creaking new-leather sound over the right lung, as far down as the middle of the scapula before and behind. Below that and on the left side respiratory murmur normal, expiration being slightly prolonged at the left apex behind. Tactile vibration increased over right apex. Respirations 32, pulse 96. Bowels confined.	States that it often strikes very cold on coming into the open air in their pit clothes, and they often have some distance to walk to the changing house.
First complained, 5 or 6 years ago, of pain in the head, weakness in the legs and knees, shortness of breath, sickness at stomach, palpitation of the heart, and pain in the back. He was then working in bad air at Dolcoath. Says he strained his back 7 months ago. He was able to walk, 3 or 4 weeks after the accident, but has lost the use of his legs twice since, but only for a day or two. Has been losing flesh for 6 or 7 months. During this time he says he has been spitting up black stuff, but he had left the mine 3 months before he began to do so. Spat up a teaspoonfull of dark frothy blood about a month ago.	Bad air, and injury from lifting heavy weights.	Chest resonant on percussion, movements normal, slight mucous crepitation at right apex posteriorly, in other parts, nothing abnormal detected.	Has been intemperate in his habits. He has a wife and 11 children, and receives 28s. per month from the mine club.

Number; District; Disease; Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
6 Camborne, Dilated heart, July 1862.	45	Dead	Died of disease of the lungs after 10 years ailment.	- - -	17	Employed chiefly in the shafts for the last 13 or 14 years "forking" mines.	Has generally worked in the best air in the mines, being employed in the shafts. Has sometimes worked very hard, being obliged to go up and down a shaft 9 or 10 times a day, the distance being from 100 to 120 fathoms each way, and the ladders almost perpendicular. This would occur about once a week for 13 or 14 years, at other times he had only to go up and down once or twice during the day. The time occupied in climbing was about 20 minutes, but he says it would have been much better for him if he had taken an hour to do it. For the last five years he has not had to go up and down above once a day.
7. Crowan; old disease of heart, pneumonia, recent bronchitis; July, 1862.	53	84, alive.	Formerly a miner, but ceased working for 20 years, now a farmer in good health.		15		Has worked chiefly at South Wheal Bassett mine. He has received a good many injuries during his work. 17 years ago he was cut about the head, wrist, and abdomen, from the accidental explosion of a hole. He was at home for 12 months in consequence of having an attack of erysipelas. 10 years ago he received a blow on the head, and says his skull was fractured by a falling kibble. Ill 4 months. 7 years ago a piece of rock fell upon his shoulder; he was in the Truro infirmary 13 weeks, and away from work 12 months.
8. Illogan; dilated heart; July 1862.	58		A miner.	- - -	17	Tutwork and tribute.	Has worked at several different mines but chiefly in good air, till about a year and a half ago. Worked at North Roskear in the 70 level, where it was very hot, and where the men mostly worked naked; the air was good, and he had good health. He last worked at Camborne Consols about 7 or 8 years. The last year and a half in bad air in the 50 fathom level and 40 from draught. The air was cool, but the candles would not burn upright.
9. Illogan; Phthisis; July 1862.	38	63, alive.	A miner "in tolerable health for an old man"	Two sisters and his mother have died, cause of death unknown, one sister was an infant, the other about 18. Thinks his mother died of old age, worn out, age 61 or 62. "This is considered a good age in this part."	16	At first on tutwork, afterwards tribute.	Has worked since he was 16 years old, at Carn Brea mine. Worked for 3 months in bad air in a rise at the back of the 90 level. The candles would not burn properly. Did not feel any ill effect from it. also worked in very bad air in the 66 level "driving an end" for 6 months. The candles would not burn. Felt ill effects from it, and removed in consequence. Afterwards went on tribute, and worked generally in good air. Has been away from work 9 months.
10. Illogan; Pleuritic effusion; July 1862.	42	Dead.	Miner, died from an accident in the mine.	- - -	14 or 15.	- - -	The first 7 years worked at Cooks Kitchen and South Roskear, in good air, afterwards worked for 20 years at Carn Brea. "I have worked in close and dry places, also in dusty places where there was mundic. I could not prevent myself inhaling some of the dust."
11. Illogan; Chronic pneumonia; July 1862.	51	47 Dead.	Miner, died of a chest complaint.	- - -	13 - -	Both tutwork and tribute; chiefly tribute.	Worked at Carn Brea at first, then at Dolcoath, where there was some bad air. Afterwards went to Tincroft; worked here 12 years, part of the time in a shaft where the air was very bad indeed. Here "my knees were so weak I could hardly hold myself up, and my head seemed splitting all abroad. I was obliged to tie it up." Afterwards was a mine agent, employed at Pedhandrea, where he had to repair a calcining machine. Has never been well since then, 4 years ago.

REFORM CLUB PALL MALL

History and Duration of Illness.	Cause to which he refers his Illness.	Present Condition.	Remarks.
His illness has been gradually coming on for some years, and gradually increasing in severity up to the present time. It now quite prevents him from working, although he looks and says he feels quite well when he is quiet. He has been away from work 6 months with pain in the chest. The pain which he describes as a pressure on the breast bone comes on upon any exertion, such as walking up hill. He can walk a short distance, when suddenly the pain comes on and he is obliged to stop. He then usually has pain down the inner side of both arms, and his heart beats rapidly. After standing still a short time the pain leaves him, and he then feels quite well again, and can move about as usual. During the last month before he gave up work, he was often obliged to stand still on the ladders for 2 or 3 minutes owing to sudden attacks of pain in the chest, in this case preceded by shortness of breath. After standing still a short time the feeling would leave him, and he was then able to continue the ascent. He had no feeling as if he were going to die, and felt himself quite safe on the ladders during the time. He had a cough after taking cold about a month before the pain in the chest, but it went away, and has not returned.	Climbing.	A stout, healthy looking, muscular man. Chest freely moveable, respiration normal. Heart sounds distinct, both sounds double, and the first clearer and sharper than natural. Pulsation regular at the present time, easily excited by walking across the room, but not becoming irregular. Impulse feeble, diffused, extending to epigastrium, where the sounds are very distinct. Extent of dulness on percussion increased. No murmur to be heard. 2d sound heard distinctly some distance along the course of aorta. Pulse 104, small, soft. Respiration 20, easy, regular.	His living has usualld been good. He usey to drink freely from 18 to 25 years of age, but has not done so since. Used to drink beer.
Says he had inflammation in the left side, 11 months ago. He had copious black expectoration, and was unable to lie down in bed for a week. He was laid up for 13 weeks, and since then has constantly had fluttering of the heart, and "has never felt himself the same man since." Never had rheumatism. Has lost 20 lbs. during the last 6 months. Six days ago he got wet in going to the mine, and after he had done work he put on his wet clothes. In the evening he felt poorly, and he has been getting worse up to now. Has been at home three days.	Putting on wet clothes after leaving work.	Complains o nortness of breath, with expectoration of a little thin frothy mucus. Has "weakness in pit of stomach," loss of appetite, fluttering of the heart, and a feeling of weakness in the limbs. Tolerably muscular. Chest resonant on percussion, slight dulness under the left clavicle; vesicular murmur heard loudly all over chest; under left clavicle breathing somewhat tubular, and expiration is prolonged down the upper half of left chest anteriorly and posteriorly. Mucous crepitation to a slight extent over both bases behind. Cough comes on occasionally of a spasmodic kind and accompanied by the expectoration of a little thin mucus. Heart sounds distinct; the 1st is followed by a tail, scarcely a murmur. Pulsation irregular in frequency and force, impulse less than natural and diffused, not much impulse at epigastrium. Pulse 60, small, feeble, intermittent and irregular.	This case shows the necessity of having proper drying places for the men's clothes, and the result of neglecting the precaution of drying them before putting them on on leaving work.
First felt weakness in the legs, in climbing about 6 months ago. He used to have headache, "but that is so customary that we don't take notice of it. For 3 months before he gave up work, he felt shortness of breath so that he had to give up work and sit down for a time, and to stand still on the ladders when climbing. He then had "beating of the heart." Was obliged to give up work in consequence.	Working in bad air.	Complains now of shortness of breath and palpitation of the heart on making any exertion, and weakness. Feels tolerably well, and his breathing is easy when sitting quietly at home. Appetite good, but cannot get food now he is out of work. Respiratory murmur rather increased at left apex, no other abnormal sound detected. Heart at the present time beating regularly. The sounds are very bright, especially the 2nd. Area of dulness increased. Considerable pulsation in epigastrium.	He gets nothing from the club.
Felt weakness in the legs, and heaviness on the chest when working in bad air. Had pleurisy 3 years ago, and was laid up about 3 months, and has had a cough ever since. Has never spat any blood. 12 years ago, says he had inflammation of the chest and slow fever, but after 3 months illness he got quite well again. Used to sweat a good deal, but has not done so for 6 months. Has been steadily getting worse, and now has a general weakness, shortness of breath, and a cough.	- - - -	Fingers clubbed, skin hot, limbs wasted. Chest shallow anterio-posteriorly, motion defective in left side. Dulness on percussion, mucous crepitation, and increased resonance of voice in left infra-clavicular space. Mucous crepitation over the whole of left lung posteriorly, except just at the base. Right lung, mucous crepitation at apex behind, slight dulness on percussion in front. Heart sounds distinct, impulse diffused over a circle about 4 inches in diameter, of which the nipple is the centre. Pulse 128, regular, compressible; respiration 34, variable, shallow. Cannot speak many words together. Tongue injected with a white streak down the centre. Bowels not at all loose.	
Felt shortness of breath in climbing about 5 months ago for the first time. Was working then in the adit level. He went to a funeral at this time and caught cold. Had "slow fever," and inflammation of the lungs. Says he has lost 20 lbs. during the last 4 months.	Exposure to cold.	Prevented working by weakness, loss of appetite, and shortness of breath. Has now a little cough, but without expectoration except a little in the morning. Dulness on percussion, and loss of vibratile thrill (tactile) on the right side below a line extending round the chest an inch above the nipple. Tubular breathing and slight œgophonic modification of voice over the same part. The remaining portion of both lungs clear, respiratory murmur being somewhat puerile. Heart sounds not very distinct, impulse forcible, extending to epigastrium; action regular, but quick.	
Four years ago he had to go into a calcining machine to repair it; and though the fire had been out two days, it was so hot that he fainted twice. He could only remain in the furnace three quarters of an hour at a time, and then go in again after resting. This continued three or four days. (Arsenic is here separated from the tin in large quantities.) He had a pain and inflammation in the throat, faintness and weakness in the limbs. No looseness of bowels or pain in the stomach. Says he has had a bad cough and difficulty of breathing ever since; profuse perspirations in the morning, and expectoration of white frothy mucus. Never spat blood. Has not been subject to sweating for the last 3 or 4 months, and is now much better than he was 6 months ago.	Exposure to great heat and the fumes of arsenic in repairing a calcining furnace.	Sallow icteric complexion, muscles flabby, but tolerably well covered with fat. Has not lost flesh for six months, though he did lose a good deal previously. Chest, dulness, flattening, loss of motion in left side anteriorly, and in upper half posteriorly. At apex bronchophony and cavernous respiration, below that, mucous crepitation over upper half anteriorly and posteriorly; vesicular murmur at base, tubular breathing between. Over right lung there is puerile respiration, and behind at base fine mucous crepitation. Heart sounds clear, second sound double, impulse and area of dulness diffused. Pulse small, easily compressed, regular. Laryngeal inspiration, which he noticed 4 years ago. It has not increased, and he has never lost his voice. Subject to diarrhœa when he takes cold, the looseness being preceded by pains in the stomach.	

Number; District; Disease; Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
12. Amelebra; general ill health; July 1862.	38	56 Dead	A farm labourer. Paralysis.	- - -	15 - -	Tutwork.	Worked in various mines but at first usually in good air. First worked in bad air in Wheal Kitty in a cross cut, where he worked 11 or 12 months, but without any ill effect. Afterwards worked 6 or 7 months in poor air in 220 level at Wheal Ruth. It was very hot. He worked in other levels above that where the air was dead. When he was taken ill he was working in a winze below the lowest level.
13. Lugeven; chronic pneumonia, July 1862.	63	72 Dead -	Butcher, old age.	- - -	13 to 14 -	Chiefly tutwork.	Worked in bad air for 6 months in Tincroft in the adit level. No ill effect from it. Worked 20 years or more at Gea. Two or three years in the 60 level in bad air, and two or three years in the 100 level, in bad air. "The greater part of the 20 years I worked here I worked in bad air. I complained to the agent, and so did others, but no notice was taken." I last worked in the Durla adit. There was bad air there, and I suffered more from that than from anything else.
14. Camborne; old inflammation of bowels; July 1862.	56	51 Dead.	Miner, palpitation of the heart.	Two sisters, his wife, two daughters, and a son died of lung disease, and a daughter is now ill with the same disease. Length of illness in most of them about 2 years. Ages, son 18, daughters 11 and 14, wife 44, daughter now ill 23. The son was a miner, and had been at work 6 or 7 years, sometimes in bad air.	16	- - -	-
15. Camborne; Chronic bronchitis and emphysema, &c.; July 1862.		Dead -	Miner, killed by an accident.	- - -	17	- - -	Has been working at grass for 5 months. Ceased working under ground at that time in consequence of ill health. Has worked in close places, and then used to feel weakness in the legs.
16. Illogan; Chronic pneumonia; July 1862.	63	- - -	- - -	Has a son who is now in the last stage of phthisis.	18	Tribute and tutwork.	Worked in various mines, but usually in good air until he went to Wheal —, where the air was very bad in the adit level, in which he worked 4 months, and suffered greatly from it. Afterwards went to Wheal Raven, where he worked 18 months in the 18 level. The air was very bad there, and he worked in bad air about 12 months. "I have been at Carn Brea about 20 years and am there now. I worked in bad air in the 105 level. I worked there 2 years. We had no machine." Worked also in very bad air in a winze at the bottom of the 20 level. Worked there 6 months. Has been working at the surface for 5 years.
17. Camborne; rheumatism; July 1862.	42	- - -	- - -	Lost a brother from an accident, another died with dropsy, and a sister in a decline.	26	Worked at first on tutwork, afterwards as a kibble filler, and was then employed in the shaft.	Before commencing mining, he worked as a farm labourer. Worked 9 years at Carn Brea on tutwork, where the air was good, afterwards worked 6 months in the adit level, where there was cold damp, and from which he felt ill effects. After being at home for a time he went to Camborne Vein as a kibble filler for 12 months. Worked here in the shaft; was taken ill here, and has not worked at mining since. Has since worked on the roads.

History and Duration of Illness.	Cause which he refers his Illness.	Present Condition.	Remarks.
Felt a little weakness in climbing in the knees when working in the bad air. Had not been working in the winze many days when he had pain in the bowels, and general weakness, also shortness of breath for about a week, with a little cough. He left off work, but in a few days felt better, and went to work again. He then injured his knee by striking it with a piece of iron. There was very much discoloration both above and below the knee, though the blow was not very severe. Did not give up work for a fortnight, when it became more painful. He became then generally ill and took to his bed, where he remained three weeks. After this he got up and was better, but has never been able to go to work again.	Bad air.	Has a sallow complexion, and appears generally out of health, but no disease detected about him.	
Ill effects of working in bad air have shown themselves gradually. At first he had pain in the head and weakness in the knees in climbing. During the last 4 or 5 years he suffered severely with shortness of breath, singing in the ears on coming to grass, and a feeling like a "stone at the chest," a "tightness or hardness just above the breast bone," and pain at the pit of stomach.	Bad air.	Has shortness of breath, "hardness of stomach," palpitation of heart. If he goes ten steps faster that he ought, he says his heart beats as if it would come out of his body. Has lost 40 or 50 lbs. in the last 2 or 3 years. Chest, dullness and flattening under right clavicle, breathing tubular, no crepitation, respiration puerile behind at right apex, wheezing, and prolonged expiration over front of right chest. Heart's sounds normal and regular at present, impulse felt over considerable extent of chest, and dulness somewhat increased. Cough, but little expectoration. Skin cool and soft.	
Was quite well until 2 years ago, when he had occasion to work under ground from Thursday until Sunday without any opportunity of changing his clothes, which were frequently wet, and allowed to dry upon him, and in consequence of this exposure he took cold. He had pain in his shoulders and arms, and his joints were somewhat swollen; he was feverish, no perspirations, and had some pain and inflammation of the bowels, which confined him to bed for 6 months. The bowels were then very much relaxed, and remained so for 4 or 5 months. He was leeched and had blue ointment rubbed into the abdomen, and had turpentine stupes applied. The pain came on at intervals of about ¼ of an hour, and lasted for a minute or two; when going away he says the pain was of a griping character, and the bowels at the time were drawn up into knots. He states that he passed membraneous tubes from the bowels, described by the surgeon who attended him as lumps of gelatinous matter. No tenderness. For the last 18 months he has been subject to occasional severe pain in the bowels, with nausea, without diarrhœa, but with tympanites, and usually relieved by a small quantity of gin. He has never worked in lead in any way.		Bowels regular in their action. He is a healthy looking man, with florid complexion, contrary to the common appearance of miners. Abdomen soft and natural to the touch. Body fat, heart sounds not very clear; 2nd sound double, otherwise normal.	Lives well, having meat every day, which will in some measure account for his florid complexion and good condition of body.
Five months ago he had tightness in the chest, and wheezing in the windpipe, cough, shortness of breath, and palpitation of the heart, and was unable to lie down in bed. The difficulty in lying down still occasionally comes on. He says he has not breath in the morning to walk any distance.		Complains now of shortness of breath and wheezing. Occasional slight cough, without expectoration, weakness and sinking at the pit of stomach. Appetite tolerable. States that he has lost flesh during the last 6 months. Chest rounded, and resonant on percussion. Mucous crepitation, with wheezing inspiration and expiration at base of both lungs behind. Prolonged wheezing expiration at base and anterior edge of left lung. Heart's impulse extends over to the right side, being forcibly felt in the epigastrium. Pulsation irregular in frequency and force, and occasionally intermittent.	Lately he has been living well.
When working at adit level at Wheal —, felt weakness in the legs on climbing, "my chest felt loaded, I had difficulty in breathing, a bad headache, and a little cough. I spat a good deal, it was dark but not black." When working at Wheal Raven, was very ill from the bad air, and it was thought he would not live. Had "a pain under the ribs on the right side and round to the back bone." Had a bad cough and spat up a great deal. It was dark expectoration. "I had no stomach to eat anything." Felt the usual ill effects of bad air when at Carn Brea, both in the 105 and in the winze at the bottom of the 20 level, "I came to work at the surface because I had shortness of breath and weakness in the stomach." Had an accident to his hip 3 years ago by which one leg is shortened about 2 inches.	Bad air	Subject to dyspnœa on any change in the weather. Complains now of weakness and shortness of breath. He is 63, and says "that is the age of two men." He cannot exert himself in any way without palpitation of the heart and dyspnœa. At other times he feels well. Dulness, loss of motion, and tubular breathing under right clavicle anteriorly, mucous crepitation over the corresponding portion posteriorly. The rest of chest gives normal respiratory sounds. Heart sounds not clear, 1st sound double, impulse not increased, action regular when he is quiet, but on walking across the room it becomes much quickened and irregular. Pulse small, unequal, compressible.	
"When working in the cold damp at Carn Brea, sometimes when I came up from under ground my limbs would tremble, and I felt sometimes very cold and sometimes in a great heat; at times I felt quite giddy and light-headed, as if I had been drinking." Left the mine, and after being at home for some time I got better, and afterwards worked at Camborne Vein. From here I was laid up with pains in my limbs, and was at home about 2 years. I have been ailing about 11 years."	Working in cold-damp, and exposure to cold in the shaft.	Has effusion into both wrist-joints and œdema of both legs, and a chronic abscess on his left arm. Heart sounds normal and feeble. Respiration healthy. Was unable to procure any urine for examination, probably it would be found to be albuminous.	

Number; District; Disease; Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
18. Curginven; July 1862.	46	66 Dead.	A miner; Miners' decline.	- - -	18	Tutwork and tribute, but chiefly the former.	Worked at Terwonys cliff 8 or 9 years, the lowest level being the 70. The mine extends under the sea, and was cold and wet, and the water in the mine was salt. There was cold damp here, and the air was bad, so that a candle could scarcely burn; there was only one shaft for a long time. They could scarcely carry a candle into the adit when the wind was north, but when south the air was better. "I did not feel any ill effect from working in that bad air. Afterwards worked in Wheal Basset 9 or 10 years. It is a copper and tin mine. Worked in poor air for 2 years in the 100 fathom level. I know the air was bad because the candle would not burn. I was ill here and left the mine in consequence, and afterwards took care of a dry for 6 months. This is 18 months ago, and I have not been to work since."
19. Camborne; Broncho-pneumonia; July 1862.	58	- - -	- - -	- - -	23	Employed in burning the tin ore.	"First worked at Wheal Vor for nearly 20 years, not much under ground. I worked at the burning of the tin. A great deal of sulphur and arsenic came from it. The ground where I was would be covered with arsenic as if it had been sprinkled with flour. I had heartburn and gasping for breath. I left Wheal Vor and went to Cook's Kitchen. I was 6 years there, and had the same employment. I was taken ill there. I was afterwards employed at Carn Brea for 7 or 8 months, and after that worked on the roads."
20. Penventon; Chronic bronchitis and emphysema, pleuritic effusion, disease of stomach; July 1862.	59	Dead -	Died from an accident.	Mother died suddenly, and two sisters died in decline.	19	- - -	First worked at Tresevian for 22 years in the 250 level. The air was good but very hot, and he often worked naked, and his boots used to be wet through with perspiration. Then went to Trethesollel mine for 12 years. Air good in 136 level. Afterwards went to Constantine mine, and from there to Wheal Henry, where he worked 16 or 17 years. Worked in the 60 level. The air was good and the candle would burn, but there was cold damp.
21. Camborne; Contraction of right side, with displacement of heart, and emphysema; July 1862.	51	63 Dead.	A miner; died from miners' complaint, after being at home 12 months.	- - -	15	Tutwork, afterwards on tribute.	Worked at Dolcoath for 15 years. "In a general way there was good air there, but sometimes I worked in poor air. I felt my health suffer during that 15 years." From there went to Carn Brea, and from there to Cook's Kitchen, at both places on tribute and in good air. Wages there averaged 5*l.* a month. Then went to North Roskear for 10 years, 9 years on tutwork. Worked in 120 level. It was very hot, the air tolerable, but not very good. Then worked at Great Wheal Seaton 3 years, in good air on tribute. "I have worked at Cook's Kitchen for 5 years, and am there now. I am now unable to go under ground, and have been at home 9 weeks."
22. North Brea; Emphysema; July 1862.	46	- -	- - -	- - -	15	Tutwork and tribute, and afterwards employed in the engine shaft.	Worked in many different mines, and usually in good air, and enjoyed good health until he went to Condurrow. Was there 6 years in the engine shaft. "I was taken ill there, and after staying away 3 weeks and then attempting to work again, was at last obliged to give it up."

History and Duration of Illness.	Cause to which he refers his Illness.	Present Condition.	Remarks.
Has had headache ever since he commenced mining. At Wheal Bassett felt qualmish in the stomach while at work, never vomited, but felt sick; sometimes used to feel weakness in the knees on climbing the ladders; no cough, but sometimes a pain in the breast, giddiness and lightness in the head, singing in the ears; never had any cough or expectoration. "Sometimes my heart used to beat harder on climbing, and sometimes I felt a sensation of drowsiness, or as if I should have gone to sleep if I had stopped working a bit."	Bad air -	Complains of giddiness. Says his head feels as if it were too full. Ringing in the ears, pain in the back of the head and down the back and round his loins. No cough or palpitation. Feels a fluttering in the legs. Says he has a sensation as if a cord were tied round him, and often he has pain under the right side of his ribs. Pulse 64, full, firm. Tongue large, pale, clean. Pupils normal, and contract normally under stimulus of light. Conjunctiva injected. Complexion rather florid.	
Complained of gasping for breath and heartburn when exposed to the fumes of arsenic at Wheal Vor, and was afterwards laid up with probably some inflammatory affection of lungs when at Cook's Kitchen. Has been now 4 years at home.	Exposure to the fumes of arsenic and sulphur.	Says that he feels as if everything had gone out of his body excepting his heart. Has palpitation of the heart, "and weakness across the stomach and loins." Sometimes has "lightness in the head." Expansion of chest limited to the upper part, the lower ribs sinking in on inspiration, and intercostal spaces depressed. Under right clavicle there is dulness, tubular breathing, and loss of vesicular murmur. Posteriorly puerile respiration at both apices. Large mucous crepitation over lower half of both lungs behind, and on the right side in front. Heart's impulse increased in extent towards epigastrium, not increased in force. Pulse 104, compressible.	Has had 17 children, 9 of which are dead. Has now 6 at home, and has only 1 bedroom.
Taken ill when working at Wheal Uny. Felt ill for 3 or 4 months before giving up work. Had a "crushing pain in the breast bone." "My feet went cold first. I had a little cough, but without shortness of breath at first, but that came on afterwards, and before I left, my breath was so short that I could scarcely get up the ladders."	- - -	Has great pain and tenderness on pressure over the stomach, and the epigastric region is swollen. Has had a feeling of nausea and tenderness over the stomach for 2 or 3 weeks. Nausea and pain in the stomach after meals, and is always "urging," but does not vomit. Cannot lie down on his back without severe pain in right hypochondrium. Emaciated, and has sallow complexion. Fine crepitation, but resonance over upper part of right lung in front, coarser crepitation and cooing expiration over apex behind. Dulness on percussion, tubular breathing, absence of vesicular murmur, absence of tactile vibration over base of left lung, before and behind. A pleuritic rub heard about three inches below the nipple on same side. Heart's impulse very feeble. Pulse irregular in volume, small, compressible.	
"When working in a close end at Dolcoath I used to feel pain in my head. Occasionally I felt shortness of breath in climbing the ladders, and I very often felt a weakness in the knees. I have not been well for 2 years. I began to fail about 2 years ago. I found that when I was climbing, or beating the borer, I could not work so long as I could before. I then felt a pain in my left breast. In climbing the ladders my heart used to beat a great deal. I used to expectorate a great deal of black stuff, but during the last 4 weeks I have had no cough."	Thinks his illness is produced by a cold.	My breath is now very bad. Cannot get up stairs without difficulty. Has general weakness. Dulness on percussion, deficient vesicular murmur, and creaking prolonged expiration heard over right lung behind; over left lung puerile respiration, and resonance on percussion, as much so at the ordinary seat of heart's dulness as elsewhere. Dulness on right side from 4th to 6th ribs, and from nipple to right of sterum. Impulse scarcely to be felt at all, but most distinctly about 2 inches below the right nipple. 2nd sound heard most distinctly between 3rd and 4th ribs, just to the right of sterum. Neither sound is clear; impulse regular, but very feeble. Right side of chest moves but little, and lower ribs and intercostal spaces sink in on inspiration. Lower part of right side much flattened.	He says "all miners spit up black, whether well or ill, especially when working in a smoky place."
When employed in the engine shaft, "I was round the nose of the lift, and word was sent to us to come up to the 80 fathom level as they were going to send down a piece of timber; and we came away very quick, sweating, and the kibble never came, and I was left standing there. I felt the cold go through me and I could not feel any heat in my body. I came up and warmed myself by the fire. I went to work afterwards for about 3 weeks, then I felt ill again and staid away 3 weeks, and then went to work again 2 days, but was obliged to give it up and I have never been since. I had weakness all over my body. I went into the Truro Infirmary. I was said to have inflammation of the heart, and they told me there was no cure or me, for that my lungs were affected."	Exposure to cold.	Prolonged cooing inspiration and expiration. Respiratory murmur generally deficient. Shoulders permanently raised, and chest rounded. Body in good condition. Heart sounds clear, impulse more forcible than natural. Pulse full but irregular in volume.	

Number; District; Disease; Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
23. Redruth; Bronchitis, Emphysema; July 1862.	60	Dead 60	A miner; decline.	Grand-father also a miner.	- - -	Tutwork and tribute; partly in engine shaft.	Worked during first 5 or 6 years at Wheal Gorland, then at Gwennap Consols, 12 months in the 250 level; the air was very hot, and we worked nearly naked. The candle burnt well. Afterwards worked in South Wheal Buller, in Poldice, and South Tolgus, generally in good air. At South Tolgus worked in the engine shaft. Wheal Uny is a wet cold mine, and there is tin water there. Has never worked in much poor air.
24. Illogan; Old Pneumonia; July 1862.	18	Dead	Miner.	- - -	15	The last 10 years on tribute.	Has been a miner since 15 years old. Formerly worked in bad air at Carn Brea, 20 years ago in the 80 level. Worked there 6 months and suffered from it. Worked in bad air in Wheal Agar in sinking a shaft from the surface. Has not worked for 12 months.
25. South Tolgus; July 1862.	39	-	-		- -	- - -	- - -
25a. Redruth; Mitral valvular disease; July 1862.	49	Dead	A miner; died of miners' disease after 6 years' illness.	Grand-father was a miner.	14	- - -	- - - - -
26. Redruth; Phthisis; July 1862.	32	81 Alive and in good health.	A mechanic.	- - -	9	- - -	"I have been working under ground 14 or 15 years." Worked 5 months in bad air in Wheal Elijah. That was the last mine he worked in, and he has now been at home 17 months. The bad air was in the 40 level.
27. Redruth; Miners' disease; July 1862.	42	- - -	- -	Has a son aged 15 now ill with similar symptoms to his own.	- - -	- - -	Has been working for 6 months at Elijah and Wentworth mine. Worked in bad air so that the candle would not burn, and felt ill in consequence. Then he went into another part where the air was good, but then felt worse than before.
28. Redruth; Mitral disease; July 1862.	31	Between 60 and 70. Alive.	Formerly a miner, but gave it up 30 years ago, from ill health.	-	16	- - -	Worked in foul air in Tincroft about 1½ years ago, and has since worked in foul air in America.
29. Camborne; bronchitis; July 1862.	75	- -	. .	- -		Tu work -	Was a farm labourer until he was 40 years old, when he took to mining, at which he has worked for 30 years. Has not worked for the last 2 years, because he could not see.

History and Duration of Illness.	Causes to which he refers his Illness.	Present Condition.	Remarks.
"I have been ill more or less for 20 years, but have been at work under ground until 2½ years ago. Was first laid up with shortness of breath and pain in the right side. Was ill 8 or 9 months, and have had repeated attacks since. Two and a half years ago was laid up with pain over the hip, a stoppage in the water, difficulty of breathing, and somelittle palpitation of the heart. Was ill 9 or 10 months."	Exposure to wet and cold	Complains of weakness, shortness of breath, palpitation, and wasting. Has no diarrhœa; sweats a good deal in the morning, and spits up white froth. There is wheezing expiration and inspiration all over the chest, which is very resonant on percussion. Heart sounds feeble and regular. Pulse small and compressible.	Pays 6*d.* to his club, 6*d.* to the doctor, and 3*d.* to the barber.
Was well up to one year ago. Was then taken ill with pain in the left side and shoulder. Had a cough and "no breath." Expectorated rusty sputa, and had fever with typhoid symptoms, and the chlorides were absent from the urine. He spat up suddenly a quantity of bloody greenish matter, and the expectoration continued 6 or 7 weeks. It was preceded by severe pain in the side and dyspnœa. It occurred about 2 months after the original illness; during that time there was crepitation with typhoid symptoms. (For the foregoing history I was indebted to the medical man who attended him, Mr. Hitchins of Redruth.)	- - -	Contraction of side. Absence of respiratory murmur and dulness at lower portion of left side, corresponding to seat of original disease.	He is intemperate in his habits.
Six years ago had inflammation of the lungs, but recovered and was quite well until 18 weeks ago, when he took cold and had a bad cough. He then had tightness in the chest, and spat up whitish thick sputa, and had some palpitation of the heart. The cough lasted 6 weeks and then went away. He says miners generally cough and spit up something. He is now prevented working by weakness, and has trembling, and his hand is not steady. Eleven weeks ago had shivering, occurring repeatedly for 4 or 5 weeks. Has not had it much lately. At that time lost flesh considerably, but has recovered it since.	- - -	Complains of a sensation of cold down his back and legs, and at the back of the head, like cold water running over the part. Has emphysema, general dulness of chest, and absence of respiratory murmur in right infra-clavicular space, and irregular inspiration at the base of right lung.	
Has not been well for 20 years. Was taken ill with inflammation of chest. Has had inflammatory fever two or three times, and has been as he is now for 7 years. Had dropsy 2 years ago, and at that time the surgeon who attended him says his urine was not albuminous.	- - -	Pain in the left side, shortness of breath, a fluttering of the heart, general emphysema of the lung. Loud, rough, systolic murmur over the mitral. Says he has never had the rheumatic fever.	
Never had a day's illness till about 16 months ago, and was then taken ill with pain in the right breast, bad cough, expectoration of dark slimy sputa, which has continued ever since. First spat blood 12 months ago, and has continued to do so ever since at intervals of 5 or 6 weeks. It comes on with very little cough, "as if something breaks in my throat." Has brought up, he says, nearly a quart of blood, mixed with spittle during a day and night, and it continues for some days and then gradually ceases. Began to spit blood again this morning. No diarrhœa. Sweats a great deal at night. Appetite good.	Working for 5 months in poor air in Wheel Elijah.	Expectoration rusty with admixture of blood. Cavernous respiration with bronchophony heard 2 or 3 inches below the clavicle, immediately below the clavicle large mucous crepitation. The same heard behind, over the right apex.	
Has been ill 2 months, and has given up work 5 weeks. Usually had good health before 2 months ago. He was working in bad air and was taken ill with pain in the head, alternately trembling with cold and flushing with heat, qualmishness and difficulty of climbing the ladders, pain in the right side. Kept his bed for 3 weeks.	Working in poor air.	Is now much improved in health. Complains of weakness chiefly, but has pains in the head if he does more than he ought. Has had no dyspnœa. No evidence of disease in examination of chest again into good air than during the time they are actually working in poor air. Another man who was working with him was taken ill at the same time. He has a son ill now who has been working under ground 18 months, aged 15. He has general weakness and pains between the shoulders, arms, and knees.	This agrees with statements of other miners, that they feel the ill effects of working in bad air more when they get
When at work in Tincroft, had headache, soreness and tightness of the chest, and trembling in the legs in climbing the ladders. Had then a little palpitation, but this chiefly came while working in foul air in America since that time. Never had rheumatism, but 18 months ago had swelling of the hands, which were not red, and without much pain. No other joints or limbs affected. Palpitation of the heart came on chiefly about 15 months ago, with pain in the chest. Has had more or less palpitation since then, and it is now his chief trouble.	Working in foul air.	At the present time he has no difficulty of breathing, and says he feels as if he could run if his heart would let him. Has pains in the left shoulder and breast when the palpitation comes on. Lungs resonant on percussion, respiratory murmur normal. A faint mitral murmur accompanies the 1st sound of the heart. Body in tolerably good condition.	
Had good health until about 2 months ago, when he took cold, and his breath has been very short ever since. Has cataract in both eyes, which has prevented him working for the last 2 years.	Took cold, not referable to mining.	Healthy looking old man. Breathing rather laboured and wheezing, shoulders being raised. Mucous crepitation, with slight cooing inspiration and expiration at base of left lung. Has a cough and spits a grea deal.	One of the few men above the middle age with healthy looks; no doubt referable to his not having worked underground for 2 years.

Number, District, Disease; Date	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working underground	Nature of Work	General History of Case, as taken from Hospital, Casualty or Out-Door Book.
30 Chyverton; Dilated Heart; July 1862.	16	48 Dead.	A miner at the surface. Killed by an accident.	- - -	14 to 15.	- - -	Worked as a miner about 18 months. Worked at Wheal [illegible] 2 years, and for 2 years at Chyverton. Worked on and off for the last 6 months. Did not suffer at [illegible]. Has been working at grass for 2½ years.
31. Buckingmill; Consolidation of lung; July 1862.	32	60 Alive and "in tolerable good health for an old man."	A miner still working under ground.	Lost a sister about 3 months after her confinement; she was thought to be in a decline.	17		
32 Treskilleard; Destruction of lungs (Tubercular?); July 1862.	26	57 Alive, and laid up with two bad legs, which were injured by working in cold water. "They are in wounds which won't heal."	A miner	- - -	16	Tutwork for 2 years, since then driving a steam machine at surface.	Worked underground for two years at Wheal [illegible] 8 years ago. Worked in the [illegible] and was laid up with [illegible] powder smoke in my eyes. I was ill for about a week after. I was then down for about 3 months with weakness in the legs, shortness of breath, and tightness in the chest. I worked a month after I first fell ill, and then was obliged to give up, and was laid up for 7 months." Since that time has worked at the surface, but for the last 7 months has been laid up again with the same complaint. "The place where I worked was draughty and cold. I caught cold, and it brought on a fever. I recovered from the fever, but the cough remains."
33 Camborne; Dyspepsia; July 1862.	47	71 Dead	A miner. Apoplexy. Worked under ground till 6 months before his death.	- -	11	He has been working the engines above ground for 5 years.	Worked under ground for 8 years, and during the next [illegible] at the surface. Then worked underground again for [illegible] years, and the last 5 years at the surface, where he still works.
34 Redruth; Paraplegia; July 1862.	50	- - -	- - -		18 Till that age he was a farmer.	- - -	"I was working in Wheal Margaret, in the adit level, in [illegible] water, 7 years ago, from which time I date my illness." 30 years ago was thrown from a horse and hurt in the loins, but there does not appear to be any connexion between this accident and his present illness.
35 Redruth; Post mortem on a case of miners' disease; July 1862.	Both lungs adherent to the chest; left lung was [illegible], had formed [illegible] the upper part was tough, dark in colour, fleshy, and contained but little air; the other parts healthy and crepitant. [illegible] universally adherent to the chest, so that it had to be cut out. It was covered with a sort of [illegible] material on the outside. A portion of one rib was [illegible], absorbed, and replaced by the same [illegible] portion of it was [illegible] lung in contact with [illegible] was removed. The heart itself was dense, firm, solid, almost [illegible] [illegible] to substance of the upper part and a healthy [illegible] all parts of it. The coronary vessels [illegible] with the same [illegible], and the [illegible] behind every [illegible] set of vessels, and contained dark [illegible] blood in the left [illegible]. Liver [illegible] [illegible] of dark, heart pale [illegible], firm, fat, [illegible] [illegible] of a good [illegible], and [illegible] [illegible]. Aorta and [illegible] [illegible], without [illegible]. [illegible] [illegible], and [illegible] deposit. Liver rather small, and indurated. Spleen and [illegible] healthy. [illegible] [illegible] apparently diseased. Left kidney mottled, [illegible], [illegible] [illegible] [illegible] [illegible]. No clots in pulmonary artery. Left lung [illegible] black on the [illegible] [illegible] [illegible]. No [illegible] [illegible]

History and Duration of Illness.	Causes to which he refers his Illness.	Present Condition.	Remarks.
Had good health until 3 years ago when he had inflammation in the left side, and was ill for 6 weeks. Says he has had rheumatism, but has never been laid up with it. Had shortness of breath at the same time as the pain in side. Six months ago he was ill again, and was considered by the surgeon who attended him to have abscess in the liver. He brought away a quantity of matter by the bowels at that time.	- - -	Now complains of shortness of breath. Has palpitation of the heart sometimes, and indigestion. Respiration is normal, but his heart is very irregular both in its frequency and force of its impulse.	
Was never ill until 4 years ago, when he had "slow fever" and was ill 4 weeks, but walked about all the time. It came on with sickness and pain in the head; no cough, a general weakness. Was again ill seven months ago from taking cold in the engine shaft, and "although I continued to work, felt a little cough, and had pain in the left side. After that I had a pain in the right side, which continued until 5 weeks ago, when I gave up work." Has lost flesh for 2 or 3 weeks, but has recovered it somewhat during the last few days.	Taking cold in the engine shaft, though he had been ill before that attack.	Complains of shortness of breath. Has cough but no expectoration. No pain. Has profuse perspirations in the morning. Body emaciated, face thin, eyes dark and sunken, sallow complexion. Chest very resonant in front, but dull behind between the scapulæ, and in that part vocal resonance is increased, and downwards from that spot respiratory sounds are almost tubular in some portions. Vibration normal, skin hot and dry, pungent. Heart sounds normal. Considerable impulse in epigastrium.	
First was laid up with the usual effects of working in bad air described in the previous column, but recovered after 7 months' illness since that he has been exposed to cold and laid up again with similar symptoms for the last 7 months, but is somewhat better now than he was a short time ago. Has a cough, and expectoration is white and frothy; never spat blood.	Working in bad air in the first place, and afterwards from exposure to cold in a draughty engine house.	Shortness of breath, "weakness of stomach." Body not extremely emaciated though thin. Tolerably healthy looking in face, with some colour, not flushed. Chest resonant all over right side in front, and behind except at base. Tubular breathing bronchophony, loud creaking and cooing with inspiration, and prolonged expiration heard under left clavicle. On right side prolonged creaking expiration, down the edge of sternum, and behind large moist crepitation at the base. Heart sounds normal.	Tolerably healthy appearance of face coincident with 8 years' work above ground, although the man is in an advanced stage of disease of the lungs.
Gave up work under ground because he was always ailing and catching cold.	- - -	Has a sallow unhealthy look, but his body is fat and in good condition. Feels a pain in pit of stomach when taking a deep breath. Has had nausea and lightness in the head lately. Pain on pressure in the epigastrium. Heart sounds normal. Chest resonant, prolonged emphysematous expiration in front.	
Illness came on from working in cold water 7 years ago. When he came out of the water, he had pains all over his body and limbs, which lasted 3 or 4 days, but he went to work again in a dry place, and about 6 months afterwards felt his legs "going dead" below the knee. They used to feel as if they were going to sleep, and gradually got worse for 5 or 6 years when he went into the Truro Infirmary. When he went there he says he could scarcely move one leg before the other. Both legs were affected alike; he had good feeling, but they felt always as if they were cold, and with an occasional stinging sensation. Was in the infirmary 2 months, and by then his legs felt warmer, but he felt weakness in the back. Has been at home 12 months. Two years ago had incontinence of urine, and when he felt a desire to go to stool he was obliged to go at once. About a year and a half ago he went to Penandrea mine, and was exposed to wet and cold attending to the stamps. Afterwards his limbs were in a tremble, and he has not been able to work since. Never had any pain in the back.	Working in cold water.	Can now walk across the room with the aid of a stick, but unsteadily. Has been in his present state about 6 months; but, if anything, gets a little weaker. No affection of upper limbs. Has 5 children, aged 12, 10, 8, 6, and 3½. At one time he used to drink a good deal of beer (3 or 4 quarts), but not for many years.	
The history of this case as far as could be ascertained was that of an ordinary case of miner's disease, in its severest form; and in many points, as in the expectoration of blood in considerable quantity, simulating tubercular consumption.			

Number; District; Disease; Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working underground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
36. Redruth; Chronic bronchitis; July 1862.	64	28 Dead.	A miner; died from an accident.	- - -	16	Tutwork and tribute.	First worked in Cook's Kitchen in 130 level in good air. Then in Consols (Gwennap) for 3 years, in 110 level. The air was "slight," very slight in some parts. On tutwork. Then he went to Tolgus Downs, for 6 or 7 years in different levels, on tribute, air generally good, but not always. Then to Carn Brea about 12 years, deepest level 100 fathoms. "The air was tolerably good for miner's air. Damp cold air usually on the granite, worse than on the killas." Has been away from work 14 or 15 years.
37. Camborne; Miners' disease; July 1862.	21	48 Alive.	A miner in good health.	Grandfather was a miner, and was 80 yrs. old when he died.	8	Formerly a miner, now a railway porter.	Worked under ground for 8 years. Worked in bad air in Fowey Consols 4 years ago, for about 12 months. In the back of the adit, in the 40 level, and in the 240 level there was bad air. Afterwards took a situation as gentleman's servant, and lately has been employed on the railway as a porter.
38. Camborne; Injury to heart; July 1862.	24	49 Dead.	A miner, miners' disease, with pain in the side.	- - -	15		Worked under ground until 7 months ago at West Wheal Seaton.
39. Tuckingmill; Miners' disease; July 1862.	21	45 Alive.	A miner, in tolerable health.	- - -	11	Tutwork.	"I first worked at South Tolgus in the 50 level, employed in blowing in air to two other men; air good; worked there 4 months. Then worked at grass for 3 years. After that worked at Copper Hill for 6 or 7 months in 60 level; good air part of the time, but dead and close 100 fathoms from shaft. During the last 2 or 3 months that I worked there the air was bad, so that the candle would not burn except when inclined. Did not feel any ill effect from that. Then worked at grass 5 or 6 months. Then worked 3 months at South Wheal Basset in adit level on tribute, air good. Then at North Wheal Basset for 2½ years in 50 level. Air close, but we had a machine blowing to us. The candle would not burn. We had hard work to carry in a candle lighted, although we had an air machine. I worked 4 months in that foul air, and then went to the 40 level, 50 from shaft, to sink a winze. It was rather cold. The air was very dead and close, and the candle would only burn when inclined. Then worked 3 weeks at grass, at Wheal Seaton, and then went to West Wheal Basset, where I work now. I have worked in the 70, 80, 90, 114 levels, and now in the 104. Very bad air in the 70. Sometimes I was there for 3 or 4 hours before we could carry a light into the end where I worked on tutwork. We had to give up that end on account of the bad air, and work in another place. Since then a shaft has been sunk near the end, so that men can work there again. Air very close in the 80, candle inclined, air rather cold. Air good in other levels but there was cold-damp, it being a granite mine in general. Tin and copper."
40. Redruth; Miners' disease; July 1862.	49	73 Dead.	A miner, but worked at grass for 8 or 10 years before his death.	- - -	14	- - -	- - -
41. Redruth; Chronic broncho-pneumonia; July 1862.	70	- - -	- -	- -	20	Chiefly at surface, in the "dry."	Did not work under ground many months. Worked at Wheal Vor in the East. "I gave it up on account of the bad air."

History and Duration of Illness.	Causes to which he refers his Illness.	Present Condition.	Remarks.
Was taken ill whilst working at grass with violent pain in the kidneys, extending into the groin, sickness, and followed by sudden relief. After this he passed a calculus. He has now a large collection of calculi that he has passed of all sizes up to a bean. First felt his breath short 2 or 3 years ago; and now he has not "breath to travel," and it is much worse in the winter.	- - -	Expectoration white and frothy. Has had a rupture on right side for many years; but he says it came from working in a constrained posture, and not from climbing.	
Worked under ground for 4 years before feeling any ill effect from it, and then he lost his appetite, had shortness of breath, and could climb the ladders. Had sores on the head and glands in the neck swollen. Was at home about 2 months and had medical advice. Was recommended not to go to work under ground again. Went to work again under ground, and continued to do so for 4 years with occasional attacks of illness, being sometimes under ground and sometimes at surface. When ill had a bad cough with expectoration of "black corruption" and occasionally blood. Had pain in the left side and shortness of breath. Lost flesh very much. Got better when he stayed above ground.	Working in bad air.	Has had very good health since leaving the mine, but still feels difficulty of breathing, and has a cough if he gets at all wet. Had palpitation of the heart, while climbing the ladders, and he still feels it a little at times. Fresh healthy colour in face, is stout and strong in body, and seems in good health. Chest generally resonant except at lower part of left lung in front. Emphysematous crackling over front of right lung near sternum; tubular breathing over a limited space at 3d or 4th left costal cartilages. Heart sounds normal, impulse natural. Pulse tolerably full, soft.	
Whilst lifting a heavy load of rock, he sneezed, and felt something give way in his chest (about the middle of sternum) with a sensation as if stabbed with a penknife. The pain remained 10 or 15 minutes, and then ceased, but comes on now if he exerts himself. Was quite well before this occurred; but since then has had palpitation of the heart, so that he cannot work for the pain. Has had nothing else the matter with him.	Lifting a heavy weight.	Feels weakness, pain in the breast at times, palpitation of the heart under any excitement. When quiet feels in tolerable health, with the exception of being rather weak. Heart easily excited and beats violently after walking across the room. Impulse forcible, and accompanied by a flapping noisy sound near the apex. The two sounds are distinct, and no murmur detected with either.	
First complained when working in North Wheal Basset, in 40 level, of pain in the head, weakness in the legs, and generally of the body, sickness on entering the mine in the morning, so that he was obliged to give up work for a time, shortness of breath, heaviness in the chest, and palpitation of the heart on climbing. Sometimes he used to race up the ladder with the other men, and then his heart used to beat very much. "There was a covering over the manhole, but we had to go 200 fathoms to the changing house in all weathers." I was laid up for about 3 weeks at this time, and then went to work again in the same mine." Was home ill 4 or 5 weeks when working in the 70, same symptoms as before. Has not been laid up in that way since, but has had sore throat, and pains about the body and chest when he exerts himself. Has had pains in the chest the last few days; sometimes has weakness, and dimness of sight, and lightness of the head.	Working in bad air.	Has a little cough, with white frothy expectoration, black after working in a dry close place. They have 1½ pint of water for two persons during 8 hours work. Muscles flabby, face and body rather thin, pale, sallow complexion, dark about the eyes. Slight increase of vocal resonance over right apex behind, with dry creaking inspiration. In other parts normal resonance, but dry creaking in places. Heart sounds feeble, but distinct. Gets 60s. a month (good pay); his father gets 60s. They are 6 in family, and they generally have about 4lbs. of meat a week for the six.	He had to walk a distance of 400 yds. in all weathers from the mouth of the shaft to the changing house, and that after racing up the ladders against other men. He nearly fainted during the examination, and says that he has done so at times before.
"I had good health until about 8 months ago, when I went under ground into a winze where there was poor air and cold damp. I got within 5 feet of the bottom when I broke the "damp" and my candle went out. I lost my speech, felt a choking sensation and trembling in the limbs. I came to grass and went home. I felt very bad and my bowels were all in a tremble. I sent for the surgeon. I was ill 4 months before I was able to go to work again. I had pain over my chest, no cough, palpitation of the heart, pain in the limbs, weakness and shortness of breath. I have now been working 4 months, the first month at grass."	Bad air and cold damp.	"I now feel palpitation of the heart when I climb, and shortness of breath, otherwise I feel pretty well." He has a tolerable colour in the face, and says he is in as good condition as ever he was. Deficiency of respiratory murmur, generally over the chest. Right infra-clavicular space duller than the other, and respiratory murmur more deficient there than elsewhere, prolonged creaking expiration behind.	
Has never been quite well since he was hurt about 20 years ago, when he fell down on some iron and hurt his shoulders and side. Was laid up for 3 years. Was salivated in the Truro Infirmary; the surgeon then told him his liver was hurt. Has frequently taken cold whilst employed at the dry. Used then to have shortness of breath and cough. Has not been able to go backwards and forwards, for 5 months, to work, on account of shortness of breath, pain and weakness in the limbs. I have a little cough sometimes, and spit up a little frothy matter.	- - -	Body wasted, chest resonant on percussion generally, but right apex is dull before and behind. There is tubular breathing and prolonged expiration, and the resonance of voice is increased. Heart sounds regular, 2nd being double.	

Number ; District; Disease ; Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
42. Vobloath; Old pleurisy; July 1862.	32	54 Alive and in good health.	A miner -	- - - -	10	- - -	Worked under ground until 12 weeks ago.
43. Redruth; Pleurisy; July 1862.	46	70 Dead.	Farm labourer.	Mother is alive, aged about 70. Grandfather died about 90. No history of phthisis in the family.	18	Tribute, 2 months only on tutwork.	Worked at Carn Brea in bad air for 2 months in the 18 level. Never worked in bad air except then. Has been laid up for 12 months, but during the last 2 months has worked at grass.
44. Redruth; Debility following previous illness; July 1862.	47	74 Dead.	A miner for 59 years.	Grandfather a miner, died at 90, was blind for 30 years before his death from an accident in the mine.	15	Tutwork chiefly, and principally worked in the engine shaft.	Has not worked much in bad air. Worked in a little in Carn Brea in the 100 level. Has been away from work a year and eight months.
45. Redruth; Dyspepsia and hæmorrhoids; July 1862.	34	36 Dead.	A miner died in a decline after 10 years' illness.	Mother alive and well.	17	Tutwork and tribute.	Worked 7 years at Carn Brea in 26 level, 2 years at East Pool in 90 and 48 levels, then went back to Carn Brea for 3 years. Whilst working here had an attack of fever, and was laid up for 4 months. The air was good in these mines. Then went to America for 5 years.
46. Camborne; Miners' disease; July 1862.	34	60 Alive.	A miner in good health.	Grandfather died aged 75. Has 3 brothers alive. One brother died of miner's disease, aged 16, after working under ground 4½ years.	9	Tutwork -	Worked first at East Wheal Crofty 2 years, and then went to North Roskear for 5 years. He worked 9 months in bad air in the 60 fathom level, and felt bad effects from it: "I felt my windpipe choked up and heaviness in my breathing just as I feel now." Then went to West Caradon for 7 years. There was cold-damp in the 104 level; worked there 6 months, and then went to 140, where the air was good Then worked in the 80, where the air was very bad. "I worked there 17 months. I felt bad effects from it. I felt pain in my breast and body, shortness of breath; and I am suffering from it now. I am still working."
47. Camborne; Eczema; July 1862.	40	- - -	- - -	- - -	- - -	Chiefly in a tin burning house. Only 12 months under ground.	Worked under ground for 12 months 5 years ago, but it did not agree with him; so he left it, and worked at grass since then. During the last 4 months has worked at a tin burning house at Luny. "I have to burn the tin in the furnace, as it contains mundic and arsenic. I have felt when at work a feeling of nausea coming on several times during the day. The poison comes out of the furnace when we are working the tin with the rake, and settles on the handle and on our hands like hoar frost. It gets into our mouths, and has a nasty bitter taste, and produces a feeling of sickness."

History and Duration of Illness.	Causes to which he refers his Illness.	Present Condition.	Remarks.
"Had good health until 7 years ago, when I was taken ill with inflammation in the side. I had been working in bad air for about 2 months before that. I was taken ill suddenly whilst going home from market, with pain in the side and trembling of the limbs. I was in bed for 3 or 4 weeks with cough and expectoration of yellowish thick matter. I then went to work again, but have never been thoroughly well since. I have been laid up 2 or 3 times since then, for a week or two at a time."	Exposure to cold, after working in bad air.	Now complains of weakness and shortness of breath, some pain in left side and shoulder occasionally, palpitation of the heart under any emotion, or if anything comes suddenly upon him, perspirations at night. Chest flattened below on left side, where it also sinks in on inspiration, and there is loss of respiration there. The other portion of same lung is somewhat deficient in respiratory murmur and prolonged expiration is heard in some parts. Heart sounds normal.	
Has not been well for 10 or 12 years, Was taken ill with inflammation in the side and slow fever. At that time had pain in the chest, with expectoration of a little black stuff, but about 18 months afterwards he spat up about ½ a pint of pure blood, of a bright red colour, mixed with mucus and frothy. It ceased gradually in the course of a day or two. Was home at that time 6 or 8 months. Since then has been laid up at intervals with affection of the chest. Yesterday week he spat up a mouthful or two of blood, preceded by pain in the side, no cough, but which ran out of his mouth after some little exertion and accompanied by a feeling of sickness. It was hours after dinner, but he did not bring up any food.	- -	Has now pain in the left side and fluttering of the heart and shortness of breath, no cough. Light complexion, florid healthy look. Pulse full, slow, compressible, regular. Chest resonant on percussion except at base of left side, where there is dulness, absence of respiratory murmur, or breathing sound of any kind. Tenderness over the whole of left side of chest, and has a pain in breathing, which is irregular and catching. Heart sounds faint, but regular and distinct.	
"Was quite well until 20 months since. I then worked in cold water for about 3 hours. I then had shivering, soreness in the limbs, pain in the right side. I was laid up for 12 months before I could get out. I had cough, no expectoration, never spat blood. I have not been able to work since from weakness in the stomach. I have had rheumatic pain in the shoulders for 2 months, but it is better now." Lost flesh considerably, but says he has recovered it lately since he has been out. Has had "beating of the heart" ever since he was ill, 18 months ago.	Working in cold water.	Shortness of breath, no cough, general weakness, and tenderness in epigastrium on pressure. Has a tender periosteal swelling on right index finger, which has come by itself. Sallow complexion. Chest normally resonant throughout. Respiratory murmur not quite so loud as usual. Heart sounds somewhat indistinct, but no murmur detected. Impulse regular, but rather feeble.	
About 12 months ago he first complained of pain in the pit of the stomach, and at the same time passed blood by stool. Has had a recurrence of the pain and hæmorhage several times since. No nausea or sickness, has loss of appetite, and is afraid to eat anything for fear of bringing on the pain. Is always easier when his stomach is empty. Pain resembles cramp, and comes on violently for a time and goes away again.		Sallow leaden look, complexion pale, no line on gums; bowels generally confined, says, he almost always passes blood on going to stool. Nothing abnormal detected about the heart or lungs. Has an anemic appearance as from loss of blood, and says he has no strength. Tongue clean; pulse full and firm, unlike a person who has lost much blood.	
Had good health until 9 years ago. Was then taken ill with pains in the body, fluttering of the heart, cough with expectoration of black sputa. Had been working about 2½ years in bad air, in a warm mine with cold-damp as well. "I came up the ladders very hot and very much fatigued. The first two of these ladders I could climb very well, but after that, cough would come on, with shortness of breath, fluttering of the heart, and weakness in the knees." After taking cold going home from the mine, "I had shivering, felt stupid and drowsy, with nausea." Was at home 9 weeks at that time, and has never been thoroughly well since, and has been at home "times out of number," for 2 or 3 weeks at a time since then. At these times he had pain in the chest, shortness of breath, not much expectoration.	Taking cold on going home from the mine. "After coming to grass I had 200 to 300 yards to walk to the changing house, and afterwards about 2½ miles home, and I think I caught cold in coming home."	Sallow complexion, sunken features, especially about the eyes, which have a dark areola. He can count 20 slowly without taking breath. Has fluttering of the heart in climbing or working, and pain in the right side on beating the borer. Body not much wasted, muscles tolerably firm, no extra fat. Chest expands tolerably at upper part not much below. Resonant on percussion, respiratory murmur less than natural, and expiration is prolonged with creaking sound at both apices before and behind, otherwise the sounds are normal. Heart sounds very feeble, though clear, impulse slight. Pulse small, soft and compressible.	
"I am now suffering from a bad leg, which came on first like a little excoriation in front of the instep, and with continual working it has spread all up the leg. I felt it first about 6 months ago, and have been working ever since."	Irritation from his work.	Has chronic eczema of both legs.	

Number; District; Disease; Date.	Age.	Father's Age, and whether dead or alive.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
48. Camborne, Miners' disease; July 1862.	21	43 Alive, but working at grass on account of an accident.	A miner.	- - -	8	Tribute and tutwork.	"When I first went under ground, my father used to sling me round the waist with a rope, the other end of which was fastened round his own, on going down, and the same coming up, the first day, but after that, he used to put me up before him, so that he could catch me if I fell. Worked several years in Tincroft, Wheal Seaton, North Wheal Crofty, and Trefina mine, where I had to clear away a "choke" and was slung with a rope round my waist in case the ground should give way. Had my leg broken here by a kibble falling on it, and was laid up 3 months. I am now sinking a shaft at Dolcoath."
49. Whendron; Chronic broncho-pneumonia, July 1862.	58	- - -	- - -	- - -	- - -	- - -	- - -
50. Camborne; Bronchitis and emphysema, miners' disease; July 1862.	27	Dead.	A miner, killed by the accidental explosion of a hole.	- - -	13	Tutwork and tribute.	First worked at Trefina in the 14 level on tutwork for 2 years. Air was rather close but not so bad as in some places; it was a cold mine, in granite. Then went to Dolcoath, where he has worked ever since, 12 years. Worked first in 170 on tribute, for 12 months, air good; then in 42 level, where the air was closer and colder, being away from shaft 40 fathoms; then in the 210, in good air, for 2 or 3 years. (The "man engine" was then put in.) Since then has worked in the 250 level on tutwork; good air, but warm.
51. Camborne; Mitral valvular disease; July 1862.	20	46 Alive.	A miner, in good health.	- - -	13	Tutworkand tribute.	First worked at North Roskear, 3 years, in 160 level, 140 from shaft; air good, but a great deal of powder smoke. Then at Camborne Vein, 8 months, good air. Then at Wheal Maxwell, 3 months, in adit level, on tribute, 60 from shaft, air very bad, candles would not burn upright. Then at North Wheal Crofty, 2 years, 130 level. Then at West Francis, in 80 level, tutwork, air very bad (120 from shaft), candles would not burn, and a great deal of powder smoke. Then went to Wheal Harriet for 8 or 9 months, in 30 level, air good, but a little smoke. "I then felt the effect of working in poor air in the previous mine." Left that 9 or 10 months ago, and then worked at North Crofty 3 months, and the last 6 months at grass till a day or two since, when I was obliged to give it up for want of breath.
52. Camborne; Pleurisy; July 1862.	44	- - -	A miner.	- - -	16	Tutwork and tribute.	Worked at Wheal Tremayne, on tribute chiefly, for 7 or 8 years, on tutwork for a short time in 10, 20, and 30 fathom levels, in bad air, about 2 years altogether. Then at Lady Hill, 2 years; air slight but not decidedly bad. Worked at several mines after that for a short time in each. Then went to a little granite mine called Carn Camborne; it was very cold, and here he caught a severe cold. The air was not bad but there was cold-damp. Then went to North Roskear, but had to give up after 5 days in consequence of his cold, and left work for 3 months, and then attempted it again but was obliged to give up. Has not worked since. At that time could not climb more than one ladder at a time owing to shortness of breath.
53. Liskeard; Pleurisy, dilated eart; July 1862.	50	- s -	Not a miner.	- - -	11	Tutworkand tribute.	Worked first in Gwennap Consols, for 9 years, and then went to Fowey Consols, a very deep hot mine. Worked there for 18 years, and in a great deal of bad air, in 55 and 200 levels. "I worked naked all but my shoes and cap for 10 years." Used very often to take cold, and suffered when working in those levels from palpitation of the heart, so that I was obliged to give up work." Then worked at Trchern Mine (lead) for 6 years, not much bad air there. After that at Trelawney (lead) mine until last September. Has not worked since.
54. Liskeard; Chronic bronchitis and emphysema; July 1862.	63	Dead.	A miner, and killed in the mine.	- - -	12	Tutwork -	When he first went underground he says he could hardly climb the ladders. First worked at Gwennap United for 12 months and then at Consols, 2 or 3 years on boy's work; "No particularly bad air." Then went to the Ashbourn mines in Devonshire on tutwork, for about 6 years. Worked in bad air 50 fathoms from surface about 5 or 6 months. The adit is 10 fathoms here. Then went to West Caradon on tutwork for 5 or 6 years. No bad air. Then went to Wheal Mary Anne, a lead mine, for 7 or 8 years. Worked in very bad air in the 90 level for 6 months. "I was ill from that, and have never worked since;" that is 5 years ago.

History and Duration of Illness.	Cause to which he refers his Illness.	Present Condition.	Remarks.
"Two or three days after commencing to sink a shaft at Dolcoath I lost my appetite, and I have sometimes pain in the side so that I can hardly breathe. I have palpitation of the heart, but that I have had for 5 or 6 years, when I am climbing; sometimes I feel as if my heart would jump out of my body, and I can hardly speak. My head opens up and swells, and I have ringing in my ears when I climb. Sometimes if we are late in giving up work we have to climb hard for fear of being caught in the engine when she stops. One day about a month since the engine ceased working when we were about up to adit, and then we had to climb the rod of the engine to grass. During the last few days I have had a cold, and a little cough.	Climbing.	Chest resonant on percussion, the left infra-clavicular space being not quite so resonant as the right, and there respiratory murmur is not so distinct and is accompanied by slightly prolonged expiration. Heart sounds are regular, easily excited; 2nd sound remarkably clear, no murmur.	
Ill 22 years. "About 22 years ago I was taken ill with shortness of breath, tightness in the chest and pain between the shoulders and in the right shoulder. I have never been well since. Have had cough all the time with expectoration of white frothy mucus. Have spat blood at times, but I do not think as much as a teaspoonful at a time."	Climbing deep ladders and working in hot mines.	Dulness in left infra-clavicular space, with tubular breathing, and crepitation over the whole of right chest in front.	
About 2 years ago was laid up with inflammation in the chest, having complained some time before he gave up. There was not much smoke. He got quite well after it, and went to work again. About 6 weeks ago, had a return of the cough, which has continued up to the present time.	Thinks it came on from "a cold."	Complains of weakness; has a bad cough, with expectoration of thick white mucus, sometimes black when he has been working under ground. Not much perspiration. Has tightness in the head, and sickness sometimes with the cough in the morning. Has had giddiness and headache occasionally for the last 2 or 3 years. Chest generally resonant on percussion, but has not much motion even on deep inspiration. Deficiency of respiratory murmur and creaking inspiration over the greater part of the chest. No crepitation. Voice sounds natural. Heart sounds clear but feeble. Pulse, slow, small, compressible. Skin cool and soft. Face thin and sallow. Eyes dark and sunken. Muscles flabby.	
Has had palpitation of the heart and shortness of breath as long as he can recollect, and never could climb without dyspnœa. After working in poor air, had pain in the stomach, sickness with vomiting of a little blood with the food; had also pain in the bowels and diarrhœa; had also weakness in the knees on climbing. No history of rheumatism.	- - -	Face congested, puffy, conjunctiva clear, lips dark. Feet are generally cold, he says. Legs œdematous. Pulse 104, so small as hardly to be felt. Heart has a double see-saw murmur, with a vibratile thrill felt by the hand. A double impulse, one with systole and another with the diastole, the latter being accompanied by thrill felt by the hand. Systolic murmur heard distinctly in the back. Action of heart tumultuous, area of impulse and dulness much increased. 1st sound scarcely heard, 2nd sound distinct.	
While working in bad air at Wheal Tremayne he was under the doctor's hands for a long time. Had pain in the shoulders and back, and a load on the chest, so that he could not breathe. When in Carn Camborne, his feet and legs were always cold, and though he worked hard, yet he could never sweat. Then he had a bad cough and shortness of breath. Never spat as much as a teaspoonful of blood at a time. Used to sweat at night when he was worse than at present, but has not done so during the last fortnight.	- - -	Respiration 24. Pulse 120 compressible. General deficiency of respiratory murmur over chest. Dulness on percussion. Absence of tactile vibration, loss of vesicular murmur, and œgophonic modification of voice at lower part of left chest behind and in front. Motion of left chest much less than of the right. Heart sounds normal. Bowels rather confined than otherwise.	
Illness came on gradually for 8 months before he gave up work. Had pain in the right side and shortness of breath. It gradually increased until he was obliged to give up. Was then confined to bed for 4 or 5 weeks. First spat blood in August (several spoonfuls), and several times since then has done so. It was fresh coloured and frothy, sometimes dark.	- - -	Has pains in lower part of right side in front, and soreness behind the sternum. Has a feeling as of cold water running over the legs, weakness, but little cough or expectoration, and that is yellow and thick. Palpitation of heart at times. Bowels very much confined. Irregular motion of walls of chest, which do not expand freely, the motion being restrained. Vesicular murmur over both lungs, faintly at the apices. At base of both lungs in front is a dry creaking, pleuritic rub. Heart sounds distinct, but its action is irregular. Respirations 22, easy. Gums have a red, but no blue line. Pulse 76, small. Body thin, but not emaciated.	
After working in bad air 5 years ago, he felt very cold after coming home one day, and after that was seized with shortness of breath, pain under the left breast, and a bad cough. Expectoration copious but difficult to get up. His breath was almost stopped. Has had the complaint upon him ever since.	Working in bad air.	Body thin, but not emaciated. Chest resonant on percussion, all over it. Respiration clear and puerile at the apices. Prolonged cooing inspiration and expiration over lower part of both lungs before and behind. Large moist crepitation over both bases behind. Heart sounds clear and regular.	

Number; District; Disease; Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
55. Liskeard; Chronic bronchitis; July 1862.	54	- - -	- - -	- - -	15	Tutwork and tribute.	First worked at Hurlun mine, near Gwinear. Worked there 14 years, on tribute chiefly. Not much bad air, but a little cold-damp. Then worked 2 years at Wheal Providence, and afterwards at Wheal Fortune, near Marazion, for 3 years. Worked in some bad air there, but not much. Then went to St. Ives Consols for 6 years. There was a good deal of poor air there. There was bad air in the 140 level, where he worked for 10 months. Felt ill effects from that. After that worked in several different mines for a short time, and then went to Wheal Trelawney for 8 years. Worked 3 or 4 months in bad air in the 108 level, and suffered from it in a similar manner to the former attack, but did not leave off work. I now belong to Wheal Mary Anne. There is no bad air there.
56. Liskeard; Chronic broncho - pneumonia; July 1862.	42	63 Dead.	A miner, died of "decline."	- - -	14	Tutwork and tribute.	Worked at Treburgatt, Tregargatt, St. Minver, Mulberry, and East Caradon mines for different spaces of time, and then went to South Caradon on tribute for 12 years, where he worked in bad air for 2 months in the 30-fathom level. Then went to West Caradon on tutwork for about a month. "The air was so very bad there that I could not stand it." The candles would not burn. Then returned to South Caradon for 3 years. Has not worked in a mine for 10 years, owing to ill health.
57. Liskeard; Miners' disease; July 1862.	36	76 Dead.	A sawyer -	Grandfather died at 96.	30	Tutwork -	Up to 30 years of age was a farm labourer, and never knew what it was to have a day's illness. First worked at West Caradon, for 3 years. Worked in bad air in the 17 level for 3 months. The candles would not burn upright, and other men were laid up from working there. Was ill in consequence. Then went to Wheal Mary Anne for 3 years. Not much bad air, but a great deal of powder smoke in the 110 level. "I worked there till 16 months ago, when I was taken so ill that I could not work, and I have not worked at anything since."
58. St. Cleer; Pleurisy; July 1862.	20	51 Alive.	A miner -	- - -	11	Tutwork and tribute.	First worked at West Caradon for 7 or 8 years, the latter part of the time on tribute. No bad air where he worked. Then went to South Caradon for 12 months, and afterwards went back to West Caradon, where he worked for 4 years; air good. Since then has worked at Cradockmoor. The air is good, but there is a great deal of smoke in 72 level.
59. St. Cleer; Miners' disease; July 1862.	51	- - -	- - -	- - -	15	Tutwork chiefly.	Worked first at Fowey Consols for 15 years in the 150 and 180 levels. The air was very hot and very bad. No ill effect from it. Then went to South Caradon, 5 or 6 months in bad air in the 35 level, 6 or 7 months in bad air in the 50 level and 2 years in the 70 level, also in bad air. Did not feel any ill effect from it at that time except weakness in the knees on climbing. "We generally feel that after working in bad air." Then worked at Wheal Phœnix 7 years. At the bottom of the 90 there was bad air, also in the 100 level. In these two levels he worked about 4 years or more. Then went to West Caradon on tribute, air good. Then went to Cradock Moor on tribute, and worked 9 months in bad air in the 30 level. "I knocked up there, and have never worked since." That is 3 or 4 years ago.
60. St. Cleer; July 1862.	54	45 Dead.	A miner. Miners' decline.	Grandfather was a miner.	14	- - -	Says he has worked in bad air in almost every mine he has been at. Caught a bad cold at West Caradon, which gave him lightness in the head. He has not worked under ground since.

History and Duration of Illness.	Causes to which he refers his Illness.	Present Condition.	Remarks.
After working in bad air in St. Ives Consols had tightness in the chest, pain and lightness in the head, "sickness at the stomach," with loss of appetite, bad cough, shortness of breath, expectoration of blackish frothy sputa, like as if powder smoke were mixed up with it. Similar symptoms accompanied another attack of illness when working at Wheal Trelawney.	Working in bad air.	Complains of tightness in the chest and jumping of the limbs when going off to sleep at night. Has cough with expectoration. Chest very resonant on percussion, respiratory murmur clear everywhere. Heart sounds clear and regular. Body not emaciated.	Has a wife and 5 children. Gets 50*s*. a month at his work.
Says he caught cold in coming away from work in a hot winze, having at the time only a thin suit of clothes on. He was very ill for 2 years, and has never been well since. He was told by a surgeon, 9 years ago, that his left lung was diseased.	Exposure to cold after working in a hot mine.	Has "pressure on the chest," a bad cough, sickness, (brought on by coughing,) and shortness of breath. Expectoration copious, clear or darkish in colour, frothy, and sometimes streaked with blood. Says he has lost his voice during the last 2 years, and he now speaks with a rough, hoarse voice. Bowels regular. No perspiration. Left side of chest has but little motion, right side moving freely. Left side very much flattened under clavicle, dull on percussion. Tubular breathing, and bronchophony heard as low as the nipple. Behind, there is respiratory murmur with mucous crepitation. Mucous crepitation in right infra-clavicular space. The rest of chest resonant, and normal vesicular murmur is heard over it.	
When at West Caradon "I had pain in the head on left side, shortness of breath, and vomited blood several times, about a pint each time." At Wheal Mary Anne, he complained of shivering, weakness in all his limbs, cough, and severe pain in the side. Had expectoration of thick yellowish mucus, sometimes streaked with blood. Has had shivering fits for some months. They generally come on about 12 or 1 o'clock, lasting 1½ hour, and followed by half an hour of profuse perspiration. The house he lives in, he says, is in a high and dry situation. About 6 weeks ago he passed blood with his water, preceded by severe pain in the loins; but since then has had no pain.	- - -	Complains of pain in the left side, weakness, "sinking at the pit of the stomach," not much cough or expectoration, shortness of breath, and sometimes a good deal of palpitation of the heart. Says he has lost flesh a good deal lately, but his body is not at all emaciated. No evidence of local disease of any kind to be detected.	
Had fever 4 or 5 years ago. Last night was taken with pain in the right side. Has been poorly a day or two, rather feverish. Has a little cough, and spits up thick white frothy mucus. Had no cough before last night.	- - -	Still has pain in the side on breathing, but not so bad as it was. Tongue tremulous, flabby, covered with a little creamy fur. Skin rather hot. Pulse 84, small, compressible. Respiration shallow. Urine highly coloured. Bowels regular. Respiratory murmur clear and distinct. Chest resonant. A limited pleuritic rub is heard over lower part of right lung in front, and the motion of the chest is there somewhat restrained. Heart sounds clear and regular.	
Had inflammation of the lungs about 30 years ago, but since then has had good health until 3 or 4 years ago. Was then taken ill with pains in the left side, which came on gradually. Brought up about a cupful of dark blood at that time, and shortly after it was seized with a cough. Since then has coughed up a little blood at times. Has had also palpitation of the heart and general weakness. Has not spat blood for the last 3 weeks.	Thinks it came on from working in poor air.	As long as he is quiet, he says he feels pretty well, but directly he begins to move about he is "done" directly, from palpitation of the heart, and shortness of breath. Spits a good deal of white frothy mucus in the morning, but not much during the day. Has pain and weakness across the loins. Loss of motion, slight dulness on percussion, flattening, and respiratory murmur with mucous crepitation at left apex in front, large mucous crepitation over apex and base of same lung behind, tenderness on pressure and loss of respiration at extreme base. Opposite the middle of scapula, there is prolonged cooing inspiration and expiration on the same side. On right side there is puerile respiration at apex, elsewhere respiration is clear. Heart sounds clear and regular. Says he has lost 30 lbs. weight during the last 4 or 5 years. Appetite good. Sweats profusely, but not at night. Pulse small and very compressible. Face pale, but not emaciated.	
Has had a discharge from both ears ever since he was a child. It becomes worse when he has a cold, and he then becomes deaf and has a headache. Complains of giddiness and lightness in the head when he lies on his left side or back. Can only lie on his right side, as otherwise he feels as if everything were tumbling away from under him. Feels giddy if he looks upwards or turns his head round, and sometimes has fallen down, feeling as if he had been drinking.		Nothing to be seen by examination of the ears. Has no discharge from them now, but complains of headache over forehead, and left side. Pulse firm, full, artery being tortuous. Pupils act freely, sight good. Tongue pale, clean. Heart regular in action and impulse. First sound not so defined as usual, but no murmur.	

Number; District; Disease; Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
61. St. Cleer; Miners' disease; July 1862.	47	- - -	- - -	- - -	15	Tutwork -	"First worked at Fowey Consols; in some places the air was bad. Worked in bad air at West Caradon, also at Gonamena. Worked in very bad air at South Caradon, and was ill in consequence for 2½ years. Then went to East Caradon, where I am now working the engine."
62. St. Cleer; Chronic broncho-pneumonia; July 1862.	44	33 Dead.	A farmer, died from typhus fever.	- - -	17	Tribute -	Worked first at Wheal Darlington on tribute for 6 or 7 years, occasionally in bad air. There was bad air in all the levels where it was far from ventilation. Then went to the Brazils where he worked in a gold mine for 2 years. Says that the mine was there well ventilated, and that the men do not suffer there in the same way that they do here. Was then in very good health, though he used to drink freely (rum). Afterwards he worked at Wheal Friendship, Wheal Darlington, Devon Consols, and the Bedford United Mines. In the last he worked 12 months, and the whole time in bad air. Was then about 31 years old. Since then has kept a public house.
63. St. Cleer; Disease of kidneys; July 1862.	50	62 Dead.	A miner, died from consumption.	Grandfather a miner, died about 60.	9	Tutwork and tribute.	First worked at Mixton mine (copper), in Staffordshire, for 2 years. Then at East Crinnis, in Cornwall, 9 years. Afterwards worked at Pembroke mine and Charlestown United about 11 years. Then went to Bodmin, in Lanlevet Consols, for 4 years. Worked in good air in the mines for the most part. Then went to West Caradon, for 5 years, 12 months in bad air in the 50 level. Then to Wheal Massey, at Bodmin, for 3 or 4 years. A little bad air in the 20 level. Then to South Caradon for 5 years, bad air, in the 34 level for 4 months. Then went to West Caradon on tribute for 1 year. The air was middling. Was laid up there, and has not worked since. This was 14 months ago.
64. St. Cleer; Miners' disease; July 1862.	54	40 Dead.	A carpenter, died in a decline.	- - -	20	Tutwork -	First worked at East Crinnis, for 8 years. 12 months in bad air in the 80 level, and 2 years in bad air in the 70 level. Then went to Fowey Consols for 8 years, in bad air for about 3 years in the 22, 100, and the adit levels. Then went to Trewaddock mine, for 6 months in very bad air, in the adit level. Felt ill effects from it, but not much. Afterwards worked in the coal mines in Wales, and then in the Box Tunnel, where the air was bad for 9 weeks. Then went to Fowey Consols for 5 years, in bad air almost all the time. Since then has worked at Wheal Blanen, at Fistome mine (bad air for 15 months), Wheal Colding, East Wheal Rowe, Copper Hill, and West Caradon, where he is working now, in good air.
65. Camborne; Flat foot; July 1862.	16	- - -	- - -	- - -	- - -	He has never worked under ground, being employed at the stamps.	Has worked at the tin stamps since he was 7 years old. Worked at Luny mine and Cook's Kitchen for 2½ years, since which time he has worked at Dolcoath until 2 months ago. When at work he has to stand in mundic water, that comes from the stamps, all day, and in winter he says it is very cold.
66. Tuckingmill; Sprained back; July 1862.	27	50 Alive.	A carpenter	- - -	15	Tutwork and tribute.	First worked for 4 months at North Roskear and Carn Brea, and then went to West Seaton for 12 months, and worked during 2 or 3 months in bad air in the adit level. After that, worked in the 50 level, where the air was good, but the mine was wet and cold. Then went to Camborne Vein, where he had an accident and knocked out some of his teeth by falling away from the ladder about 3 fathoms. Then went back to Wheal Seaton, where the air was good, but there was a great deal of powder smoke.

History and Duration of Illness.	Cause to which he refers his Illness.	Present Condition.	Remarks.
Had good health uutil 5 years ago, when he worked 10 months in bad air, and was taken ill in consequence. It came on gradually with shortness of breath, weakness in the legs, and palpitation of the heart. Then had pain in both sides, chiefly in the right, so that he could not lie down in bed. No cough at that time. Had lightness and giddiness in the head, so that he could not stoop without danger of falling. About 2 years ago he brought up a table spoonful of bright pure blood, preceded by a little tickling in the throat. It continued "for two or three times spitting," and then ceased, and recurred at intervals in a similar manner for a month or two. Had no cough during this time and looked well, but was not fit for anything on account of shortness of breath. Has now been at work 8 months, and feels pretty well, except when he exerts himself, when he has shortness of breath and palpitation of the heart.	Working in bad air.	Has a colour and healthy appearance in the face. Body in good condition. Says he lives well, having about 3 lbs. of meat a week. Pulse 64, very small and feeble, and the beats are unequal in force, but regular in time. Respiration 22, easy. Heart sounds feeble, impulse feeble, but regular. Lungs apparently healthy, respiration being clear and bright.	
Was quite well 4 years ago. Then caught cold and was seized with a bad cough. Had difficulty of breathing, "apparently from something in the throat," thickness of voice and a tickling cough. When the winter came on he was very much worse, and then had profuse expectoration of yellowish green mucus, not frothy. Has had a cough ever since, worse in the winter and improving in the summer. During the last 2 months his cough has been better, expectoration more frothy and whiter in character. Never spat pure blood. No perspirations night or day. Dusing the last winter has lost flesh more than at any other time.	Exposure to cold, and intemperate habits.	Complains of weakness and shortness of breath, a little cough and spitting. Pale sallow look, with sunken features. Chest has the left side flattened under the clavicle, where there is a loss of respiratory murmur, and a creaking sound is heard, with mucous crepitation. There is loss of motion in the whole of that side, large crepitation over the whole of the lung before and behind, and opposite the scapula there is tubular breathing, and bronchophony. Respiration over the right lung is somewhat puerile, and the side is resonant and moves freely. Heart beats very rapidly, but no abnormal sounds detected, impulse feeble but regular. Pulse 144, compressible.	
When taken ill at West Caradon, had pain across the loins, shortness of breath on any great exertion, but no cough. When the pain came on, he had to pass water a great many times during the day. Urine was clear and frothy. Says he has passed a great deal of urine in the day, but it varies a great deal. At Plymouth Hospital he was told that when the water abated he would recover his strength. Says that his urine became thick on boiling it 3 months ago. Sometimes he is puffy about the face and body.	Thinks it is from over work.	No œdema of legs. Has pain in the back, and still passes water very frequently, and a great deal of it. Has not lost much flesh. Tongue moist and clean, fissured. Appetite good. Says he cannot work on account of weakness and pain in the back. Healthy look in the face. No opportunity of examining his urine.	
Has been failing in health for the last 12 months, having had good health before that. It came on with a feeling of weakness in the chest, lightness in the head, shortness of breath, and weakness in the legs. No palpitation of the heart. The symptoms have gradually increased, but he still continues to work in the 116 level, and says he finds it is too deep for him to come up.	Working in bad air.	Has a little cough, no expectoration except in the morning. Sweats a great deal in the morning when going to the mine, but not at night. Has a failing appetite. Not lost much flesh, but feels weak. Pale, sallow, wasted face. Muscles flabby. Respiration 18, easy, shallow, diaphragmatic. Pulse 60, very feeble and small. Chest very resonant; there is a remarkable absence of respiratory sounds of any sort, especially at the upper part. The chest walls move very little even on deep inspiration, which is mostly performed by the diaphragm. Heart sounds feeble, clear, slow.	
Has had a bad foot about 13 months. It came on suddenly when at work, with pain across the front of the ancle joint. He continued to work until 2 months ago, although his foot was painful and stiff, and sometimes swollen. It is always painful when he stands upon it, but when at rest it is easy. He gave up work for a fortnight once before, and it then got better, but returned on going to work again.	Standing for a length of time in cold water.	Foot is tender, and when struck underneath it gives him pain in the joint, also when he stands on it. The arch of the foot is diminished, there is no swelling, and no other evidence of disease. No wound.	
Thinks he injured his loins by "heaving the coach," and by weighing ore, which is very heavy work (3 cwt.), as he has felt weakness in the loins ever since (2 years ago). He has been at work since, but has had to give it up occasionally on account of pain in the loins. Complains of occasional pain in the back, extending round to the abdomen. He says his stomach then gets tender and he cannot stoop.	Lifting heavy weight.	Says he is very well except the occasional pain and weakness in the back, which prevents him doing as much work as he used to do. Is a married man (7 years), and has 3 children.	Says he has been getting *4l.* and *5l.* a month ever since he has worked as a man, and about 4 years ago he had a "good start" and built himself a house for about 100*l.*

Number; District; Disease; Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working underground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
67 Camborne, pain in left arm, July 1862.	60	55 Dead.	A miner -	- - -	15	Tutwork.	Worked first in Marbeck mine in Durham. It is a lead mine. Worked there 4 years in bad air, and was afterwards obliged to work at grass in consequence. Had shortness of breath, and giddiness when going to and from the mine. Then worked at a lead mine in Cumberland in good air for 1½ year. Then went to Wales for 18 months in a lead mine. Then worked in a lead mine in the Isle of Man for 2½ years, in tolerably good air. Then came to Sheppard's mine in Cornwall, a lead mine, for 15 months, when she stopped. Then worked for 9 years at East Wheal Rose, a wet mine, 100 level the deepest, and bad air in several levels. Was ill there, with sickness, lightness in the head, weakness in the knees, and head-ache. Worked in the Mount mine for 9 years in bad air, with the same ill effects. This was 7 or 8 years ago. It was in the 50 level, and the candle would only burn when almost horizontal. Then came to Camborne to Crane mine. Air bad in 60 level. Worked there only a month when he was taken ill.
68 Camborne; Synovitis of knee-joint; July 1862.	48	- - -	- - -	- - -	- - -	- - -	- - - - -
69 Camborne; Emphysema and old bronchitis; July 1862.	39	Alive and in good health.	A miners -	- - -	12	Tribute for the most part, some short time on tutwork.	First worked at the United (Gwennap) mines for 13 years, in some very hot places, though the air was "pretty good." Worked a good while in the 208 level. Was obliged to give up for 3 or 4 years after working in that level, being laid up with rheumatic fever which prevented him doing hard work for 3 or 4 years, though he was only in bed for 8 weeks. Then worked above ground for 3 years and then went to East Wheal Seaton in 100 level, good air. Then went to West Wheal Seaton on tribute for 18 months. Air "close and muggy" but cold. Had tightness in the chest, but continued to work. Then worked at East Grantfell for 2 years and 11 months. Good air, but very wet and cold. Works there still.
70 Camborne; Emphysema and injury to loins; July 1862.	24	Dead	A miner, he was killed by a kibble falling upon him.	- - -	13	Tribute and tutwork.	First worked at Tincroft for 7 or 8 years on tribute, in 133 level chiefly. No bad air there. Then went to Dolcoath for 4 years, and is there now. Worked there on tutwork in the 220 level. There is too much air there, there is a draught, and the air is good.
71. Illogan; Chronic bronchitis and emphysema; July 1862.	49	70 Dead.	A miner, but did not work under ground for 20 years before his death.	A brother, also a miner, died in a decline, aged 33; he was a drunkard. Another brother died from an accident. Two sisters are dead, one aged 53; neither of them had much cough. Mother was 70 years old at death.	10	Tribute at first, afterwards both tribute and tutwork.	First worked at Cook's Kitchen for 9 years, in some bad air in the 42 and 29 levels. Did not suffer from that, except a little tightness on the chest. Then went to East Wheal Crofty for 7 years. Worked in one place where the air was very bad, for 3 months. "It was in the 60 level I think." "I thought I should have died in consequence." Also worked in the 42 level in bad air for 2 or 3 months. It was very close and hot, but he did not suffer "so much as before" from it. Then worked 17 or 18 years at Tincroft, chiefly on tribute. Bad air in the 60 level for 5 or 6 months. Was ill in consequence, with the same symptoms as before, but did not give up work. It was 40 or 50 fathoms from shaft where he worked. Worked 4 or 5 months in bad air in the 120 level, with the candle horizontal, and felt ill effects from it, but continued to work. Then went to Carn Brea for 2 or 3 years, and after that worked at surface until a fortnight ago, when he was laid up. Worked in bad air in the 18 level for 3 or 4 months on tribute, but "I found it was killing me, and I gave it up in consequence."
72. Camborne; Emphysema; July 862.	46	- - -	- - -	- - -	- - -	- - -	Was discharged from the army 15 years ago with pain in the legs. Was in the army about 2 years. Worked under ground in Ireland for about 2 months, and since then has worked at surface.

History and Duration of Illness.	Cause to which he refers his Illness.	Present Condition.	Remarks.
Had good health until 7 or 8 years ago. Was then working in a very wet mine, and sometimes he had to go up to his waist into cold water to ring to the engine man to work the engine faster. He had to do this when quite hot from working, and used to shiver with the cold. Was then taken ill with shivering, pain in the limbs, fever, and was ill for 5 months with inflammation in the wind pipe. He recovered and was well until 5 months ago, when he again had inflammation of the chest, with cough, shortness of breath, and expectoration of frothy mucus. This continued about 3 months and then went away. At this time he felt pain in the shoulder and left arm coming on gradually.	Working in cold water.	Complains of a "dead burning pain" down both sides of left arm and shoulder and the same side of the neck. It is always present, sometimes being worse than at others. He says it is so bad that he cannot use his arm. Nothing detected about chest, neck or arm, except slight wasting of the left scapular muscles. The arm is as fleshy as the other. Muscles are tender when touched, no heat of skin, no difference of sensation in the two sides. He is an old looking man for his years, is thin, but has a tolerably healthy look in the face.	
8 weeks ago he had a blow on the outside of the right knee. It was not painful at the time, but during the next week it began to swell and became very painful. He still continues to work.	A blow.	The joint is freely moveable. There is a small amount of thin fluid in the joint, and it is tender on manipulation.	
For 4 months he has had tightness in the chest and difficulty of breathing, and if he works hard he "gets all in a flutter inside," has some palpitation, and weakness all over the body. He works now in the shaft, where the air is good if anywhere.	Working in hot and cold mines.	Has a tolerably healthy look in the face for a miner. Has a little cough, no pain, nor expectoration. Dry emphysematous crackling heard towards the upper part of the left chest in front, otherwise respiration is clear. Heart sounds regular. First sound not very distinct, and rather prolonged. Second clear. Impulse feeble. Pulse 60, tolerably full, compressible. Respiration 21, easy.	He gets 3*l.* 15*s.* to 4*l.* a month, and has a wife and 1 child. They get about 9 lbs. of meat a week for the family.
Had good health until about 18 months ago, when he fell away from the level, about 3 fathoms, and injured his back. A board slipped away from under his feet. Has not been well for long at a time since then, but has been home for a short time, and then has gone to work again. Has pain in the loins whenever he takes cold, so that he cannot work. Has had also griping pain in the bowels for the last 3 or 4 months. No diarrhœa, but bowels open regularly. Says he finds his breath very short if he walks up hill.	Falling away from the level.	Has a cough at night, but no expectoration. Chest resonant on percussion, but respiratory murmur is rather deficient, and cooing sounds accompany the expiration in various parts. Heart's action normal. Tenderness on pressure over the lower part of spine and muscles in the loins. No weakness of legs. Body well nourished and in good condition.	
When working at East Wheal Crofty he says: "I could hardly breathe, had weakness all over me, very bad headache whilst at work, sometimes I was sick, had a little cough, but not much expectoration, and palpitation on climbing. I was laid up for 3 months, and was very weak for some time afterwards. I think the climbing hurts me very much. I have heard my heart beat sometimes when climbing regularly so that I thought it would come out of my mouth." Used to sweat a great deal, but has not done so for a month or two. He expectorated half a cupfull of blood about 3 months ago, and again a fortnight ago. It came on with a little tickling cough, and after a mouthfull or two it ceased.	Working in bad air.	Complains of tightness in the chest, difficulty of breathing, bad cough at night, expectoration of a good deal of dark thick tenacious mucus. He has always been thin, but for the last 2 months has lost flesh. Has had looseness of bowels occasionally, but not at the present time. Body thin, arms wasted, face sunken; chest deficient in motion; right supra-clavicular space is depressed more than the other. The sound on percussion is flat on and under the right clavicle, and vocal resonance is increased there. Respiratory murmur is heard all over the chest, but it is accompanied by rhoncus and prolonged whistling expiration. There is also large mucous crepitation over the base of both lungs.	It is said that men need not work in the levels where there is bad air unless they like. Here is the answer of this man when asked why he worked in the 42 level when the air was bad, at East Wheal Crofty. He says, "I went there because, when poor men want bread, they must go where they are put, and they (the masters) will not tell you beforehand whether the air is good or not."
Says he has been ill for 7 years with pain in the chest, difficulty of breathing, bad cough, and spitting up phlegm mixed with blood.	- - -	Chest rounded, and tympanitic. Emphysematous respiration.	He is an Irishman.

Number; District; Disease: Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
73. Camborne; Irritation of rectum; July 1862.	46	Alive -	A farmer -	- - -	30	Tutwork and tribute, latterly employed at the surface.	First worked at Tincroft for 8 or 9 years in 120 and 140 levels. The air was bad in the 120 level, and the candles were placed horizontally. He worked in that bad air for 12 months, and sometimes used to feel lightness in the head, but did not take any notice of it. Then worked for 3 years at Cook's Kitchen in good air. Then went to Camborne Vein for some months, and then to West Wheal Seaton, where the air was good, but where there was a great deal of powder smoke. No ill effect from it. He then worked at several mines for a short time, and came to Dalcoath about 7 or 8 years ago, where he has been working ever since. His business now is to keep the frames in order, and to do the carpentering work. Says he does not work in any way in arsenic, but when he has been near the burning houses it makes him ill, with sickness in the stomach and difficulty of breathing.
74. Illogan; Irritation of rectum; July 1862.	42	70 Alive -	A miner, but chiefly employed at grass.	- - -	15	Tutwork and tribute, chiefly the former.	Worked first at Carn Brea for 15 or 16 years. Air good. Lowest level was 90 fathoms. After that he worked at Wheal Tehiddy and Wheal Uny for a few months. Air good. Then worked at East Carn Brea for 5 years in the 40 and 26 levels. The air was very close in both levels. They had a machine blowing air to them, but even with that the candles would hardly burn. Worked in bad air about 12 months. He used to feel sick, and had tightness on the chest, but not much cough. There was a good deal of powder smoke. The last level he worked in (26) was very wet, and he thinks he took cold after sweating. This was 5 months ago, and he has not worked since.
75. St. Day; Miners' disease and pleurisy; July 1862.	13	Dead -	A miner, but died in Brazil from dysentery.	- - -	11	Tutwork -	First worked at Wheal Spenser for 6 months in the 50 level. The air was very bad there, and he worked in bad air for 2 months. He knew it was bad air because the candles would scarcely burn. The powder smoke was so thick that it made him cough and affected his breath. Says he could not climb because of his breath. It was between 50 and 60 fathoms from shaft, and there was no winze. They were sinking a winze when he left, on account of ill health. The water they had to drink came out of the granite between the 50 level and grass. He was home for 5 weeks at first, and then went to work again in another mine (Wheal Damsel) for 7 days. There was bad air there in the 50 level. He was obliged to give up after 7 days, and has not worked since.
76. Kenyon; Miners' disease; July 1862.	45	55 Dead.	A farmer -	- - -	17	Tutwork -	First worked at Wheal Vivian for 6 years, and then at Pendardemour for 18 months, then at Beeralston and East Wheal Rose for 3 or 4 years. Air good in these mines. Then worked an adit level for a gentleman at Curlands for 5 years. Sometimes the air was not very good. Then went to St. Austell at East Crinnis for 12 months, in 110 level. Good air. Whilst there he had slow fever, and was ill for 6 months, but only ceased work about 6 weeks. Then he came back to East Wheal Rose for 6 months, in 110 level. Air not very good, and he worked in it for 2 months at 30 fathoms from the shaft. Then worked at the Great Consols (Gwennap) for 3 months, in 140 level. Good air. Then at Wheal Clifford, a hot mine; so that after 3 months, he says, "I could not stand it any longer, it was too hot." Good air. Then worked at Wheal Spenser for 3 months, in 50 level. Air bad there, the mine being a granite one. He knew the air was bad from the weakness of his legs, so that he could hardly climb the ladders; sometimes he had a little pain in the head and cough, but that would go away again. He says, "The air was bad all through that mine, and many men have lost their lives there from working in poor air." Afterwards worked at grass for some months, and then went to East Wheal Damsel, where he was taken ill. He worked there for 3 months, 6 fathoms from the surface, in bad air. The candle would not burn. He only worked in bad air 4 days, when he was taken ill. He stayed at home a fortnight, and then went to another mine, North Scurvy, for 3½ months, out of which he worked 3 weeks in poor air in the 40 to 50 winze. He was poorly all the time at this mine, and has not worked since (10 weeks ago).
77. Kenyon (Kenven?); Miners' disease, Dyspepsia; July 1862.	51	69 Dead.	A miner, and died of miners' disease.	- - -	11	Tutwork -	First worked at Wheal Poldice (Gwennap) for 13 or 14 years), and in a good deal of bad air. The worst was in the 60 level, where there was also cold damp. Felt ill whilst at work there, but did not give up work. Then went to Consols, where he worked for 11 years in very good air. After that he worked 3 months in the United Mines. There was no bad air, but it was very hot. Then came back to Consols for 6 years, in good air. Then he went to Wheal Busy for 3 months in the 70 level, where the air was very bad, "and that place done me up." He was taken ill, and remained at home for 8 days, and has never been able to work since.

History and Duration of Illness.	Cause to which he refers his Illness.	Present Condition.	Remarks.
Has been complaining for 3 years. First had a gathering under the armpit, which was more than a year before it healed. Since then he has complained of pain in the stomach and bowels, but without either sickness or purging. His bowels are usually confined, and he passes "a quantity of stuff like white of egg, sometimes mixed with blood;" also he complains of tenesmus. Never vomits his food.	- - -	Complains of a good deal of pain in the pit of the stomach, and has a feeling of sickness in the morning. Feels weak, so that he says he cannot do anything. He is stout, with a fresh healthy colour, and looks as well as any one. No disease detected about him. No tenderness on pressure at pit of stomach. Urine pale, contains mucus, becomes thicker on boiling, but clears again to its former amount on adding nitric acid, with effervescence.	He seems inclined to make the most of trifles. His complaint, if it can be depended upon, is such as might be caused by the influence of small quantities of arsenic, but there is no positive evidence of this.
Five months ago he was taken ill "with pain in the back way of privates" and was obliged to stop away from work. A month afterwards had outward piles and lost blood. They got well, but he has passed blood frequently since. Says he has lost 20 lbs. in weight during the last 5 months.	Taking cold after sweating.	Body thin, face emaciated, eyes sunken. His bowels are rather confined, and he passes blood by stool. Has constant tenesmus Urine highly coloured, no difficulty in micturition. Has a burning heat, a stabbing pain in the rectum. Stools he says are slimy and mixed with corruption. Tongue clean. Sometimes he is feverish, but this is variable.	The mine he worked is a tin and copper mine, but chiefly copper. The water they had to drink was carried down to them from the adit, and also from there to the men at grass to drink.
When working at Wheal Spenser, he says he had pain in the head whenever he went into the level, was "sick at stomach," and lost his appetite, and had shortness of breath. Afterwards at Wheal Damsel he had the same symptoms. First he felt a pain in the left shoulder and side, then had sick stomach and headache, and shortness of breath. He managed to climb, but with great difficulty at last. Had weakness in the legs on climbing, and palpitation of the heart, both when at work and when climbing. At this time his legs had large red spots on them, which were swollen and tender. These lasted about 3 weeks, and then disappeared. This was about a week after giving up work.	Working in bad air.	Now complains of general weakness, but feels better when lying down. Has a little cough, but no expectoration, except in the morning. Has no pain. Appetite now pretty good. He has a pallid, sallow complexion. Pulse small, quick, compressible. Tongue pale, clean. Chest resonant on percussion; respiration clear and free, except at base of left lung, where there is some loss of respiratory murmur, dulness on percussion, and pleuritic rubbing behind. Heart sounds clear and regular.	He used to earn 25*s.* a month when at work, but gets no allowance now he is ill. He had no deduction from his wages for the club because he worked as a boy. This is a good specimen of this common disease of miners in its earliest stage.
When at Wheal Spenser he had the usual effects of working in bad air, but recovered from them. At Wheal Damsel he was taken ill with "hardness in the bowels, the belly being swollen." No pain or diarrhœa. The same week he had weakness in the legs, and then pain in the right side under the ribs. Then came on shortness of breath, and a cough with expectoration of white and green frothy sputa, which has continued ever since.	Working in bad air.	Has cough, shortness of breath, and weakness in the limbs. Never spat up any blood to speak of. Chest expands freely, and is resonant on percussion, respiration being clear and natural. Heart sounds normal and regular. Pulse small and soft. Has but little expectoration. Body in tolerable condition. No perspirations. Face sallow and pallid. General weakness, but no local disease detected.	The mine in which he suffered most is the same one, and the same level, as in the previous case (75).
When working at Wheal Poldice in bad air he had sickness, but did not give up work. When at Wheal Busy, where his last attack came on, he says, "I felt my inside all trembling, and was sick at stomach. I then had a severe pain in the pit of the stomach." He has never worked since. This is 7 or 8 years ago.	Working in bad air.	He now complains of a feeling as if his inside was all in a flutter, and a sensation like a stone over the top of the breast bone and at the pit of the stomach. Has no cough, and his breath is not affected. Has a good appetite, but often brings up his food again shortly after taking it. He has a tolerably healthy look, though his features are rather sunken. Body has no superfluous fat. Skin soft and cool. Chest resonant, freely moveable, and respiration heard all over it. Inspiration and expiration rather coarse at both apices, and base of right chest. No crepitation or increase of vocal resonance. Heart sounds clear, regular. Pulse full and firm. No tenderness over the abdomen.	

Number; District; Disease; Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
78. Kenwen; Bronchitis and Emphysema; July 1862.	73	67 Dead.	A miner, and died of miners' complaint from "poor air, powder smoke, and that like."	- - -	10 to 11	Tutwork -	Worked under ground until 6 months ago. He worked at Wheal Garland, Wheal Busy, and the Solitary Mines for many years, and generally in good air. The last 20 years he has worked at the United (Gwennap) Mines, and the last eight years in poor air and powder smoke in the 18 level. "They took pity on me, and put me there, because I was an old man."
79. Chacewater; Consolidation of right lung; July 1862.	49	53 Dead.	A miner, died of miners' complaint.	- - -	16	Tutwork -	Worked first at Gwennap Consols, and remained there for 28 years. He says, "I worked with my father, just before he died, in bad air, in the 120 level. Six of us worked there. It killed him (the father), and I was ill at the time. Three others were also ill, and the sixth man died, so that out of the six men two died, and the other four were ill for some time." This was 28 years ago. About 7 or 8 years ago he worked in the 60 level in bad air, was home ill for 3 or 4 weeks, and felt it for some months afterwards. Since then he has worked in close places, but has not been laid up. He has not worked under ground for 2 years.
80 Camborne; araplegia; July 1862.	61	75 Dead.	A miner.	- - -	12	Tutwork and tribute.	First went to Dolcoath and worked there 20 years, in good air. Chiefly employed in the 155 and 160 levels, but has worked as deep as 190 fathoms for some months. This was before the man engine was put in. Since then he has worked in several mines, usually in good air. The last mine he worked in was West Wheal Seaton, when he was taken ill, 14 months ago.
81 Camborne; Imperfect recovery after an accident and pleurisy. July 1862.	31	Father died at 46 years of age of miners' decline.	A miner	- - -	18	Tutwork -	Worked at Carn Brea for 3 years in the 60 level. The air was bad, the candles were obliged to be put on one side to make them burn. Had poor air nearly all the time he worked in that mine, and he says he would have left it before but he had no other place to go to. At last he was obliged to give it up, and then he went to West Wheal Basset, where he worked 5 or 6 months in good air, in the 60, 70, and 100 levels. Then he went to Cook's Kitchen, where he has worked for the last 6 years, but has not been under ground for 11 months. He states that he has been temperate in his habits. His living has not been very good. Wages 50s. a month. Has three in family. Since the accident he has had 30s. a month from the club.
82. Illogan; Consolidation of right lung (Phthis ?); July 1862.	54	72 Dead.	A miner	- - -	14	Tutwork and tribute.	First worked at St. Agnes for 2 years in good air. "There is scarcely any poor air at the mines at St. Agnes." Then worked for about 7 years at Wheal Basset, Wheal Music and Redgate Mines. Then went to Wheal Kitty on tribute for 10 months in the 50 level. "The air was not particularly good where I worked, which was about 90 fathoms from shaft. The candle would not burn except when inclined." He felt no ill effect from it. Then he went to United Hills for 7 or 8 years, on tutwork, in 60 level, in good air. Then worked at West Wheal Basset, for 8 months in 90 and 100 levels. Air not good, the candle would not burn upright. Then worked at Wheal Greybird for 3 years, in very bad air, in the 30 level, for 2 months, but did not feel ill until he had left it about 5 months. He was then working at Burncoose where the air was good and the mine dry.

History and Duration of Illness.	Cause to which he refers his Illness.	Present Condition.	Remarks.
Since he has worked in the United Mines he has had a cough and a burden on his chest, so that he can hardly breathe, and he has never got rid of it. He has also a rattling in his chest.	Working in poor air and powder smoke.	Says he feels pretty well in health, except the rattling in his throat, which is so bad that he says his wife won't sleep with him unless he can get rid of it, because she cannot get any rest. Chest rounded and tympanitic. Nothing detected beyond some prolonged emphysematous crackling.	
Seven or eight years ago he was taken ill with cough, shortness of breath, and weakness in the legs. No pain, and but little expectoration. Eight months ago he got wet whilst at work, and was taken ill with cough and shortness of breath. He continued to work until 7 weeks ago, when he had inflammation of the chest, from which he says he is now recovering.	Working in bad air, and at last getting wet whilst at work.	Body thin, hands wasted. Skin pale and thin, with some increase of heat, but not burning. Pale, sallow, leaden complexion. Has a cough without much expectoration. Soreness in the chest after coughing. Chest.—Sternum prominent and rounded. Right infraclavicular space is flattened, its motion is diminished, and it is dull and tender on percussion. There is loud bronchial breathing and bronchophony at the same spot, but no mucous crepitation. Behind, there is complete absence of any respiratory sound, even on coughing, except an occasional dry creak. The rest of the chest is resonant, and respiration is heard over it. Heart sounds are normal. Pulse soft and compressible. Cough is spasmodic, dry, and harsh. Sputum whitish, and but little of it. No sweating or diarrhœa.	
First complained of pain in the left breast, shoulder, and pit of stomach. The pain in the stomach and breast has never left him entirely. It was a pricking or burning pain. It is worse when his stomach is empty. About 12 months ago his legs became painful and then numb. It increased for a fortnight, at the end of which he could not feel anything that touched him below the knees. He could not move them himself, but they would often jump without his being able to stop them. The flesh about his body became numb, but not his arms. Had difficulty in making water and it became thick and offensive. It never ran away from him. He continued like this for 6 months, when sensation began to return, first in the toes and then gradually came up the legs. Power of motion then returned. He improved for about 3 months, but since then his condition has remained stationary. He cannot account for his illness in any way. Never had any injury to his back, and he never stood in cold water or in a draught for any time that he is aware of.	—	Sensation in legs is now good, and he can stand for a minute or two when he holds by something, but cannot walk. Legs wasted, muscles flabby. Arms thin, but not wasted to the same extent as the legs. He had palpitation and cough before he left the mine, but since he has been in bed, they have both left him. No disease detected about chest or abdomen. There is a swelling of the upper part of abdominal muscles simulating a tumor, and this he says is painful. He says also he has a feeling as if something were tied round his stomach. Bowels regular, though they have been much confined.	For some months this man had to climb 380 yards by ladders on leaving his work, 310 and 320 yards being his daily amount of climbing for some years.
When at Carn Brea he had lightness in the head, loss of appetite, and was so weak and his legs trembled so much that he could hardly work at all, and he could scarcely climb the ladders. He has had shortness of breath for the last 2 years. Eleven months ago he fell down "a stope" about 10 fathoms and broke several of his ribs and his left shoulder, and was badly cut on the head. He was in bed for 6 weeks, but was not able to do any work for 8 months after it. Since the accident he has had pain in the left breast on drawing breath, and the shortness of breath has increased. He still complains of lightness in the head, which he says is worse in hot weather than in cold.	Working in bad air in the first place though his present condition is due to his accident.	Body in good condition for fat. Face is sunburnt and has a healthy look. There is considerable prominence of the ribs and inferior angle of scapula of the left side and the spine is somewhat curved towards that side. Wasting of the scapula muscles and thickening about the body of the scapula, probably from an old fracture. Chest generally resonant on percussion, and respiratory murmur normal. There is a creaking pleuritic rub heard at the lower part of left chest in front. Heart sounds normal and regular.	
After he had left Wheal Greybird about 5 months, where he had been working in bad air, he began to have shortness of breath. He was then loaded at the chest, and when he went underground he was always in a cold shiver, and a cold sweat used to run off him. He continued to work for 2 months longer and was then laid up. He had at this time lightness in the head, shortness of breath, and pain across the front of the chest, and was very weak. He has been unable to work since. This is about 2½ years ago.	Working in bad air.	He says, "I have no pain except a little in the arms, but my complaint is nothing but weakness, and my flesh is wasting away." Has a bad cough and spits up a quantity of blue slaty-coloured sputa, in the morning. His breath is short, so that he cannot get up hill. Height 5 feet. 6 in., weight 9 st. 8 lb. Vital capacity (spirometer) 110 cubic in. Motion of chest limited; there is resonance generally over it Sound over right apex being rather flatter on percussion, than over the left. Mucous crepitation over the greater part of right upper lobe, before and behind, breathing and coughing being accompanied by a ringing metallic sound. There is also tubular breathing at the same infraclavicular space. A whistling noise at the termination of the inspiration heard generally over both lungs; expiration is not much prolonged. Heart sounds normal, regular. Skin cool, moist, supple. Bowels have always been regular. Not subject to sweating. He says about 6 months ago he did sweat a good deal for a few nights, but not since. Face pale. He says he has lost 40 lbs. in weight in the last 2½ years.	—

Number; District; Disease. Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Canse of his Death.	Other Relatives.	Age at which he commenced working underground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
83. Camborne; Emphysema; July 1862.	41	59 Dead.	A miner, died of miners' disease after 2 years illness.	- - -	8 to 9	Tutwork and tribute.	First worked under ground at Gwennap Consols for 7 or 8 months, and after that worked at surface until he was 15. Then went to Fowey Consols for 3 years in good air, and then back to Gwennap for 10 years. It was very hot in the 208 level, but the air was good, though not enough of it. They had an air machine. He had good health here, but he believes that it injured him. They used to come out of the hot ends and plunge into a stream of cold water to cool themselves. He always had a cold and cough, worse than at present. Then he went back to Fowey Consols for 2¾ years, in good air in 230 level. He was taken ill, after working here 2 years, with inflammation in the windpipe. It was from coming out of a hot mine and stopping to talk on the landing places. Since then he has worked at Dolcoath about 9 years, in 230 and 240. No bad air in this mine.
84. Camborne; Chronic bronchitis; July 1862.	57	45, Dead.	A miner, died in a decline.	- - -	14	Tribute -	Worked for 30 years at Dolcoath on tribute in good air. Then went to South Roskear for 2½ years, in 116 level, good air. Then worked at Condurra for 6 months, in 100 level. Air not very good there, and he says his breath was not so good as when working in good air, but he was not very bad; he lost his appetite. Then went back to Dolcoath, where he has been about 14 years, chiefly as a timber man.
85. Baldieu; Heart disease; July 1862.	48	- -	A husbandman.	- -	18	Timberman and on tutwork, principally employed in the shaft.	First worked at Great Consols for 10 or 12 years, in good air, then for 12 years at East Wheal Rose, in good air, but it was damp and cold in 100 level. Then went to Penwhealdarva for 3 years in the sump shaft, in good air. Then at North Jane for 2 years, in 20 level, in good air. Says he took cold here, being down in the mine from Saturday to Sunday night. He got wet and cold, and felt shivering afterwards; since this time his illness has been gradually coming on.
86. Baldieu; Old pleurisy; July 1862.	57	50, Dead.	A miner, died from fever.	- -	9	Tribute at first, afterwards tutwork.	First worked at Consols for 20 years, deepest levels 188 and 200. Air very hot in some places, but not bad. Then went to Wheal Maid for 7 years (now knocked). Then to Poldice for 2 years, in good air. Then to East Wheal Jane, 3 years in good air. Then to Penwhealdarva, 2 years, good air. Then worked at Nangiles for 5 or 6 months, in 18 level, good air, but wet and cold. Then at North Jane 2 years. Air not very good. The candle sometimes would not burn. It was a wet, cold mine. He worked 20 fathoms from grass. They used to send the men down in a kibble, and they used to get out through the adit, walking through water for 40 or 50 fathoms, and then they had half a mile to go to the changing house, from where they came out of the mine. They had to walk this in their wet clothes and in winter.
87. Key; Asthma, July 1862.	34	41, Dead.	A miner, died from the effects of an accident in the mine.	- - -	- - -	- - -	Worked 8 years in the St. Day United Mines at Gwennap, but latterly has been working in a silver mine in Mexico. The mine in Mexico was dry and dusty. He has never worked in bad air.
88. Kenwen; Dilated heart, &c.; July 1862.	60	64, Dead.	A miner, died from an accident in the mine.	- - -	15	Tutwork and tribute.	Worked first at Wood mine, Kenwen, for 7 years, in good air, in 20 level. After that worked in a gold mine in Brazil for 5 years, in good air. Then went to Great Consols for 16 years, a deep, hot mine, though the air was generally good. Then went to Naples for 2½ years, exploring some mines. Then he came back to Poldice for 2 years on tribute, in good air. The last mine he worked in was Creedbraws. It was a shallow mine. He worked in the 36 level under adit for 7 or 8 years. The air was good. There was no engine, and the water collected in the level, and he had to walk through it for 100 fathoms to and from work. It was about 20 inches deep. Thinks that was the cause of his taking cold.

History and Duration of Illness.	Cause to which he refers his Illness.	Present Condition.	Remarks.
During the 9 years he has worked at Dolcoath he has been ill 4 months from inflammation in the windpipe, from taking cold in coming out of bottom of the mine where it is hot, to the top where it is cold, and sometimes from going into cold water to repair the pump.	Thinks he was injured by working in bad air some years ago, but his illness latterly has depended on exposure to changes of temperature.	Feels a little tightness in breathing in the morning, but nothing to speak of. Face thin. Body in good muscular condition, but not much fat on it. Chest resonant, respiration natural, but with prolonged whistling expiration over the base of both lungs posteriorly. Heart sounds normal.	
About 8 years ago he received a blow on the head from a stone. He did not feel anything from the blow, but in about a fortnight dropsy came on, first in hands and face, then in legs. He had dropsy for 3 months, and was unable to work; he then got better, but has never been well since. During the last 3 years he has been unable to work much from shortness of breath; has had a cough in the winter, but has not any now except a little in the morning.	A blow on the head (!)	No œdema of body or ankles. Says he is easy when sitting down, but his breath goes all at once when he begins to move about. He has a tolerably healthy look in the face. Chest resonant on percussion, respiration clear over the upper part of chest, mucous crepitation over lower part of lungs behind, where there is loss of respiratory murmur, but no dulness. Heart sounds regular and distinct, point of impulse is nearly in the medium line and near the bottom of sternum. No impulse felt in its usual situation. The sounds are heard most distinctly at point of impulse. Urine somewhat cloudy from mucus, not albuminous. Face dark and congested, lips dark in colour. Some copper-coloured spots over the body, and brownish discoloration of the iris.	
He was never ill before 4 months ago, when he took cold. He had a violent cough which lasted more than a month. Then his face and neck began to swell, and his breath became short. His legs were not swollen and he had no palpitation of the heart. Then he found he could not climb, and was obliged to give up work.	Exposure to cold.	His principal trouble is shortness of breath. Has a troublesome cough at night, but not during the day. Not much expectoration. Face congested, rather puffy under the eyes, which are watery. Says his urine was very highly coloured a fortnight ago. Never had rheumatic fever, but has had rheumatics in his arms. Veins over the chest and neck are large, and he says when the swelling first came on, the veins in the neck were bigger than his finger. Pulse 118 soft, small. Respiration 32, easy, but deep. Respiratory murmur heard over both lungs, chest resonant on percussion. Heart sounds very feeble. 2nd sound comparatively loud, 1st sound scarcely audible. Scarcely any impulse. No murmur. The interval is much shortened. Hands cold and blue.	
12 years ago he had inflammation of the lungs, and was ill for 3 months, but after he recovered he says he was as well as anyone, but his breath was never so good as it was before. 1½ years ago was taken ill with shivering, pain in the right side, followed by cough. He was at home for 6 months. Since then "he has never been half the man he was before." His breath has been very short since this last illness, and he has not been under ground since.	Exposure to cold.	Complains now of shortness of breath. He feels a weakness and a little pain in the right side sometimes where the inflammation was. He has a healthy complexion from exposure to the sun. Chest generally resonant, but somewhat deficient in resonance at the base of both lungs in front, where there is also a double pleuritic creaking sound. Heart's impulse increased in force, especially towards the epigastrium. Its action is regular, and there is no murmur. Respiratory murmur is very distinctly heard all over the chest.	He had an allowance of 36s. per month from Wheal Jane, for 6 months.
Felt no ill effect from working in mines in England. When at work in Mexico he was seized with tightness on the chest and shortness of breath, so that he was obliged to give up work. He had no pain or cough. He used to drink salt water to make himself sick, and then he was well enough to work on the following day. He ceased work for 6 months, then went again to the same place, but was obliged to give it up from the same complaint. This is 17 months ago.	Working in a dry and dusty mine.	He now feels shortness of breath, if he exerts himself, and if he takes cold, it goes to his chest. He is stout and looks well. Nothing abnormal detected about either lungs or heart.	
Has been ill 4 years, and has been away from work for 2 years. Was taken ill with weakness, pain and deadness in the legs and shortness of breath. It came on gradually. No pain, but a fluttering at the pit of the stomach. His appetite continued good, and he had no sickness. He could not get up the ladders, and so was obliged to give up work.	Walking through cold water to and from his work.	Complains of weakness and shortness of breath. Has no cough, except when he takes cold. Body not wasted. Face thin. He looks about 70 years of age instead of 60. Chest resonant, general deficiency of respiratory murmur, but no abnormal sounds. Heart sounds are regular and distinct. There is considerable impulse in the epigastrium, but not much in the normal seat of impulse. No murmur. Pulse 68, full, but compressible.	

Number; District; Disease; Date.	Age.	Father's Age, and whether alive or dead	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
89. Key; Miners' disease July 1862.	56	64, Dead.	A miner, died of decline.	- - -	- - - -	Tutwork and tribute.	First worked at Keatbraws, Kenwen, for 5 years in the adit level, in good air. Then at Poldice for 3 years, in good air. Then at North Wheal Busy for 8 or 9 years, in good air Then he worked in several small mines for a period of 3 years. Then went back to Keatbraws on tribute for 6 years, in good air. Then worked at South Francis in the 36 level for 4 months. The air was slight. He was taken ill there, and left in consequence. Then he went to Penwhealdarva for 3 or 4 years on tutwork and tribute. The air was very bad in the 20 level, 50 from shaft. He was laid up for 2 months in consequence of that. He worked again in the same level in better air afterwards when they had made a communication with another level. Then went to Nangiles for 10 months, and after that to North Jane for 2 years in good air. Then went back to Keatbraws, but after working 2 months he found his breath was so short that he could not climb the ladders.
90. Kenwen; Chronic bronchitis; July 1862.	60	63, Dead.	A miner, died in a decline.	- - -	11 to 12	Tutwork -	Worked first at Wheal Andrews for 3 or 4 years. Then at Nangiles for 2 years at surface. Then worked at Woodmine for 20 years, in good air generally. Then went to Wheal Busy for 3 or 4 years. Worked in bad air in the 50 level sinking a winze, also in sinking a shaft under the adit level. In the 90 level also the air was bad sometimes. He was taken ill whilst at this mine. Then worked 3 years at Consols, but was obliged to give give it up, and then worked for 6 or 7 years at the surface. Then he went under ground at St. Day United for 3 or 4 years. Not bad air in general. The last 4 years he has worked at Wheal Jane.
91. Kenwen; Dyspepsia; July 1862.	57	86, Dead.	Used to work at the surface.	- - -	14	Tutwork -	First worked at St. Day United for 8 or 9 years, in good air. Then went to Wheal Ramoth for 4 years in the adit level, 14 from grass. The air was very bad, "so that we could scarcely keep our candles alight when the wind blew from the North." He wastaken ill here, after working about 3 months, with shivering pain in the limbs and jaundice. He was at home 2 years, and afterwards he had a pain across the stomach, which has recurred at times ever since. Then he worked at Wheal Providence for 5 months in good air. Then went to Wheal Tehiddy for 1½ years, generally in good air, but there was poor air for a month in the 20 level; since then he has worked at Creedbraws, Great Consols, Rose in Vale Consols, St. Day United, and Fowey Consols, for a few months at each place, generally in good air.
92. Kenwen; Miners' disease; July 1862.	48	41, Dead.	A miner, died from consumption.	- - -	18	Tribute	First worked in Woodmine for nearly 4 years in good air. Then went to St. Day United for 10 years, in good air. Then to the United mines for 8 years, in good air sometimes, but 2 years in very bad air in the adit level. Sometimes the candles would not burn at all, and it was a very wet place, and there was cold damp there. Then he went back to St. Day United, and worked at the surface for the 8 years, since he has left the United mines. He has not been under ground during that time. Has not been able to work for 3 years from beating of the heart, and he has had relief from the parish during that time.
93. Kenwen; Pleuritic effusion; July 1862.	54	48, Dead.	A miner, died in a decline.	- - -	11	Tribute and tutwork.	First went to St. Day United for 2 or 3 years. No bad air there. Then went to Poldice for 14 or 15 years. Worked 3 months in bad air in the 34 level. Then worked at Consols 15 years, about a month in bad air in the 120 level, and another month in bad air in the 160 level. Felt ill effects from it. After that he again went to the 120 level and worked there nearly 12 months, where the air was bad. He says, "I worked there when I could not carry a light, and a man who worked with me died, I believe from the effect of the air. I felt shortness of breath, choking in the pipes, pain in the side, and weakness in the legs." Then he went to Creedbraws for 12 months, in good air. Then back to Poldice for 3 or 4 years. This was the last place he worked at.

History and Duration of Illness.	Cause to which he refers his Illness.	Present Condition.	Remarks.
When at work at South Francis in bad air he lost his appetite, had general weakness, shortness of breath, and soreness when he drew his breath. He was again ill when at Penwhealdarva with weakness and shortness of breath. He says, "I did not give up work there, because when we are getting a little bread we do not like to give it up, for we might then be out of work for some time. This is the way that men injure themselves."	Working in bad air.	Complains of pain in the right side under the ribs, when he draws a deeper breath than usual. He has also shortness of breath, weakness and loss of appetite. He has no cough. No disease detected about the chest. Pulse 80, tolerably full, soft. Face thin and sallow. He has a look of premature old age.	
At Wheal Busy he was taken ill with shortness of breath so that he could not lie down in bed. He had pain in the chest, cough with expectoration of white frothy mucus. He was at home for 2 or 3 weeks at a time, and then at work again; for a space of 2 or 3 years. After working at the surface for 6 or 7 years, he got better, but had a return whenever he took cold.	Working in bad air and exposure to cold.	He can scarcely climb the ladders at the present time, though he still goes underground. Has shortness of breath, weakness, and sometimes pain in the right side. Very little cough or expectoration, chest generally more resonant than normally. Whistling inspiration and prolonged expiration heard over the greater part of the chest. Behind there is some dulness, with tubular breathing and mucous crepitation about the middle of scapula on the right side. Heart sounds normal. The lower ribs as well as the supra-clavicular and supra-sternal spaces sink, on inspiration. There is but little respiratory murmur at the base, but it is loudly heard at the apex of both lungs. Face dark and congested.	
Was taken ill whilst at work at St. Day United mine. He says, "After coming up the mine one day, and having a pint or two of beer, I was sick; the next day the sickness returned, and I vomited about a pint of blood. Afterwards I took cold and had a cough, and since then I have felt weakness in the pit of the stomach and in the legs."	- - -	Has no cough or shortness of breath. Tongue cracked and covered with a brown fur. Loss of appetite. Pulse full and not very easily compressed. He has a florid spotted complexion, as from intemperance. He is an old looking man, and says he used to be very pale. Says he has not been in the habit of drinking much, but has been tipsy on a time.	
When working in bad air in the United mines he had pains in the left side, and between the shoulders, weakness in the limbs and faintness, and feeling of always being tired. (He says one of his fellow workmen died soon after he came to work there, and evidently regards his death as the result of working in bad air.)	Working in bad air.	He complains of fluttering of the heart, weakness, "rising in the stomach" and sickness, headache, and says his limbs get sleepy. Chest resonant, deficiency of respiratory murmur, no abnormal sounds. Heart's action at the present time is regular and the sounds are normal. Pulse regular, soft, and compressible. Face sallow, thin, with sunken features. Body in fair condition.	
When at Consols, felt ill effects of bad air; had pain in the left side and pit of stomach, and weakness of the legs on climbing, and shortness of breath. He strained his side whilst at Consols, carrying ore, and had inflammation there. He strained it again at Poldice in rolling ore. Had pain at the time, and a day or two afterwards spat up a clot of blood, and several times during the day. He fainted the next day whilst going to St. Day.	- - -	Complains of pain in the side and in stomach, has no cough or expectoration; weakness in the legs and loss of appetite and sometimes fluttering of the heart. Chest.—There is dulness on percussion, absence of vibratile thrill, loss of respiratory murmur, with modification of voice at the lower half of left chest behind. A pleuritic rub heard about the level of inferior angle of the scapula, and in front on the same side. Elsewhere resonance is normal, though the respiration is everywhere catching in character. Heart sounds normal.	

Number; District; Disease; Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
94. Key; Miners' disease; July 1862.	55	- - -	Father worked as a miner when young, but gave it up before he grew up.	- - -	15 to 16	Tutworkand tribute.	First worked at Consols for 15 or 16 years. "Can't say that I never worked in any air that hurt me. I never felt any ill effects from it." Then worked at Carnon mine for 10 months, it was bad air there all through. The candles would not burn except when sideways. Did not feel any ill effect from it. It was 16 fathoms from surface and 40 or 50 from shaft, under the sea. Then went back to Consols for 2 or 3 years, in good air. Then went to Wheal Barron for 5 months, in good air. Then to Baldiew for 2 years, in good air. Then back to Consols for 2 years, in good air. Then to Creedbraws for 11 months. "I could not complain of the air there." Then went back to Consols for 2 or 3 years. "No bad air to affect me," some places not very good, but he did not feel any ill effect from it. Then went to Wheal Henry for 17 months, in bad air all the time, in the 70 level. He felt headache and weakness in the legs in climbing, but nothing else. Then went to Wheal Barron, in very bad air in every level, the candles would go out even close to the shaft; "It was the worst mine for air that I saw in my life." He did not feel any ill effect from it. Worked there nearly 8 years, the last 1½ year the air was good because another level was driven at the side. He has not worked since. This is about 3 years ago.
95. Carnwinnen; Pleuritic effusion; July 1862.	52	- - -	- - -	- - -	11	- - -	He continued to work until 7 months ago, when he was obliged to give up from weakness and shortness of breath. He only worked 12 months underground at first and then remained at the surface for 3 years. Then went to Condurrow for 2 or 3 years, and from there to Stray Park. Some places at Condurrow had not good air, but it was generally good at Stray Park. Then went to East Wheal Crofty for 7 or 8 years, sometimes in very bad air. In some places the candle would hardly burn. He felt ill effects from it, "but it wore off." Worked a short time at Cooks Kitchen and then gave up working under ground.
96. Carnwinnen; Bronchitis and consolidation of the right apex; July 1862.	42	- - -	- - -	- - -	10	Tutwork -	Has worked at Dolcoath ever since he went underground. Worked in bad air for 3 years in the 190 level. The air at the time was very bad. He says, "I was working there with my son, and whilst he was turning the borer for me he would faint, and I was obliged to carry him out of the level and pour water over him. We were 40 fathoms from any draught." He had to fit a shaft where it was very wet, and he thinks that gave him cold. At another time he had to wait 4 hours in a cold level after working in a hot place, and he thinks he took cold from that also.
97. The Beacon, Camborne; advanced phthisis; July 1862.	21	Alive.	A miner, in good health.	Four brothers and sisters under 3 years old have died, three of them with inflammation on the chest. His mother's father was a miner, and died in a decline. His father's father is alive, aged 82.	15	Tutwork -	First worked at South Condurrow for 6 weeks on boy's work. Then he went to North Roskear on tutwork, where he has worked since with the exception of 3 weeks at Tolcarn, and a fortnight at Wheal Harriet. He worked in bad air during the 3 weeks at Tolcarn, in good air at Roskear, but it was very hot there in some places. He has been at home now 4 months and a week. He says he took cold by working in the shaft, which was very wet. He used to work 6 or 7 hours in his wet clothes.
98. Camborne; Dyspepsia; July 1862.	62	63 Dead.	A miner, died from a chest affection.	- - -	9	Tribute -	Has been chiefly employed in the shaft, and on tribute. Never worked in much bad air. "The shaft men generally drink a good deal of spirits, but not so much now as they used to do, and what they now drink is chiefly beer." He used to drink freely of beer and spirits, but has left it off for 12 years. He has continued working till the present time, but he does not go deep under grouud now.

History and Duration of Illness.	Cause to which he refers his illness.	Present Condition.	Remarks.
There is no account of any illness until he takes cold 3 years ago whilst working at the surface. He says this was followed by a slow fever, and he has not been able to work since from weakness.	Exposure to cold at the surface.	Has a little cough, expectoration of thick darkish sputa, weakness, and sinking at the stomach. No pain. Face emaciated, features sunken, darkness around the eyes, sallow complexion. Chest resonant, nothing abnormal detected. Heart normal.	This is an example of the apparent impunity with which some men will continue to work in impure air until some slight cause disables them, which, under other circumstances, would be quite insufficient to produce the same effect. This man, though he worked for a length of time in very bad air, seemed not to suffer from it, and now scarcely attributes his condition at all to its effect, though the result shows that his health has given way under it, so that a comparatively trivial cause has been sufficient to disable him.
Was quite well until about 12 months ago, when he found his breath getting short. He had no pain or feeling of illness of any sort, and it came on quite gradually. The only thing he felt was shortness of breath, which has gradually increased. He has lost flesh rapidly during the last 12 months.	Cannot account for it in any way.	Body thin but not emaciated, pale sallow complexion. Skin soft and rather hot. No appetite. Pulse 104, small but firm, Respiration 28, easy. Expectoration thin, white, and frothy, very little cough, and that of a spasmodic character. Chest perfectly dull on the left side, before and behind. There is complete absence of vocal vibratile thrill, absence of respiration. A little tubular breathing heard near the upper part of scapula, close to the spine. Modification of voice over the same side. There is very little motion in the chest, none of the left side, respiration being performed almost entirely by the diaphragm. Complete resonance and puerile respiration over the right side and as far as the left side of the sternum. No bulging or contraction of side. Heart sounds normal.	
He was quite well 5 years ago, but soon after that he began to fail a little, he lost his appetite. After working in poor air he was exposed to cold. This was followed by diarrhœa. The next day he had pain in the chest in the right side, and a cough, of which he had had a little before, increased. The expectotion was white and frothy. He has had the cough ever since, and the expectoration has now become bluish, rather thick, less frothy, and sometimes yellowish. Has had diarrhœa frequently, but always used to have loose bowels. He has lost flesh a good deal, but his strength varies very much.	Working in bad air and afterwards being exposed to cold.	Now complains of weakness, cough in the morning, but without much expectoration. Not much pain now except when he exerts himself. He sweats a great deal, especially at night. Chest resonant on percussion, but there is some dulness under the right clavicle and some loss of motion at the same spot as compared with the other. Vocal resonance is somewhat increased, and respiration is almost bronchial. Loud respiration over the chest generally and no abnormal sounds. Heart sounds clear and regular.	
He caught cold about 5 months ago, and then had pain in the left side, cough, shortness of breath, and lost his appetite. It was a dry cough at first, but he has been spitting white thick mucus since then, and lately somewhat yellow. He used to sweat profusely about 3 or 4 o'clock in the morning, when he was first taken ill, but has not done so for 6 weeks. Never had any diarrhœa. His appetite had failed him for 3 or 4 months before took cold.	Exposure to cold	Great emaciation of body, sunken eyes and cheeks, of a very phthisical aspect. Light complexion, with long light air, grey eyes. Tongue red, with a little fur, skin pungently hot. Fingers clubbed. Chest, dulness on percussion, loss of motion, and flattening over the left side, mucous crepitation, absence of respiratory murmur at apex before and behind, tubular breathing rather below the apex, and about the middle of scapula behind, below that mucous crepitation. Puerile respiration over right lung with mucous crepitation at the apex. Pulse small, soft, compressible.	This is a case of ordinary tubercular consumption, with its usual characteristics, the disease going on quietly (as evidenced by his failing appetite for 3 or 4 months) until he took cold, which set it going in its most acute form, with probable death in a few weeks.
Has had a pain in the left side under the ribs for 10 or 12 years. It varies in severity. He has been at home for 4 or 5 months at a time in consequence of it. Never had much cough except when he takes cold. It is a burning pain, and his legs heat and burn like fire, and he has a pain under his left shoulder blade.	- - -	He is a stout, healthy-looking man, with florid complexion. His diet is chiefly bread and butter and milk. He says meat does not agree with him, the pain is always worse after taking it. Nothing abnormal detected about him. Abdomen fat and flabby. Conjunctiva yellowish. Bowels regular. Pulse soft and compressible. Appetite good.	His former habit of drinking sufficiently accounts for his present condition.

Number; District; Disease; Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
99. Redruth; Miners' disease; July 1862.	52		A miner in early life, but afterwards a farmer.	-	16	Tutwork.	First worked at North Downs for 12 months, at good air, and then went at East Wheal Damsel for 2 or 3 years, in good air. Then worked at Poldice 4 or 5 years in good air. Then went to Wood mine for 2 or 3 years in the 80 fathom level. The air was bad there, and the candle would sometimes hardly burn. Felt ill effects from it. Then went to North Basset, where he has now worked nearly 17 years. Has worked in a quantity of bad air there. The worst air he ever worked in was in the 40 level. The candle would scarcely burn and he could hardly breathe, and when he came into fresh air his legs would tremble so that he could hardly stand. He worked in that place for 2 or 3 months. After that he worked in the 70 level, 100 from shaft, for 2 years. "That done me up, and I was never worth anything after that." When he came to climb the ladders he felt so weak he could scarcely get up. During the last 4 or 5 years he had been working at the surface at the same mine.
100. Redruth; Acute phthisis; July 1862.	21	58, Dead.	A mine captain. He had a bad cough and shortness of breath for some time before his death.	Mother has been dead 11 years, died after a short illness. She had king's evil in the neck. Six sisters have died, the eldest was 10 years of age. They were subject to gatherings and disease of the bones.	15	At first he went under ground with the captains, but afterwards worked at Tutwork.	First worked at Dolcoath in the 230 level for 1 month, but was not strong enough for the place. It was very hot, but the air was good. Then he went to Cook's Kitchen for 12 months in the 230 level in very good air. "It was a long way to climb, and the ladders were very steep, and the staves worn out with rust. Sometimes they would break in our hands, and in some places there would be two or three gone together. They were 10 and 12 inch staves (chiefly 12 inch). It was not hot. We used to drink the water that ran down the side of the lode. They would not send the key down for us two only, unless the kibble was coming, because it was so deep. Never felt any ill effect from drinking the water, although we could taste the mundic." Then he went to Portobello, but after working there 12 months "she knocked." Then he came back to Cook's Kitchen, for 9 months at surface, and in putting in the man engine. Then worked at the burner's yard at Dolcoath for 6 months. Then worked a short time at Trefina, which is wet and cold, and at Tihiddy, and then went to Wheal Buller for 6 months in the 70 level. It is a comfortable mine to work in, no bad air. He was taken ill there.
101. Redruth; Chronic bronchitis and emphysema; July 1862.	48	60, Dead.	A miner, died of miners' disease.	- - -	16	Tutwork -	First worked at Tyburnhale for 6 or 7 years, in good air, mostly in the engine shaft. Then went to South Towans for 6 or 7 years, when "she knocked." There was good air in the engine shaft where he worked. Then went to East Wheal Rose for 13 years, in good air, 8 years in the engine shaft. Then worked at Poldice for 10 months, in good air. Then he came to Copper Hill for 7 months in the 54 level. The smoke lay on the ground, but the air did not appear to be bad. Then worked at West Wheal Damsel, which was a bad air mine, in the 60 level for 12 months. The air was bad there. He then worked at Wheal Cubitt as a pitman, not regularly under ground, for 10 months. Then worked at South Scurvy as a pitman, working mostly in the shaft. He took cold here, and was laid up for 14 days, and has not been to work since. This is about a year ago. His wages were from 3*l.* 10*s.* to 3*l.* 15*s.* per month.
102. Gwennap; Miners' disease; July 1862.	49	49, Dead.	A miner, and died of miners' disease.	- - -	15	Tutwork and tribute.	Worked first in the United mines for 5 years in good air. Then went to Penstrethel for 4 years in good air. Then worked at Consols for 12 years, in good air, in the 140 and 188 levels. Then went to Tolcarn, for 2 years, The air was very "slight" there in the 10 level under adit, where he worked 12 months, and in the 40 level, where he worked 6 months, also in the engine shaft where he also worked for 6 months. He felt no ill effect from working there. He then went to East Tolgus for 9 months, where the air was pretty good, but where there was a good deal of smoke. He then went to West Tolgus for 9 months. The air was close and hot, but good. The candle would burn pretty well, but it will do so, even when the air is poor, when placed against the "foot wall" but not against the "hanging wall." He then went to East Wheal Bassett, for 2 years. There was very bad air in the 60 level. There was only one shaft to this mine (6 years ago), and they were 120 fathoms from the shaft. He says he was quite well there. He then went to Cuba for 2 years, where he worked in some slight air. He was then at home for 6 months, as he did not feel well, and then went to Wheal Louisa for 9 months, in the shaft, 25 fathoms from surface, in good air. He was tolerably well there, but did not feel so well as he had been before. He then went to America, where he stayed 14 months, and worked in poor air. Then he worked at Wheal Moyle in Gwennap, for 3 months. The air was good there, in the 30 level.

History and Duration of Illness.	Cause to which he refers his Illness.	Present Condition.	Remarks.
When he first worked in bad air in Wood mine, 20 years ago, he had loss of appetite, weakness, pain in the chest and side. He says, "on coming up the ladders my heart would beat so that I could hear it, and the men above and below me would ask whose heart it was beating. They could hear it 4 or 5 fathoms above or below. I have often heard other men's hearts beat at the same distance. I think I could mention a score of my companions who are now dead of miners' complaint whose hearts could he heard beating. A man's heart cannot be heard unless he is ill, and only when they have come out of bad air to climb. It sounds as if some one was beating on their breasts with his fist." When working at North Bassett in the 70 level, he says he had shortness of breath, beating of the heart, head-ache, loss of appetite. He was then taken with inflammation on the chest, and was confined to bed 6 weeks, and was at home nearly 2 years. The expectoration was slate coloured at first, after 4 or 5 days it became red and viscid, and afterwards yellow, and then gradually ceased. He spat blood for a day or two during the first few days. During the last 4 years he has been laid up occasionally for weeks together. 2 or 3 months ago he was laid up for 3 weeks with pain in the right side, and a cough, with no expectoration to speak of. Since then he has improved in health, but has never got strong.	Working in bad air.	"If I get to work now for 5 minutes I am done up with weakness, trembling of the limbs, and shortness of breath. I have constantly palpitation of the heart, so that I cannot walk fast or work." Sunken features, has lost flesh considerably, and does not recover it. Sweats a great deal on any exertion, but not at night. Chest moves freely, respiratory murmur clearly heard over the whole, except at the base of left chest. Here there is dulness below the angle of scapula, loss of vibratile thrill, loss of respiratory murmur. Heart's sounds are faint, but regular, impulse very feeble, extent of dulness not increased. Skin moist and supple. Pulse 92, soft and compressible.	He says, "when I was at work in this bad place I had better wages (3*l.* 10*s.* and 4*l.*) because other men would not work there. I should think a score of men worked in that place and left it after a short time because they could not stand it. A great many of them are now dead. The men might have been weak men for all I know, but anyhow they have died since."
When at work at Wheal Buller he found that he had a cough in going to the mine in the morning, and when he came to beat the borer he was taken with a pain in the right side. The pain continued all day, and when he left work he had to climb very slowly because it made his breath so short. He had to carry 10 borers up with him (¾ cwt.) He stayed at home two days and then went to work again for one day. He then had advice, and has not worked since. This is about 14 weeks ago. The cough became much worse when he was seized with pain in the side, and it has never left him. The first day he stayed at home he spat up a little blood. The expectoration has always been much the same in its character as it is now, greyish yellow, purulent, in masses remaining separate in the vessel.	No cause assigned.	He has light brown hair, and brilliant grey eyes, sunken features, with a flushed cheek on one side. A month ago he had early morning perspirations, but not lately. Body and arms much emaciated. Skin hot. Chest long, shallow. Motion of right upper part of chest limited. Right infra-clavicular space dull, more so than the left, which is also dull. There is mucous crepitation over the whole of the front of the right lung, with tubular breathing and bronchophony at the apex; behind, crepitation at apex, puerile respiration below. Left lung has mucous crepitation, bronchial breathing, and bronchophony at apex in front; below and behind there is puerile respiration. Never had diarrhœa. Pulse 136, very feeble. Respiration, 38, deep. Heart sounds clear, rapid.	
When working at Wheal Damsel, 2 or 3 years ago, in bad air, he says, "I got loaded on the stomach and spat up powder smoke and that sort of stuff; my breath was short, and my heart beat a little, I had no pain." When employed at South Scurvy he took cold by working in very cold water, he worked 13 hours in cold water in one day. The same evening he was taken with shivering, and on the following morning he had shortness of breath, a cough, and expectoration of white froth. He had no pain. He was confined to his room for 14 days and then got better, but has not worked since.	Exposure to cold by working for 13 hours in cold water.	He has now shortness of breath, and at times a pain in the left shoulder, and in pit of the stomach when he takes cold. Has a little cough in the morning, with but little expectoration. Body thin but not emaciated. Not subject to sweating. Chest resonant on percussion, and moves freely. The resonance extends over the normal seat of heart's dulness. Respiratory murmur rather deficient in loudness over the right side. At the right apex behind, and at the base of both lungs there is a cooing sound at the termination of a full inspiration, and the expiration is prolonged and of the same character. Heart's sounds are feeble. He has a sallow complexion.	
Four years ago he had fever and ague in Cuba, and was in hospital 8 or 9 days, and after he came home he did not go to workfor 6 months as he did not feel well. He seems never to have been quite well since this time. He has never appeared to suffer much from the effects of bad air though he has worked in a good deal. Seven months ago he took cold. He says he came up from under ground sweating, and changed his clothes in the boiler house, where there was a strong draught. He then had pain in the side, a little cough without expectoration, but no shortness of breath. He was bled for inflammation in the side. He was ill in bed for 5 weeks, and has never worked since, from weakness and pain across the stomach. About 3 months ago he spat up about half a wine glassful of blood, and he has often spat up blood since then. It comes on with a little tickling cough.	Exposure to cold in changing his clothes after sweating.	Complains of pain in the pit of the stomach, and weakness. Chest resonant on percussion. Respiration clear, but faint, and somewhat catching and irregular. Heart sounds normal. Pulse quick, moderately full and compressible.	He states that at Wheal Moyle the mine doctor was a druggist and not a qualified medical man, and that he was a relative of the captain of the mine. If this be true, it shows that the system under which the surgeon to the mine is appointed, is not the best for the men.

Number; District; Disease; Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation, where employed. Quality of Air, &c.
103. Redruth; Aortic valvular disease; July 1862.	43	58, Dead.	A miner, died of miner's complaint	- - -	18	Tribute.	Worked last at Carn Brea in the 26 level, 35 fathoms from shaft, down 8 fathoms in the winze. There was very bad air there. He worked a fortnight there, and then was taken ill. He has not worked since. This is 2½ years ago.
104. Crowan; Ascites; July 1862.	20	48, Alive.	A miner -	- - -	15	Tutwork -	First worked at South Wheal Francis, on boy's work for 4 years at grass. Then went under ground at Wheal Ennis in 30 level on boy's work, in good air. Then to Whendron Consols on tutwork for 3 years, in 25 level and 40, in good air. Then went to Whendron United for 8 months on tutwork, in 30 level. Good air, but a good deal of powder smoke. Then went to West Wheal Francis, where he worked about a fortnight in the 70 level. The air was good enough. It was a tin mine. He was taken poorly soon after going there. The ladders were very easy to climb. Has been away from work about 10 days.
105. Camborne; Rheumatism; July 1862.	27	55, Dead.	A farm labourer.	- - -	- - -	Employed in the shaft, to fill the kibbles.	He worked until 3 months ago, when he gave up, owing to weakness and pain in the back. The last 2 years he has been working at Dolcoath in a very cold place, filling the kibbles in the shaft, and he thinks he took cold from that.
106. Liskeard; Miners' disease; August 1862.	28	55, Alive.	A miner -	- - -	8	Tribute and tutwork, but lately on tribute.	First worked at Wheal Providence with his father on tribute for 3 or 4 years. Then went to Wheal Knott on tribute and tutwork for a year or two. Then came to Wheal Trehern on tutwork for 3 or 4 years, in the 45 and 50 levels. The back of the 45 was very warm and dusty, but the air was not bad. He then went to Wheal Mary Ann for about 12 months on tutwork in the 90 level, the air was slight and there was cold damp. Then went to Wheal Trelawny for 2 or 3 years in the 107 level. The air was warm and not good, the candles sometimes would not burn. He used to look white and pale, and sometimes had a little shortness of breath. He was laid up poorly for a day or two occasionally, but never suffered for long. Then went to Cuba, where he worked 3 years and 5 months in the Cobra mines. He had very bad air there, and was ill with pain in shoulders, beating of the heart, but was not laid up any time from it. Then he went to America, to the Rockland mine for 14 months, in good air. Then came back to Wheal Trelawny, where he is working now. He has been there about 12 months on tribute in the 140 level.
107. Bodminland; Miners' disease; August 1862.	27	52, Alive.	A miner -	- - -	17	Tutwork -	First worked at Wheal Gill for 2 years in the 26 level, air good. Then went to Wheal Trehern for a week, and then to Wheal North Trelawny for 2 years in the 25 level. There was a little poor air there, but he had good health. Then went to Wheal Ray for 6 or 7 years in the 12, 30, 40, 70, and 100 levels. There was bad air in the 30, 70, and 100 levels, and the smoke was very thick. He was ill there, and has not been to work since This is 12 months ago.
108. Bodminland; Damaged health from his occupation; August 1862.	37	60, Dead.	A miner -	-	11	Tutwork ..	First worked at North Roskear on tutwork for 3 years, in the 20 level, in good air. Then went to Redmoor, for 10 or 11 years, in the 100 and 110 levels and others. There was bad air in the 90 level where he worked for 15 months, he was home in consequence for 6 or 7 weeks. Then worked at Holmbush for 2 or 3 years on tutwork, in the 100 level; there was bad air there for 6 or 7 months, and then he found he "could'nt stand it any longer," he found himself failing, and had shortness of breath. Then he went to Mark Valley Consols on tutwork in the 50 level. The air was very bad, and there was cold damp for 7 months. The candles would not burn up to the end of the level. They had an air pipe in with them, and they were obliged to keep the candle in the pipe to keep it burning. They used sometimes to fire the fuse with a tobacco pipe, because the candles would not burn sufficiently to fire it, and the fuse was not long enough to reach the candle in the air pipe. Says he did not feel much ill effect from it besides headache and weakness in the knees. This was about 1½ years ago. They had good air after that, and he worked there for 12 months, and then stayed at home for 3 months with pain in the chest, and abscesses in the neck; for the last 2 months he has been at work again.

History and Duration of Illness.	Cause to which he refers his Illness.	Present Condition.	Remarks.
Says he was quite well before 2½ years ago. He was then taken ill whilst working in very bad air, with his heart beating very loudly as if it would jump out of his body. He had worked in bad air before and had had pain in the head from it, but not much, as he was a tributer. He first felt the beating of the heart when walking and then when he climbed the ladders, and it increased so much that he could neither go up nor down,	Working in bad air.	Pale, sallow complexion. Body thin, but not emaciated. Skin sweating. Heart :—There is a loud double see-saw murmur heard distinctly over the aortic valves and up the course of the aorta. Impulse forcible. diffused. Pulse full, sudden, splashing.	
When working at Whendron Consols, he had inflammation in the left side, from cold, and was laid up about 5 weeks, with pain in the side, and cough; but without expectoration, shortness of breath, or difficulty of lying down. At Wheal Francis he was gradually taken poorly with loss of appetite, general weakness, and a little shortness of breath. He had cough, with but little expectoration. Eleven days ago his body began to swell, and his ancles began to swell about 3 or 4 days since. Face has never been swollen even in the morning.	Exposure to cold.	Pulse 92 soft, compressible, irregular in frequency and force. Chest resonant on percussion respiration clear and healthy. Heart's sounds clear, but irregular in its action. Abdomen is evenly swollen, not tense, fluctuating, containing fluid in peritoneum. He has no pain or tenderness on pressure; no enlargement of viscera detected. Large veins course over the surface of abdomen. A little œdema about the ancles. Urine not albuminous. Face rather dark and congested. Tongue clean, healthy. He says he has been steady in his habits, and not in the habit of drinking.	
He has not been quite well for 12 months. He first felt stiffness and pain in his back, so that he could not straighten himself in the morning, He became gradually weak and had shortness of breath.	Exposure to cold.	He walks with his head stiff and bent forward, and says he cannot turn it round or put it back on account of pain. There is a slight amount of tenderness on percussion over the spine in the back and neck, no pain on striking the top of the head, but it hurts him if his head is twisted round far. It can be rotated freely to a limited extent without pain.	
He came back from America, because he was ill there, with beating of the heart, weakness and pain in the shoulders and shortness of breath. He was at home for 12 months before he was able to work under ground. Last week, he says, he spat up about a teaspoonful of blood, with a very slight cough.	Working in bad air.	Has lightness in the head, pains over his body, and beating of the heart at times. Pale sallow complexion, with dark areola round his eyes. Body in pretty good condition, but not fat. Lungs apparently healthy. Heart sounds normal.	An instance of the early age at which a father will expose his children to the influence of under ground air and want of light, in order to increase his own earnings. There is no evidence as to the condition of the air when this child of 8 years of age was first taken under ground by his father.
He was failing for 2 years before he gave up. He had headache, weakness, pain in the side and stomach, a feeling of chilliness, and inability to climb the ladders during the last few months from shortness of breath.	Working in bad air.	Has now pain in the side and stomach, nausea, shortness of breath, no cough. He had cough at first and he vomited a small cupfull of blood, just before he gave up work. Has beating of the heart when he goes up hill. The weakness, pain in the right side, and shortness of breath prevent him working. Chest moves freely, resonant on percussion respiratory murmur is clear but faint. Heart sounds normal, impulse feeble. Pulse small and compressible. Skin cool and soft. Body in good condition, he says he has picked up flesh lately, and is gradually getting stronger.	He receives 8*s.* a week from the parish, for four persons. He gets nothing from his club because he has "no "visible hurt."
When he first worked in bad air in Redmoor mine, he was ill for 6 or 7 weeks with pain in the chest, bad cough with expectoration, pain in the limbs, and weakness in the legs in climbing. Since then he has worked in a great deal of very bad air, but without being disabled from work. His health, however, has been impaired, and for some time he has been the subject of abscesses.	Working in bad air.	He has shortness of breath, and at times pain pain in the chest. He is thin, with a pale sallow complexion. There is great enlargement of the glands of the neck on both sides, some of which are suppurating, and there are several scars where others have opened. Chest apparently healthy. Heart sounds normal.	He says the average pay of the men lately has been 47*s.* per month.

Number; District; Disease; Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
109. Bodminland; Dyspepsia; August 1862.	48	60, Dead.	A miner, died of a lung complaint.	- - -	11 to 12	Tutwork -	First worked at Wheal Knott for 2 or 3 months, in the adit level, in good air, and then at Wheal Hope, in the 50 level, in good air for several months. After this he stayed at home at a farm for several years. Then went to Wheal Union for 6 months in 70 and 50 levels. Then worked at Great Wheal Fortune, Wheal Mabley, and Ninnis Wheal Virgin for 3 or 4 years, in good air. Then he went to Buckler's mine for 2 years on tutwork in the adit level, and in the 50. There was poor air and cold damp in the adit level. They were about 200 fathoms from draught, and had pipes with a waterfall, but the water was not sufficient. He felt no ill effect from it besides losing all the hair off his head (!). It was a cold place. Then went to Fowel Consols for 12 months on tribute in 160, 50, and 80 levels, the air was good but very hot. Then went to Buckler's mine for 12 months, from there to Mark Valley, Redmoor, and Holmbush, in the latter he worked 7½ years in the engine shaft in good air, but it was very hot under the 120 level.
110. Bodminland; Chronic rheumatism; August 1862.	51	48, Dead.	A miner; died with asthma.	- - -	11	Tutwork and tribute.	First worked at North Roskear for 12 or 15 years, on tribute chiefly, in 100 and 120 levels; the air was "not generally bad." Then he went to America for 2 years, where he worked in good air, then went back to North Roskear for 12 months in 130 level. The air was close, and there was a good deal of smoke. Then to South Caradon in the engine shaft for 6 years. Air middling, but a good deal of wet and sometimes cold. Then to West Caradon on tutwork for 6 years in the engine shaft, air good but wet and cold. Then he went on tribute in the same mine for 12 years, in the 80, 100, and 110 levels. Air close in some places. Works now at the surface, but has not done much these 2 years.
111. Bodminland; Miners' disease; August 1862.	26	66, Alive.	A miner -	- - -	8½	Tutwork -	First worked at Goginnen mine in Wales with his father, in the 40 level. They walked down an incline into the mine. The air was not bad there. He worked there 3 years. Then he went to Penrhew mine on tutwork in the 20 level for 12 months. The air was so bad that they could only work two in "a pair." He felt ill effects from it. Then he went to Llanvirknock for a year and a half on tutwork and tribute in the the 20 level. Air good there. Then went to Frank Mills for 2 or 3 years on tutwork and tribute, in the 30, 40, 60, and 84 levels. There was bad air all through that mine. In the 84 level they were 250 from shaft, and there was only one shaft in the mine. Then went to East Caradon where he has worked about 10 months on tutwork in the 50 level in bad air.
112 Bodminland; Miners' disease; August 1862.	56	30 to 40, Dead.	A miner, but died abroad.	- - -	10	Tribute at first and afterwards on tutwork.	He was slung by a rope when he first went underground. He first went to the United Gwennap mines, and worked there for 20 years; the deepest level was the 120. Did not work in much bad air there. Then came to Wheal Trelawny in 55 level for 12 months. Air close, but not bad. Then went to Wheal Trehern for 3 years in bad air in the 55 and 112 levels. Then came to West Caradon for 3 or 4 years on tribute in some very bad places, the worst he ever worked in in this country. In the 17 level it was very bad; this is the last place he worked at. He has not worked for 2 years.
113. St. Agnes; Chronic bronchitis; July 1862.	46	62, Dead.	A miner, died of miners' consumption.	A sister aged 54 died, who had a cough, and lost her voice for some time before she died.	15	Tutwork and tribute.	First worked at Wheal Leisure for 5 years in good air, in the 46 level. She is now "knocked." Then went to St. George for 4 or 5 years. Worked one month in bad air in the 10 level. He did not feel any ill effect from it, but a young man who worked with him was ill in consequence, and never worked afterwards. Then worked a month at East Wheal Rose, in good air. Since then he has worked at Carn Brea, Polberro Consols, and Saint George, and then came to Wheal Trevornance, where he worked until he gave up work about 18 months ago.

History and Duration of Illness.	Cause to which he refers his Illness.	Present Condition.	Remarks.
13 years ago he had inflammation of the testicle, and was salivated for several days, and he has never had good health since. Directly after he was salivated he had liver complaint, with pain in the right side, and was ill about 2 years more or less. Ever since then he has had pain in the pit of the stomach, sometimes sickness and sometimes rising of sour water into his mouth. Occasionally he has been unable to keep anything in his stomach, for a week together.	- - -	Pale, sallow, sunken features. He is thin, but says, he has not lost much flesh. Has a dark areola around both eyes. Tongue pale and tremulous, covered with a little white fur.	
Has had pains in his limbs for 5 years, but about 2 years ago his knees and ancles and shoulders became swollen, and they have continued so ever since, but vary a good deal.	- - -	Says he is prevented from working by pains in his limbs, and swelling and stiffness in his joints. Has effusion into both knee joints, the right one being the largest. They are not tender on pressure. It goes, he says, from one joint to another. When he gets up in the morning he can scarcely move, but it goes off after half an hour's walk. He is a tolerably healthy-looking man. Tongue pale and tremulous. Says he has lost flesh considerably of late, but complains of nothing else than the pain and swelling in his limbs and joints.	
When at Penrhew in bad air, he had pain in head and stomach, lightness in the head, and was laid up for about 3 months. He was laid up for about 6 months after leaving Frank Mills, with pain in the head, back, and limbs, and he has never got rid of it, and suffers from it at times very much still. He now works at the surface, looking after the engine.	Working in poor air.	Has now loss of appetite, shortness of breath when under ground, not much cough, but has pain and trembling in the limbs. Sallow anæmic appearance, pearly white conjunctiva. Body thin, but not emaciated. Chest healthy.	
He felt himself failing for some months before he gave up work, and could not climb; and during the last 2 months that he worked he got so much worse, that being unable to get up the ladders he was obliged to give it up. This is 2 years ago.	Working in bad air.	Complains of shortness of breath, want of strength, trembling in the limbs, tightness in the chest. He has no pain, and no cough. He is thin in the face, and looks much older than he says he is. He says "56 is a brave age for a man in this country." Chest is rather dull at both apices, tubular breathing and increased vocal resonance over the left. Respiratory murmur is deficient, and inspiration is catching over the right. Behind, there is puerile respiration about the middle of the scapula on both sides, loudest on the left. Elsewhere respiratory murmur is normal. Heart sounds normal, impulse feeble. Body thin, more wasted than his face. Not subject to perspirations. Has laryngeal breathing.	
He had "inflammation in the chest and pipes" several times. At one time he was at home 19 weeks, and 10 weeks at another time. About 2¾ years ago he broke his thigh, and he had not been at work again long before he was taken with bronchitis. He has been ailing for 4 or 5 years. His voice has become husky and thick for 6 months.	Exposure to cold.	Says he has a cough, with frothy expectoration, and his breath is very short. Has no pain except on coughing. Feels very weak, and has a very bad "appetite for meat." Has lost 20 lbs. weight during the last 2 or 3 years, but not much during the last 6 months. Rounded chest, prominent sternum, resonant on percussion. Behind on the right side there is diminished respiratory murmur, with large mucous crepitation; on coughing the expiration is prolonged with a cooing sound. On deep inspiration there is rhoncus, followed by prolonged musical expiration. At the extreme base, little besides mucous crepitation is heard. In the left lung the air enters freely and respiratory murmur is heard distinctly all over it. No difference in the percussion sound on the two sides. Heart sounds feeble but distinct. Pulse 100, soft and compressible. Face sallow and emaciated. Tongue clean. Not subject to sweating.	

Number; District; Disease; Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
114. Peterville; July 1862.	59	40, Dead.	A miner, killed by a fall from the ladders.	- - -	16	Tribute and Tutwork.	First worked at Fowey Consols for 2¼ years. The air was generally good, sometimes a little flat when the wind was south. Then went to Landtiglis for 4 months. Then to Ligarthick for 2 years, in the 20, 30, and 40 levels; the air was generally good, but it was bad in the 40 for a week or two. Then worked at some iron works in Monmouthshire, where he worked in bad air for a month. The candles would not burn well and there were no safety lamps there then. There was a good deal of fire damp. They were in the mountain about a mile, and there was only one airway, and they worked about a ¼ mile from it. "There was always poor air there, and then the fire-damp would not go off; but if once the fresh air had come in, the fire-damp would have exploded." He had good health there. There was no climbing. Then went to Wheal Bise at St. Just for 12 months. He worked in the 100 level for 10 months. The air was very bad there, 180 from shaft. The other 2 months he worked in the 110 level where the air was not so bad, but not good. Then came to Polbrene for 4 years in the 30 and 40 levels. The air was tolerably good there, except when the tributers left the "deads" in the level, when the air was close in the ends.
115. Camborne; Consolidation of lung; Hypertrophy of heart; July 1862.	50	56, Dead.	A miner, killed by the explosion of a "hole."	- - -	11	Tutwork and tribute.	First worked at Ternevoor mine for 8 or 9 months, and then went to Wheal Golden for 3 or 4 years. He worked in close places in the 30 level as a boy. Then went to Polbrene; there were close and smoky places in the 20 level. Did not feel any ill effect from it then. Then went to Wheal Prudence for 7 years in the bottom level (70) in very close poor air. He was ill for some time. Then went to Wheal Coach for 2 or 3 years on tutwork and tribute. It was a bad granite mine; he worked in the 40 and 50 levels. The air was very bad. The candles would burn when on the side. Used to feel very weak in the knees and legs on climbing and was obliged to stop at every ladder almost for breath. Was not laid up then for long, but several times for a short time. Then went to Wheal Kitty for 3 years on tribute in the 55 level. It was a very sulphury poor place, with mundic. The air was very smoky and poor. The candles would melt with the heat, and it was also wet. Was laid up for some months while working there, with the same symptoms as before. Then got a little better, and went to work for about 10 months at Polberro Consols. The air was good there, and too much of it. It gave him cold.
116. St. Agnes; Rheumatism; July 1862.	25		- - -	- - -	14	- - -	The last mine he worked at was Wheal Quoit, a very cold, wet, and draughty mine. He worked about 30 fathoms below surface. He was taken ill there about 6 weeks ago.
117. St. Agnes; Chronic bronchitis and emphysema; July 1862.	63	60, Dead.	A miner, died from an injury.	- - -	25	Tutwork -	Before the age of 25, he was at sea. About 23 years ago he went to work at Wheal Coates for 4 years. During the last 12 months of this time he worked in poor air in the 70 level. It was a granite mine, cold and wet, the air was very bad, the candles would scarcely burn. It was about 60 or 70 from shaft. He was taken ill there. He was laid up about 12 months. Has worked at several mines since, but not in bad air.
118. St. Agnes; Old inflammation of lung; phthisis (?) July 1862.	55	- -	- -	- - -	17	Tutwork and tribute.	First worked at Wheal Bassett for 8 years. There was a little bad air at times, and he felt pain in the head and weakness in the knees in climbing. Then went to the United Hills for 15 years. Not much poor air there. Then went to Wheal Basset, and worked 4 years above the adit, sometimes in bad air, perhaps for 5 or 6 months altogether. Then he came home and worked at his own place. This is 12 years ago, and he has not worked at a mine since.
119. Trithell and Gulvall; Old bronchitis; August 1862.	38	40, Dead.	A miner killed in the mine by a stone falling upon him.	- - -	13	Tribute.	Has worked all the time, except about 3 years, at Ding Dong mine, and had very good health until 2 years ago, when he worked 3 or 4 months in the 40 level in bad air. After about a month he felt ill effects from it, but continued to work there for 2 or 3 months. He then went to another part and worked for 12 months, when he found he could not climb the ladders any longer, and had shortness of breath. He has been working at grass about 3 months.

History and Duration of Illness.	Cause to which he refers his Illness.	Present Condition.	Remarks.
When working in bad air at St. Just, he was ill with pain in the pit of the stomach, shortness of breath, and weakness in the knees. Four years afterwards, when working in bad air he says he did not feel any ill effect from the air, but his breath was always getting shorter. He has had inflammation on the chest 7 or 8 times.	- - -	His chief trouble is weakness and shortness of breath, so that he cannot go up hill, and can scarcely lie down at night. He has swelling of the legs, which pit on pressure, and he sweats a good deal at night. Tongue clean, skin cool and moist. Pulse 100, full and compressible. Bowels usually rather relaxed. Chest generally resonant. Heart's dulness displaced downwards and inwards about 2 inches. Resonance at the ordinary seat of heart's dulness. Dry crepitation over right apex in front and behind, where there is increased resonance of voice. No bronchophony or tubular breathing. Respiration somewhat puerile. Heart sounds normal. Says he cannot lie upon his left side, but he can on the right.	
When at work at Wheal Prudence he was ill with shortness of breath, general weakness of body, and weakness in the knees. Had pain in the right side, head-ache, "sick stomach," but a tolerable appetite. Several times he has been ill since then, with the same symptoms. 4 years ago he thinks he took cold at Polberro Consols. Illness came on by degrees, and his breath got so short that he could not climb or work. He does a little work now out of doors, but his breath is too short for him to do much. He has spat a little blood.	Working in bad air, and exposure to cold.	Has not much cough, and spits up only a little white frothy mucus. Chest on right side at upper part, is dull on percussion (but not very) before and behind. At the same part respiratory murmur is heard, but not very loudly, and there is prolonged expiration and increased vocal resonance; no tubular breathing or bronchophony, no crepitation. This condition extends as low as the middle of the scapula behind, and to just above the nipple in front. Respiratory murmur over the rest of that lung is normal. Over the left lung there is puerile respiration extremely loud, but no other abnormal sound. Heart's impulse is diffused and forcible; the sounds are clear, the 2nd being remarkably distinct. No murmur, pulse full and rather hard. Body thin, but not emaciated.	
Has had pains flying about his joints for 7 or 8 months, but always had good health until 2 months ago. One Thursday evening after leaving work he complained of being very cold, on the Saturday following he had pain in the shoulders and shortness of breath, and felt faint and feverish. About a fortnight afterwards he had pain in the left side, which moved about, lasting about half an hour at a time. He had no cough. About this time he noticed palpitation of the heart coming on occasionally for an hour or so. This was accompanied by shortness of breath. About a fortnight ago his heart began to beat irregularly.	Exposure to cold.	Complains of weakness, and pains still flying about him. Has fluttering and palpitation of the heart on walking or on any excitement. Says he cannot walk because his breast is so tight. Appetite middling. Heart's sounds are clear, impulse very feeble, action easily excited, and occasionally irregular.	
Always had good health until he worked at Wheal Coates, 23 years ago. He was taken ill there with pain in the breast, shortness of breath; he had "a heavy load on the stomach," bad cough with expectoration of white frothy mucus (sometimes black), and weakness in the legs. He has had repeated attacks of the same complaint since, though he has not worked in bad air.	Working in bad air.	Complains of shortness of breath, when he moves about, but he is pretty comfortable when he has no cold, and his breathing is easy when he is quiet. He is a old-looking man for his years.	
6 years ago he went to Truro, and in going he caught a bad cold. He had "slow fever," and "inflammation," and was very bad for 9 months. About 2 years ago he first spat up blood, and has done so ever since, with an occasional interval. Has had a bad cough, but it is now better. He had a blow on the left side 3 years ago, and has had pain there ever since, but he had pain there before the blow.	Exposure to cold.	Has shortness of breath so that he cannot work, a cough with expectoration of bluish thick tenacious mucus, sometimes mixed with blood. Chest resonant on percussion, respiration clear, but different in character at the two apices, that at the left apex being brighter than the right, and at the left respiration is rather irregular, and catching. He says blood comes up if he exerts himself or has a violent fit of coughing. Heart sounds are regular and clear, no murmur.	
After working about a month in bad air he had shortness of breath, pain in the right side, and cough, but without much expectoration. He continued to work in bad air for 2 or 3 months longer, and then went into good air for 12 months, when he found the shortness of breath had increased so much that he was obliged to give up.	Working in bad air.	Still has shortness of breath if he exerts himself. Has no cough now. Says he has recovered his strength pretty well since he has been "at grass." Sweats a good deal when he moves about, but not at night. Chest resonant, respiration normal. Pulse feeble and compressible.	

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120. Gulvall; Old bronchitis; August 1862.	62	- - -	- - -	- - -	14.	- - -	He has worked the greater part of his time at Ding Dong mine and in a great deal of poor air. Worked in poor air 40 years ago in the 60 level, 36 from shaft, and felt ill effects from it. Since then he has worked in poor air places with gradually increasing ill effects. Worked last in poor air, 2 years ago in the 20 level, 30 from shaft. He found he could not come to grass, and then he gave up underground work, and has since worked at grass. He could not bear the smoke of the candles at last.
121 Ding Dong, Chronic broncho-pneumonia; August 1862.	53	35, Dead.	A miner, killed by falling away from a shaft.	- - -	12	- - - -	He has worked nearly all his time at Ding Dong mine. Has worked in a great deal of poor air in the 40 level, not far from the shaft, without ill effect, also in the 60 level for 12 months without ill effect. 9 years ago he worked in poor air in the 30 level for 9 months. He was ill in consequence, but continued to work under ground for 4 years after that. The last month that he worked underground was in poor air. This was 4 years ago. He was then very unwell and was persuaded by the captain to stay above ground. He now belongs to "the dry," but is not able to do any hard work because of weakness and shortness of breath.
122. Ding Dong; Bronchitis and emphysema: August 1862.	47	62, Dead.	A miner	- - -	13	- - - -	He first worked at Ding Dong, and with the exception of a year and a half at Bottallack, he has worked there ever since. Has worked in bad air in the 50 level. It is a dry and cool mine, and there is a good deal of dust. There is not much mundic in the mine. When he worked in poor air he could not work "so strong or so long" as in other places. He had occasion to work at the surface for a little time, and he found his health so much improved he would not go under ground again. This is 5 years ago. He now works at grass.
123. Redruth Highway; Dilated heart; August 1862.	50	- - -	- - -	- - -	9.	Tutwork and tribute.	First worked at Treskerby on boy's work, for 4 or 5 years in different levels; the deepest was the 50 level. The adit level here was 50. Then went to Poldice on tutwork for 3 years in the 20 level. He worked in poor air there, but says, "I felt no ill effect from it, as I was young then." Then went to Ting-tang mine for 6 months in the 90 level. Air rather close. Then to North Downs for 8 or 10 months in good air. Then to Wheal Seaton for 6 years. Worked in close air there for some months in the 20, 40, 60, and 80 levels. Felt ill effects from it, and was laid up for months together, and has never been well since. This is 26 years ago. He used to climb fast when he was young. Then went to Wheal Buller for 3 years, in the 13, 30, and 60 levels. There was very close air there all the time except for 7 months in the 13. Was laid up several months. Then went to Copper Hill for 12 months, in the 60 level, in tolerable air. Then went to Tincroft for 3 years in the 70 level. Worked in bad air there, and also in good air for 8 or 9 months out of that time whilst on tribute. Felt no ill effect from that mine. Then came back to Copper Hill for 12 months in the 60 level. The air was very close there. Was home ill 2 or 3 months out of the time with similar symptoms to those he had had before. Then went to Australia for 6 years. He did no good there, and he says he thinks men do better in Cornwall. Then went back to Copper Hill for 7 or 8 months in the 50 level. The air was very close, and he was laid up several times for a few days. Then went to Penandrea for 7 months on tribute, in 40 level. There he thinks he laid himself up, for he has never been able to work under ground since. He had to come out of the "pitch" sweating and to walk through cold water. He took cold from it, and in the evening he had a "chill," but continued to work for 2 or 3 days longer, when he found he could not climb the ladders for beating of his heart, and he has not been underground since. This is 1½ years ago.
124. Tavistock; Phthisis; August 1862.	43	30, Dead.	A miner, died from an accident.	- - -	14.	Tribute and tutwork.	First worked at Whea Franco for 18 months in 24 and 50 levels, from the surface. Worked in no bad air, but plenty of smoke, and there was only one shaft. It was a very hard footway to climb. Then worked at Wheal Friendship, Wheal Betsy, Wheal Marquis, and at Great Devon Consols. Worked in bad air in Wheal Friendship on tribute about 20 years ago, in the 150 and 170 levels. "I knew it was bad air by its effects. The candle gives a very dull light so that you can hardly touch or look at it without its going out." Felt ill effects from it. There was bad air in Wheal Betsy, and there was plenty of powder smoke, but he says he did not work in bad air. He then went to Wrixhill on tribute for 2 years in good air. Then went back to Consols in 70 level; plenty of powder smoke, but no bad air. Then went to Australia, where he remained 4 or 5 years. He had good health then. Then worked at Poldice in good air, then 1 month at Anderton mine in bad air and cold and damp. Then worked at Wheal Craby for 6 or 7 months on tribute in the back of the 12 level, not in bad air. Sometimes there would be a strong current of air, at other times none at all, and they had to fetch the timber from a level where there was a very strong current of air, and in that way he caught cold, but did not give up work for 2 or 3 months, but at last he was obliged to give up, and he has not been able to work for 15 months.

History and Duration of Illness.	Cause to which he refers his Illness.	Present Condition.	Remarks.
Had shortness of breath 40 years ago, but got rid of it. It was from working in poor air. Since then shortness of breath has come on very graduually from repeatedly working in poor air places. He had a cough when he gave up working underground, but it has left him since he has worked at grass.	Working in poor air.	Now he has nothing to complain of except a little shortness of breath, when he travels quickly. Slight deficiency of respiratory murmur is the only thing abnormal detected on examining the chest.	
He first felt ill effects from working in bad air about 9 years ago. He then had shortness of breath, a cough, and his heart used to beat a good deal on climbing. He continued to work under ground for 4 years, with increasing shortness of breath and cough, and becoming weaker.	Working in bad air.	He has not much cough now except in the winter when he takes cold. Chest :—Right side rather less resonant than the left, respiratory murmur is deficient, and there is crepitation all over that side. At the apex in front there is tubular breathing. On the left side respiration is puerile. Heart sounds normal. Body thin, and he says he has "not picked up any lately."	
Has not been well for 6 or 7 years. Shortness of breath came on gradually with a little cough, no pain, and but little expectoration. He first felt it in climbing. He then had fluttering of the heart as well as shortness of breath. He says he was then working in the 40 level where there was good air, but a good deal of dust.	Working in a dusty place.	He is a tolerably healthy-looking man, not emaciated. Chest resonant, mucous crepitation heard at the apex and base of right lung in front. Behind over the apex there is dry creaking sound, with prolonged expiration. The rest of the chest gives healthy respiration. Heart sounds are feeble. Says he feels well, and has not lost much flesh.	
26 years ago after working in bad air he had "beating in the heart," burning in the stomach, and shortness of breath. He was laid up for some months, and has never got rid of the palpitation of the heart. At Wheal Buller he says he had headache, pain in the stomach, and weakness in the limbs in climbing. He was cupped on the chest in several places about 12 years ago, when he says he was ill with sharp pain in the chest. At that time he was home only a few days, and he had no palpitation of the heart at that time. It is not more than 2 years since that came on badly. He took cold about that time, and has been much worse since then.	Working in bad air, but latterly from exposure to cold.	His heart beats very much if he moves about or goes up rising ground. When the palpitation comes on he gets dizzy in his head, and his sight gets dim. Has a burning in the right shoulder and stomach. Chest resonant on percussion, whistling noise with inspiration over the front of chest. Heart very irregular in its action, sounds very distinct, the 1st sound being very sharp. No murmur detected. Impulse feeble, diffused, and accompanied by a thrill which can be felt over the apex. Impulse and the seat of dulness lower down in the chest than normal, and the extent of the dulness is increased.	Wages 50*s.* to 3*l.* per month. Has nine young children.
20 years ago he felt ill effects from working in bad air. Headache, aching in the legs, palpitation of the heart when at work, but especially on climbing. He was not laid up for any time then. During the 2 years he worked at Wrixhill he suffered from pain in the side. About 18 months ago after taking cold he was taken ill with cough and spitting of dark tenacious mucus, and pain in the right side. He continued to waste and become very much reduced, and then was obliged to give up work. Used to have night sweats a good deal at one time, but has not now.	Exposure to cold.	Now complains of weakness, but says it is not so bad as it was. Has had a husky voice ever since he took cold. Has cough and expectoration of slaty-coloured mucus. Not much shortness of breath except when he walks up hill. Dulness, tubular and cavernous respiration, and bronchophony under the right clavicle. Respiration elsewhere is clear and free. Body thin, skin rather hot. Appetite good, tongue clean, bowels rather confined.	

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125. Tavistock; Chronic bronchitis; pneumonia: (Phthisis?); August 1862.	43	- - -	A quarryman.	- - -	16	Tutwork and tribute, chiefly tutwork.	First worked at Curgreen for 12 months; a shallow adit level, a lead mine, good air. Then went to Wheal Lupus, for 8 or 9 months in 70 level. The air was "dead." "The candles would burn tolerably well, but we used to feel drowsy and sleepy when we stopped a bit." Then went to Wheal Friendship, in 150 level, for 2 or 3 years. The air was good, but the powder smoke lay dead. Felt weakness in climbing, and shortness of breath, and aching of the legs. Then went to Wheal Betsy for 9 months, in 90 level. Air not bad, but plenty of powder smoke. He felt the same ill effects there. Then to Great Devon Consols for 2 months in 90 level, air slight. Then to Vergis Lady, in 70 level, for 5 or 6 months. No bad air, but powder smoke was thick. Then went to the Devon and Courtney copper mines in the deep adit, 70 from surface. There was no shaft and no ventilation (13 years ago). The air was very bad. He was taken ill there. Worked in it 9 months till he could not work there any longer. The deep adit was being driven to meet the shaft, but it was not finished for the men could not work in it. Then worked at grass for 12 months, and then went to the William and Mary mine, in 20 level from surface. Air very good. Then to the Devon and Cornwall in middle adit (no shaft) for nine months between 200 and 300 from the month. The air was very bad and the powder smoke lay dead. Was ill for 6 or 7 months afterwards. Then went to Devon Great Consols for 5 or 6 years, 63 from grass, air good, but very hot, and there was a great deal of cold-damp. He used to have to send down timber, in his under-ground clothes, and then to go down to where it was very hot, and then after returning to grass he had to walk 300 or 400 yards to the changing house, exposed to all weathers in winter. This is 3 years ago. He thinks he caught cold here. He had a cough for 6 or 7 months before he gave up, but at last he could not climb 2 fathoms without stopping, and then he was ready to sink out of the ladders for want of breath. Has not been at work now for nearly 3 years.
126, Tavistock; Chronic bronchitis and emphysema; August 1862.	59	70 to 80, Alive.	A miner, but employed at the surface.	- - -	14 to 15	Tutwork and tribute.	First worked at Wheal Crebar for several years on wages. Air pretty good, Then at Barkle Hill for 5 years, in the 24 and 34 levels, also in the 60 level where the air was not particularly good. Then went to Wheal Rose for 3 or 4 years, in good air. Then to Wheal Franco for 8 or 9 years, in the 44 to 34 rise, where the air was very bad, and it was "a terrible bad place for powder smoke," 100 from shaft. He worked there for 2 or 3 months, and was laid up for 6 or 7 months afterwards, and the other 3 men who worked with him were all home ill at that time. Two of the men are since dead. Then went to Wheal Friendship for about 8 years in the 150 level chiefly in good air. Then went to Wheal Maria for 14 or 15 years. When he first went there, there was bad air in the 15 level for 6 months, and he was ill afterwards for several months. Since then he has worked at the surface. He used to go under ground but not to work; now he cannot go under ground on account of his breath. He has not been able to climb above 2 fathoms at a time for 14 years.
127. Tavistock; Mitral valvular disease of the heart; August 1862.	39	64, Dead.	A farm labourer. He occassionally worked at the mines.	- - -	15 to 16		First worked at Langston for 5 or 6 years, a manganese mine, now "knocked." Then went to Wheal Friendship in good air for 2 months. Then to Buttspill for 2 months. Air not very good, but no ill effects from it. Then to South Yew for 2 months. Then worked for some months at grass at Woodman's mine. Then went to Wheal Maria, and worked there 5 or 6 years, sampling ore, but not underground. Has not worked for 13 years.
128. Tavistock; Broncho-pneumonia; tubercular (?); August 1862.	61	Dead -	A sailor died from chest disease.	- - -	9 to 10	Tutwork and tribute.	First worked at Old Crinnis mine for 5 or 6 years on boys work, in the 30 level. The air was very bad there and they were obliged to carry the candle sideways when they went into the level. "There was warm-damp there, which we consider does not do so much harm as cold-damp." He was in that level about 1½ years, but did not feel any ill effects from it. Then went to East Crinnis where he worked 3 or 4 years on tribute in the 50 level in good air. Then came to Boddle Hill for 17 years in the engine shaft. There was some bad air there, and what there was, was very bad. Some places were so bad that the men could not get into them to work. The candle would not burn in them. Then went to Ivy Bridge and Liskeard for a short time, in good air. Then came to Wheal Maria (Great Devon) where he worked 14 years. on tribute chiefly, but some tutwork. Worked in very bad air there in the 40 level about 60 or 70 from shaft, (14 years ago). "It shortened my breath a little but did not lay me up, and I did not think anything of it." Then went to Wheal Emma for 12 months. The air was bad there in the 20 level, 40 or 50 from draught. He continued to work there for 5 months. "I was getting 9*l.* and 10*l.* a month because so one else would work in it, and the agent wanted it cleared away to make a shaft meet the draught." He then worked 7 or 8 months on tribute and was then obliged to give up altogether. He has not worked for 2 years and 3 months.

History and Duration of Illness.	Cause to which he refers his Illness.	Present Condition.	Remarks.
Thirteen years ago he was ill from working in bad air. First felt shortness of breath and cough, and he had a very loud beating of the heart. "They could hear my heart beat the length of this room (6 yards) and they would ask what noise it was. There was no climbing there, and it was the same walking or working." He was laid up for 9 months with pain in the right chest, and cough, but no expectoration. Was ill about 3 years afterwards with the same complaint, and laid up for 6 or 7 months. Seven months ago, he spat up about three pints of blood all at once. He continued to spit blood for 9 days afterwards, and then the expectoration became thick again like matter. About 3 months ago he again spat blood for a fortnight, bright in colour, and in large quantity at first. It occurred again in about a week, and again a day or two after. He was very weak afterwards, not being able to turn in bed. He has gained flesh and strength since.	Working in bad air and exposure to cold.	Pain between the shoulders, and in the chest on conghing, sometimes in the left side so that he can hardly breathe. Has cough and expectoration which is greyish, flocculent and lumpy, like the sputa of the phthisis. No sweating. No diarrhœa. Skin cool and soft. Pulse soft and compressible. Face tolerably fat, with a healthy complexion. Chest, general decrease of resonance over the right chest, where there is mucous crepitation (except at the apex where respiration is clear and as good as the other side). Left side rather dull in front, below, respiration distinct with mucous crepitation, and at apex dry crackling, with prolonged wheeziug expiration; behind respiration clear and almost puerile. Respiratory murmur on the right side behind is distinct.	A marked instance of the injurious arrangement for changing clothes.
After working in bad air 14 years ago he had shortness of breath, cough and expectoration of white frothy mucus. Since then he has been unable to climb, and has always had shortness of breath.	Working in bad air.	Now he has shortness of breath, but not much cough or expectoration. Feels tolerably well when he is sitting down. Healthy looking complexion from working at surface, but he looks old. Body thin, chest very resonant all over it, rounded and not very moveable. Crepitation over both bases behind. Whistling noises all over the chest and prolonged expiration, with cooing and whistling sounds chiefly over anterior part down the sternum and over the position of the heart, where it is quite resonant. Heart sounds normal, faint. Pulse small, weak, skin cool. Respiration labouring, with prolonged wheezing.	
Thirteen years ago he was taken ill with fever and inflammation of the lungs. He was in bed 6 weeks, and he has never worked since. At that time he says he was insensible for some time, and had pain all over him, but has never had rheumatism that he is aware of. He has never had much climbing. He never had palpitation of the heart before his illness.	An attack of fever, and inflammation of the lungs.	Complains of weakness, soreness in the chest, pain in the back and legs. Has a little cough, and a little thick expectoration, headache, and palpitation of the heart. Chest resonant, respiration healthy. Heart:—1st sound indistinct, and accompanied by a murmur in axilla, not heard elsewhere. Impulse very sudden, felt most distinctly about 2½ inches below the nipple, but also from there down to the edge of the ribs. In the epigastrium there is considerable impulse. There is dulness over the same extent of surface. Its action is somewhat irregular and occasionally intermittent. Pulse very small, quick, and compressible.	
Three years ago after working in bad air, he was taken ill with a bad cough, and spat blood for about 3 months at intervals. He has lost flesh very much for 2 years.	Working in bad air.	Now complains of weakness and shortness of breath, sinking in the chest, palpitation of the heart on going up hill. Sweats a good deal in the mornings. Fingers clubbed at the ends. Pulse quick, small and weak. Chest has but little motion, respiration being chiefly abdominal. Right side is duller than natural especially at the apex, there is deficient respiratory murmur, and mucous crepitation over the front, also behind, where the expiration is prolonged and of a bronchial character. At the base behind, respiration is clear and puerile. Left side is very dull all the way from the clavicle to the edge of ribs within the line of the nipple, except a small piece near the shoulder where it is not normally resonant; behind there is dulness, prolonged loud expiration with some mucous crepitation as low as the inferior angle of scapula, below that, resonance and puerile respiration. Vocal resonance is increased over the front and upper part of left chest behind. Heart sounds are very distinct, 2nd sound double and heard all over the left side anteriorly where the dulness extends especially at the upper part near the inner end of right clavicle. Impulse feeble, but can be seen and felt over the greater part of the same portion of chest, clearly seen two inches above the nipple; action regular, quick and feeble. Expectoration thick, yellow; not much of it. Body thin.	Habits not very temperate. Says he paid 9*d.* a month for 12 months to the club and 9*d.* for the doctor. He was attended by the mine doctor, but received nothing from the club because he had "no hurt."

Number; District; Disease; Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
129. Tavistock; (?); August 1862.	36	77, Dead.	A miner -	- - -	16	Tutwork and tribute.	First worked at Wheal Friendship for 12 years, in the 150 level, and in the 220 level. There was bad air in the 220, where he was "driving" from one shaft to another. He only worked there a fortnight. There was warm-damp there also. He did not feel any ill effect from it. Then went to Wheal Anne for 4 years, in the 28 level. The air was very bad there. He worked in it for 2 years, and was ill in consequence. The air pipes were brought in to within 2 fathoms of the end, but still the air was bad. He did not give up work. Then went back to Wheal Friendship for 12 months, in good air. He was hurt by the explosion of a hole aftsr being there a few months, and afterwards worked at grass. He has not worked for 8½ years.
130. Tavistock; Dyspepsia; August 1862.	63	- - -	- -	- - -	- - -	- - -	He has not worked for 4 years.
131. Tavistock; (?); August 1862.	33	- - -	- - -	- - -	13	- - -	He worked at Wheal Friendship for 5 years in the 150, 160, 200, and 40 levels. The adit is 40 undergrass. He used to climb very fast for 12 months, "like most youngsters," and used to feel exhausted, and had no breath when he reached the top. He never worked in bad air. He has not worked under ground for 18 years.
132. Tavistock; Miners' disease; August 1862.	31	38, Dead.	A miner, died suddenly from the bursting of a blood vessel.	- - -	16	Tutwork -	First worked at Wheal Maria for 8 or 9 years. Did not work in much bad air there. There was a little in the 28 level, where he worked for 2½ years. He was at home several times during that time with pain in the head and limbs. It went off after 3 or 4 days. He then went to Wheal Russell for 3 years, in the 55 level from grass. There was no adit, as it was level with the river. It was the worst air he ever worked in. The candles would not burn. He worked in it for 12 months, and was then laid up for 5 months, and afterwards worked at grass for 10 months. This was 3 or 4 years ago. He then went to East Wheal Russell, where he has worked ever since. There is bad air where he is working at the present time. He says he cannot leave it because he has a family and cannot afford to give up work. He is now working in the 88 level from grass, in a rise about 100 from shaft, 35 from a winze, and has got about 2 fathoms to get to the next level.
133. Tavistock; Old bronchitis, and emphysema; August 1862.	35	- - -	- - -	- - -	14	Tutwork and tribute.	First worked at Wheal Friendship for 8 years in the 70, 112, 170, and 190 levels. No bad air there, but a great deal of powder smoke. Then went to Virtuous Lady for 2 months, in the 40 level, but the air was so bad that he gave it up. The candles would not burn upright. He felt no ill effects from it. Then he went to Wheal Courtney for 12 months, in the 30 level, part of the time, and 8 months sinking a shaft. The air was good in the 30 level, but in the shaft it was very bad. They had a fire machine. It was bad even with that, but before that they could not work at all. He has been drawn up sometimes almost lifeless. He was ill for some time after it with shortness of breath, not much cough, and headache. He always felt tired and weary, even when at work there, and had pain in his legs when climbing. Since then he has been at Wheal Maria for 10 years. It has been very hot indeed during the last 3 years, and the air has not been particularly good. He has been sinking the shaft, which is now 212 fathoms below the surface. It is very hot at the bottom, and in coming up it is very draughty.
134. Beeralston; Miners' disease; August 1862.	52	- - -	- - -	- - -	12	- - -	Worked at Ockle Tor for 12 months, in poor air and powder smoke in the 56 level, 200 from shaft and 30 from winze. There is only one shaft. There was cold damp there. He was laid up two or three times during the winter. It was hot where he worked, but not so hot as some mines he has worked in. He has been away from work about 6 months.

History and Duration of Illness.	Cause to which he refers his Illness.	Present Condition.	Remarks.
When working at Wheal Anne in bad air, he had fluttering of the heart and pain in the limbs, shortness of breath, and weakness of the legs in climbing. Whilst working at Wheal Friendship at grass, he was taken ill suddenly with weakness, so that he could hardly get home; he got rapidly worse, and kept his bed for 12 months. He had pain in all his limbs for 12 months, and could not move, but he does not remember his joints being swollen. He had fluttering of the heart, and sometimes could not lie down in bed. This is about 8½ years ago, and he has not been able to work since from shortness of breath and fluttering of the heart.	- - -	Chest resonant, respiration feeble and shallow. Heart sounds at the present time are regular, clear, and distinct, the 1st being rather more so than usual. No murmur or irregularity about it. Impulse feeble; no increased extent of dulness. He says the fluttering of the heart comes on whenever he walks quickly, or upon any excitement. It seems to flutter and stop. He has sharp pain in the chest and shoulders at that time. He then loses his senses for about 3 hours, and does not feel well for days afterwards.	
He was quite well 5 years ago. About 4½ years ago he first complained of pain across his loins. He had also weakness, but continued to work for 4 or 5 weeks, when he was obliged to give up. His legs feel dead, but the right is the worst and the weakest. He says he had not worked in a wet or cold place for 7 or 8 years before it came on. Before that he had worked in some very wet places. He has headache at times, and pain in the shoulders, but feels pretty well above his waist.	- - -	Urine contains a large quantity of lithates and lithic acid (red sand). Chest normal. Tenderness on pressure over right hypochondrium. No pain or tenderness about the back. Sometimes he has pain in the stomach after meals, and "rising" afterwards. He cannot take much animal food, as he feels uneasy after it.	
He felt pains all about him, and palpitation of the heart, and shortness of breath, for months before he gave up work. Then he caught a severe cold on the chest, which lasted for several months. He then stayed at home for 2 years, with dropsy in the chest and bowels, but no swelling of the legs. He was blistered over the heart numbers of times. He was at home 5 years, and then went to work at grass, where he has been ever since.	- - -	Chest normal. Heart's action is quick and excitable. He is agitated and acts like an hysterical girl, and breathes in an irregular sighing manner. Flinches when touched. He is a healthy looking man, with large grey eyes and large pupils. Unmarried.	
When working at Wheal Russell 3 or 4 years ago he had shortness of breath, weakness, and spitting of blood. He was failing for several weeks, being languid, and had headache, so that he used to tie his head up with his handkerchief. He had not much cough, but spat up a little mucus, streaked with blood. He has been ailing about 4½ years; when he works he shakes all over; not so much when working in good air, but even then he cannot work so well as he used to do. He has shortness of breath when he climbs. Last week he spat up about a table spoonful of bright red blood. Says he has lost flesh for 3 years, but not much lately.	Working in bad air.	Healthy colour and appearance. Body not at all thin. He sweats a good deal when at work, but not much at other times. Has a little cough and expectoration when he hurries, not much at other times. Chest resonant, general deficiency in intensity of respiratory murmur, but no actual disease detected besides that.	An instance of a man continuing to work in bad air at the present time, "because I have a family, and cannot afford to give up work."
He was taken ill about a year and 8 months ago. He got a chill in looking after the pump engine. He then had a bad cough, and had to give up work after a time. He was at home for 12 months with cough, weakness, loss of flesh, great expectoration of a yellow, slaty, and green colour, sometimes streaked with blood. He is now much better, and has been at work again about a week.	Exposure to cold.	His voice is hoarse (he lost his voice directly he took cold), and sometimes he has soreness on speaking. Has a bad cough, with expectoration, chiefly in the morning. No sweating now. Never had any diarrhœa. Chest resonant, respiration healthy, slight crackling expiration at each apex, no increase of vocal resonance or crepitation. Heart sounds normal.	
Says he was taken ill with shortness of breath, which came on whilst he was at work in the mine. He had a cough, which has never left him. This is about a year and a half ago. About a month ago he spat up about a teaspoonful of blood with a cough. He had spat blood several times before that, the first time about 3 months ago. Since he has given up work he has had palpitation of the heart. His wife says he has been gradually failing for several years.	Working in bad air, and exposure to cold in going to and from the mine.	Sunken emaciated features, dark areola around the eyes, pale and sallow complexion. Chest generally resonant. There is limited dulness over a space about 4 inches in diameter on the right side in front and behind, about the middle of the chest. Resonance above and below it. There is tubular breathing at the same spot, and mucous crepitation. On the left side there is prolonged emphysematous crackling over the upper part of chest behind. Heart's dulness increased downwards, impulse feeble, no murmur. Pulse sharp, small, and very compressible. Expectoration (he says) is quite black, sometimes frothy. It has become black since he left the mine (!)	

Number; District; Disease; Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
135. Beeralston; Contraction of side after old pleurisy; August 1862.	50	76, Alive.	A mason -	- - -	22	Tutworkand tribute.	Before he went under ground he worked as a farm labourer. First worked at Gunnislake for 2 years. There was very bad air there, in the 90 level. He did not feel any ill effect from it. Then he went to Holmbush near Callington for 6 months; not much bad air there. Then worked in Cowey's mine (South Tamar) for 4 or 5 years. There was very poor air there. He felt shortness of breath and loss of appetite several times there, but never knocked off work. Then he went to East Wheal Russell for 2 years. There was poor air there. He nearly lost his life there by going up into a rise about 10 minutes after they had fired "a hole." He felt lightness in the head, and then became insensible. His comrade was so also, and they both fell down the rise into the level, about 19 feet. He cut his head, but did not injure himself much. He was ill for a week after that, being weak and unnerved, and felt as if he had no strength left in him. He had shortness of breath, but no cough. This is about 5 years ago, and he has never been so good a man since as he was before. Then he went to Gordon Mine for 3 years in the 36 level and the 24. He worked in a great deal of poor air there, and in wet places.
136. Beeralston; Dysenteric diarrhœa, miners' disease; August 1862.	24	60, Alive.	A miner -	- - -	10	Tribute and tutwork.	First worked at Wheal George on boy's work for 3 years, in different levels; the deepest was 40. There was good air there. Then he went to Wheal Calmedy to drive a level into the side of a hill, where there was no shaft. The air was very bad, and there was a great deal of powder smoke. Worked there 12 months, and was laid up several times during that time. Then went to several small mines for a few months, chiefly at grass work. Then he went to Wheal Franco on tribute for 6 months, in the 80 level, in a rise between the 70 and 80. There was very bad air there, and when they went to work in the morning the cold damp would settle all over the top like a cloud. A candle would go out instantly when put into it, and they could not breathe in it. They used to "break it" by firing a bag of powder in the place. They used to climb very fast, partly because the shaft was so wet that they got "half drowned," and partly because the kibble was sent down the same shaft, and sometimes the chain would break and cut through the boards into the ladder shaft. They generally used to get out of the way when the kibble was coming down, but it was very cold and wet standing in the levels to wait for it. Then he worked on the railway for 12 months, and then went to North Wheal Roberts for 12 months, in good air. Then went to East Lady Bertha on tutwork for several months, sinking a grass shaft about 6 fathoms deep, but the air was so bad they could hardly keep a candle burning. He felt very unwell most of the time with headache, but did not knock up work, and at last they put in a windfall, which improved it a little. Then came to Gordon Mine on tribute for several months, in good air. Then he went on tutwork in the same mine, in very bad air, and in wet and draughty places. He was laid up frequently during that time for 3 or 4 weeks together. Then worked at grass for 3 months, and then went to the Devon and Cornwall United for several months on tribute. This is the last place he worked at, and he has been away from work about 6 months.
137. Beeralston; Dilated heart; August 1862.	30	53, Dead.	A rope maker.	- - -	16	Tribute -	First worked at North Yew (now "knocked") about 3 months. "The air was so bad there that we could not keep a candle alight sometimes. It did not affect me much; the other men complained of headache." He had violent beating of the heart in this mine, and the last day he was obliged to be helped up with a rope because of palpitation of the heart and weakness. He had felt himself failing for some time before that. Then went to South Yew at grass for some time, and has not worked under ground regularly since. He has been working at Lady Bertha for 5 years, and has been occasionally under ground for a day or two.
138. St. Cleer; Miners' disease; August 1862.	50	80. Dead.	A farmer.	- - - -	20	Tutwork and tribute.	Up to the age of 20 he was a farm labourer. Then went to work at Wheal Kitty for 12 months, filling the kibbles. Then went to St. George for 4 or 5 years in tutwork in the 60 to 90 levels. No bad air. Then went to Budanick mine for 12 months on tribute in 52 level, in good air. Then he came to Clinnagan mine for 12 months in the 40 level. There was some bad air there. There was very bad air in the 50 level. He did not feel any ill effects from it. Then he went to South Caradon for 3 or 4 years on tribute in the 50 and 80 levels. Middling good air, but the candle would not always burn well. No ill effects from it. Then went to West Caradon for 14 or 15 years, chiefly on tribute, in the 38 and 116 levels. The air was very bad in the 116 level. He was taken very ill there. He worked in that level about 2 months, and then worked at grass for a day or two, when he was taken ill. He was at home for 8 months, and then went to work again in the same mine, but in good air. He worked for 2 or 3 days, but was obliged to give up again, and did not work again for 6 months more. Wages for self and son 50s. He has 9 in family.

History and Duration of Illness.	Cause to which he refers his Illness.	Present Condition.	Remarks.
He felt ill for a good while before he gave up work, with shortness of breath and difficulty in climbing the ladders. At last, however, he was obliged to give up work in consequence of catching a bad cold. He then had pain in his right side, which he has never got rid of. He lost flesh rapidly for 8 or 9 months, but since then he has not lost much. He had great palpitation of the heart for some time before he left off work, and since then he has felt it at times, and even now his heart sometimes flutters very much he exerts himself. For 2 years after he was taken ill he says he was unable to lie on his left side. If he turned over on that side in his sleep he became almost insensible and unable to breathe. During the last year he has been able to lie upon that side, but even now he cannot do so if he takes cold.	Working in bad air and exposure to cold.	He has now shortness of breath, pain in the right side, and general weakness. Has cough when he takes cold, but not much at other times. Expectoration is then thick, white, sometimes dark. Chest dull over both apices in front, right side moves but little, and there is more or less dulness all over it. There is also deficiency of respiratory murmur, and what there is is distant, feeble, irregular, and catching. Left side moves freely; has normal respiratory murmur over it, though more dull at apex in front than normal. No increase of vocal resonance on either side, and tactile vibration is felt all over both sides. Heart's sounds clear; impulse feeble. Pulse very small, feeble, and compressible. Pale sallow complexion; pearly conjunctiva.	At the last mine he worked at, Gordon Mine, there was no "dry" or changing house besides the smith's shop.
Says when working in bad air at Wheal Franco he suffered dreadfully with headache, pains in the limbs and all over him, bad cough and spitting. He had palpitation of the heart very much, chiefly when climbing; but he thinks it was the powder smoke and bad air that caused it. This was about 6 years ago. Again 3 years ago he felt similar ill effects from working in bad air. When at Gordon Mine about 2 years ago, he says he was very unwell, had heartburn, sickness, pain in the head, and bowel complaint, which latter has continued nearly ever since. He had also shortness of breath and palpitation of the heart. Six months ago he was taken ill coming away from the mine, though he had felt ill before he left. The air was good, but it was draughty and wet. He had stiffness and cold shivers, pain in the limbs and side, and bowel complaint. The bowel complaint was very bad then, and he has had it very much ever since. He has tenesmus and griping pains in the stomach, and passes a great deal of slime, with great pain in passing his motions.	Working in bad air, and exposure to cold.	Has still shortness of breath, pain all over him, palpitation of the heart on exertion. Says he has not lost flesh very much. Chest apparently healthy. No tenderness on pressure over abdomen. Body stout, well nourished. Tongue clean, natural. Pulse slow, small, feeble.	
After working in bad air at North Yew, he was laid up for 2 years with beating of the heart. He afterwards went to work again, but he never got rid of it entirely. About 2 years ago he was laid up again with palpitation of the heart for a fortnight, when he went to work again, but only worked one day, and then was laid up altogether. It is only lately that he has been to work again a little at grass.	Working in bad air.	Occasionally feels palpitation of the heart, and complains of general weakness, which prevents him doing man's work. Heart's action at the present time is regular, sounds clear, impulse normal, extent of dulness somewhat increased. He says palpitation comes on very often after a full meal. He suffers from wind in the stomach, and is much blown up after taking food.	
About 3 years ago he says he took cold after working in bad air, and had vomiting and purging for 4 days. He has never been well since, though he has continued to work at the mine at intervals.	Exposure to cold after working in bad air.	Pain in the pit of the stomach and chest and between the shoulders. Weakness across the loins. Has not lost flesh for 2 years. He sweats very much, but not more at night than by day. Tongue pale, with slight creamy fur. Chest, nothing wrong detected. Body in good condition, good appetite.	

Number; District; Disease; Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
139. St. Cleer; Miners' disease; August 1862.	36	77	A miner -	- - -	12	Tutwork -	First worked at Wheal Providence, for a few months, blowing an air machine. Then went to Dolphin Bridge for a few months, filling the kibbles, in good air. Then he worked at grass for 4 or 5 years, and afterwards went to St. Ives Consols for a year or two on tutwork in the 60 level. The air was not bad there. Then worked at grass for 6 months, and then went to West Caradon about 3 months on tutwork in the 60 level. Air tolerable. Then went to Wheal Speed for a year or two in the 50 level. The air was not good, but he did not feel any ill effect from it. Then went to Ballenew for 5 or 6 years, (part of the time at grass,) in the 10 and 14 level from grass. The air was dead, and there was a good deal of smoke. He was ill after working there, and was laid up for five months. He then went to work at Wheal Venter for some months in a shallow level. The air was not very good, and it was a smoky place. Then worked at Wheal Conqueror for 3 months. The air was not very bad there. Then he worked 7 months at Clarkenwater, sinking the shaft. The air was not bad, but it was a wet place. He caught cold there and was at home a week. Then went to South Finnicks, East Crowndale, and St. Ives Consols, each for a week or two, The air was not bad at the latter place, but the smoke "lay a good deal." Then worked at South Finnicks for 2 or 3 years in the shaft from the 60 to 100 level. The air was bad, and they had a blowing machine. There was cold damp also. Then he came back to Gunner-main for 2 or 3 years, in the shaft part of the time, and in a "cross cut" in the 80 level during the remainder. They had very poor air there, and a great deal of smoke, but he did not take much notice of it at that time. Then went back to South Finnick shaft. The air was not good, but not very bad. Then went to Caradon Consols for 6 weeks in the 50 level, and at surface. Then went to West Caradon for a month in the 140 level. Was taken ill there, and then worked at the surface for 3 months, and then went into the 17 level in a rise. The air was not very good, but he worked there for several months. Then went back to South Finnicks in the 100 level. Air not very good during the last month. He was taken ill there, and has not worked since. This is 16 weeks ago.
140. Gunnermain; Miners' disease and recent pleurisy; August 1862.	41	54, Dead.	A miner up to the age of 30, when he was taken ill, but left the mine, and afterwards lived till 54.	- - -	12	Tutwork and tribute.	First worked at Wheal Rock 4 or 5 years on wages, in different levels; the deepest was 60 fathoms. Did not work in bad air there. Then went to Bean mine for 10 years in the 100 and several shallow levels. He worked in a great deal of bad air there. "It was a bad air mine, and killed scores of men." The air was bad in all the levels. They could not work hard or long in the same place, and the candles would not burn except when inclined. It was a granite mine and full of timber, "which eats the air." He felt faint whilst in the air, and when he came out, had headache, trembling of the limbs, and could not climb for weakness in the legs. He worked at these two mines for a good many years. "We cannot always choose where we will work when we want money." Eight years ago he came to South Caradon, where he has worked ever since. He worked on tribute in most of the levels. There was bad air and cold damp in the 22 level. He worked in that place about 4 months, and injured himself a good deal, "in fact I have never recovered from it." He knocked up work there because the air was so bad. He worked on very well until they had an air machine, and then when the air was blown in he was laid up with inflammation of the lungs. He went to work again after 3 or 4 months, and 7 months ago he took cold at the dressing floors, and has not worked since.
141. St. Cleer; Catarrh; August 1862.	28	- - -	- - -	- - -	21	Tutwork -	First worked at South Caradon for 8 months in good air, and then went to Caradon Consols, where he worked in the shaft for 6 months in bad air. He was ill for 3 weeks, and two or three times besides for a short time each. Felt weakness, shortness of breath, and headache. Then went to Wheal Marshall for 3 months, on tutwork, in the 35 level. The air was bad, but he was not unwell there. Then he went to Mark Valley for 12 months, in the 65 level. There was too much air there, causing a draught. He was home bad during that time with "slow fever" for 2 or 3 weeks. Then he went to West Caradon, where he has worked ever since, about 4 years. Worked for 2 years in poor air in the 155 level, but did not feel any ill effect from it besides a little headache, and pain in the thighs on climbing; but he has been home sick for 2 or 3 days at a time, and then got to work again. He has been working in very good air for 11 months in the 155 level. There is a good draught there.
142. Challacut; Miners' disease; August 1862.	48	- - -	A farmer -	- - -	16	Tutwork and tribute.	First worked at Hurland mine for 2 years, on tribute, in the adit, 17 and 30, levels. Worked for 3 or 4 months in bad air, the candle being inclined on one side. He did not feel any ill effect from it. Then he worked at Mabley mine, for 12 months, in the 17 level. The air was bad there for 3 or 4 months. He was taken ill there. Then went to Wheal Providence for 4 or 5 years, 3 years in the engine shaft and in the 17 and 30 levels. No bad air. Then he went to Buckler mine for 12 months in the 17 level. No bad air. Then came to Caradon Consols for 7 or 8 months in the adit, a cold and wet place. They changed their clothes in an old outhouse; no fire or "dry." Then went to West Caradon for 20 years, on tribute chiefly, in the 50 level mostly, also in the 104. Worked in bad air for a fortnight or so at times, but not for long. During the last 4 months he worked in the 17 level, a very cold place, as the draught was so strong that the candles would scarcely keep alight, and they used to take matches to light them. He has been away from work about 14 months.

History and Duration of Illness.	Cause to which he refers his Illness.	Present Condition.	Remarks.
Eight years ago he worked in bad air, and used to feel lightness in the head and sickness at the stomach; he then took cold at the surface, and had fever and inflammation in the side. He was laid up nearly five months. Six years ago, whilst working at South Finnicks in bad air, he was home ill several times during the course of 2 or 3 years, with pain in the head and stomach, weakness in the knees, and shortness of breath and cough. Two or three years ago he worked in the same mine for several months, and was home ill several times during that period for a week or two. When he left the mine he was at home ill for 5 weeks, with pain and lightness in the head, pain in the left side, sickness at stomach, and weakness. He was again taken ill at the same mine 16 weeks ago. He was working in a wet place and took cold; he felt shivering for a day or two, and then gradually got ill, had pain in the head, sickness at stomach, bad cough, but not much expectoration, shortness of breath, sweating and weakness in his limbs.	Working in bad air and at last exposure to cold.	Now complains of weakness of body, shortness of breath, pains in the chest, worse sometimes than at others. Not much cough, but what there is, is of a spasmodic character, and not accompanied by much expectoration. Pale sallow complexion. Body thin, but not emaciated. Chest resonant on percussion; diminished respiratory murmur, but no abnormal sounds, except slight crepitation over the middle of both lungs behind. Heart sounds normal. Pulse small and weak. Skin moist and cool. Appetite variable, but never very good.	
Four or five years ago he was laid up with inflammation of the lungs after working in bad air. He had pain in the side, no cough, and was laid up 3 or 4 months. Seven months ago he took cold whilst working at the "dressing floors" in the winter. It was about Christmas, and very wet weather. He had inflammation in the left side and shoulder, but no cough at that time. He was in bed about 6 weeks, and has not been able to work since, though he has tried occasionally for a day or two. He found his breath at that time very bad on climbing, and had a dragging feel in the left side.	Working in bad air, and then exposure to cold.	Has now pain in the right side and a load on the chest. Has a bad cough, and spits up a good deal of dark mucus, sometimes yellow and streaked with blood. He is very weak, and has lost flesh a good deal. Pale sallow complexion, sunken features, pearly conjunctiva, lips pale. Chest less resonant under the right clavicle than the left, and respiration is there somewhat deficient, but not abnormal in character. At the lower part of right chest behind there is a very distinct friction sound, and he has complained of a little pain there during the last day or two. Respiration irregular and catching over the left side, but clear and louder than on the other side. Heart sounds normal. Pulse small, feeble, compressible. Tongue clean at tip; rather furred at the back part.	
About 10 days ago he took cold, and the next day was unable to work from weakness and pain in the head. He has not been able to work since. He has no cough.	Exposure to cold.	Loss of appetite. Sweats a good deal in the night. Pulse slow, full, compressible, soft. Tongue pale, flabby, covered with a white creamy fur. Chest clear.	
Many years ago he was taken ill from working in bad air in Mabley mine. He felt pain in the right side, headache, nausea, and sickness. He used to complain of feeling ill, and one day when in the level he fainted, and was afterwards ill in bed for about 5 weeks. The mine was not hot. About 2 years ago he caught cold whilst working in a draughty level. He had pain in the back and general weakness, and he has been gradually failing in flesh ever since.	Exposure to cold.	He has no cough, no pain in the chest. Has a pain and hardness in the pit of the stomach, and palpitation of the heart, which he noticed whilst at work about 2 or 3 years ago. Body thin, but not emaciated. Chest healthy. Tongue clean. Pulse small and compressible.	

Number; District; Disease; Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation, where employed, Quality of Air, &c.
143. Kerrerbridge; Dilated heart; August 1862.	56	67 Dead.	A farmer -	- - -	30	Tutwork -	Before the age of 30 he worked as a farm labourer. First worked at Redmoor, about 18 years, "tramming" in all the levels. Worked in a great deal of bad air. Some, in the 70 level, was so bad that they could not work above one or two strokes at a time. In the 90 level it was so bad that the men could not carry a light along the level. They used to push along "the tram" in the dark, and when they came to where the men were at work they were obliged to put their candles in the air-pipe to keep them alight. He felt no ill effect from that beyond weakness in climbing and shortness of breath, and some sickness at the stomach. He was never laid up for any length of time. He used to work here in the 112 under adit, 142 from grass. It was a "very hard footway," and he used to climb hard sometimes. Then went to Lidcut for a few months, in the 80 level, in very dead air. Then he went to Wheal Ray, for a few mouths, in the 50 level. Air pretty good. Then went to Mark Valley for 2 months, in the 80 level, in very dead air. Then to Appledore, driving a level under a hill. The air was good there. Then to Wheal Hooper for 4 or 5 years, on tutwork, "tramming" in the 47, 60, and 90 levels. The air is good there. He works there now.
144. Bodminland; Miners' disease; August 1862.	58	- - -	A soldier -	- - -	21 to 22	Tutwork and tribute.	First worked at Bardon mine, near Blue Anchor, for 2 months, in the 40 level. Air good. Then went to Drakewells on tutwork, for 7 months, in 70 level. Then to Wheal Franco on tutwork, for 6 or 8 months, in the 30 level. Air not good there. Candle inclined. Then to Busy Pool for 9 months, in the 124 level. The air was "dead." He used to feel weakness in the legs in climbing, "but nothing to hurt the body." Then he went to adit's foot for 1½ year, sinking from grass, in good air. Then to Beckenwood, for 7 months, in good air. Then to Treburgat for 2 years, on tribute, in the 10 level. Air not bad there. Then to Singinnis for 3 years, in the 20 level, in middling air. Then back to Treburgat for 2½ years, in the 40 and 60 levels, in "dead" air. Then to Wheal Mather for 12 months, in "dead air," in the 50 level. Then to Holmbush for 3 years, in the 90 level. Air sometimes "dead." Then to Wheal Mather for 6 months in the 70 level, in "dead" air after "shooting." Then to North Holmbush for 9 or 10 months on tutwork, sinking a grass shaft. Air was very well there. Then to Simonward for 5 years, on tutwork, in 24 and 35 levels. The air was "dead" there. Then came to Trewether for 4 years, on tutwork, in the 40 and 70 levels. Air very often "dead" there. Then to Wheal Mary Anne for 7 months on tutwork, in the 110 level, in bad air. Then to Lidcut for 6 months, in good air, in the 40 and 60 levels. Then to Redmoor for 6 months, in the 110 level, in dead air. Then to Caradon Slades for 4 months, in a grass-shaft and in the 60 level. In the level the air was "dead," but in the shaft it was good. Then came to South Caradon for 10 months, in the 70 level. Air good, by a machine. He is working there now.
145. Bodminland; Debility; August 1862.	20	52 Alive.	A miner -	- - -	13	Tribute and tutwork.	First worked at West Caradon for 5 years on tribute, in the 17 and 70 levels. The air was very bad in the 17 level; the candle would not burn, except when inclined. Then he went to East Caradon on tutwork, for 6 months, in the 50 level. There was poor air in that level for a month. Then to South Caradon for 15 months on tribute and tutwork, in the 50, 60, and 80 levels. The air was bad in the 50, and he worked in that for 3 months. He is now working in the 80 level, where the air is good. His wages are 45*s.* to 50*s.* per month. His father averages 4*l.*, and his brother 45*s.* to 50*s.*, and there are eight of them in family. He gets about 3 or 4 lbs. of meat a week.
146. Bodminland; Debility; August 1862.	37	54 Dead.	A miner; died in a decline.	- - -	9	Tutwork and tribute.	First worked at Fowey Consols, about 12 years on tutwork in the 70 and 190 levels. He worked in a great deal of bad air in the 90 level for 4 years. Then went to Redmoor mine for 3 months on tutwork, in the 90 level. The air was not very good. It was very wet, and they only worked 4 or 5 hours at a time. Then went to Herod's Foot for 3 years, on tutwork chiefly, in the 60, 70, and 80 levels. He worked in very bad air in the 60 level for 4 months, when he worked on tribute. He lost his appetite and had weakness of stomach. He got his leg hurt here, and was laid up for 2½ years, and then worked the engine for 3 years. Then he went to Spain for 1½ years as an engineman. Then worked at South Finnicks for a year, in the same capacity. He also worked 12 months under ground, at South Finnicks, in the shaft, on tutwork. The air was not very good. There was only one shaft. Then he went to South Caradon, where he has been for 4 years. He worked on tutwork in the 70 level, air rather close. They have an air machine.

History and Duration of Illness.	Cause to which he refers his Illness.	Present Condition.	Remarks.
He first noticed that he had palpitation of the heart about 8 or 9 years ago. He has had it when climbing, walking, and even when in bed. It has increased lately, and sometimes he now has an attack 3 or 4 times a day, and sometimes not at all.	- - -	He complains of feeling weak, and has palpitation of the heart. He has it generally after he has been climbing; not more so during that time than at others. It comes on with a feeling of fluttering, faintness, without pain, but with a dread of dying. It comes on suddenly and goes away suddenly, and after it he feels quite well. Heart sounds clear; its action at the present time is regular, and there is no murmur or abnormal sound with it. Impulse feeble, dulness somewhat increased, and displaced downwards more than usual. Healthy complexion and appearance.	
- - - - - - -	Working in bad air.	Complains of shortness of breath, weakness, and pain in the pit of the stomach. No cough, except in the winter. Has a sallow complexion, and looks older than his years, but has a not unhealthy look. Nothing abnormal about the chest.	
When working in bad air at West Caradon he used to feel weakness in the legs and shortness of breath. This was about 2 years ago.	Working in bad air.	Does not complain of feeling unwell now, but he has lightness in the head, headache, and general weakness. Does not feel any difficulty in climbing at the present time. Pale complexion.	
When he worked at Fowey Consols in bad air, he used to have cough at night, and could not lie in bed; his head ached very much; and his legs ached in going to and from his work. This is 16 years ago.	Working in bad air.	Feels weakness on the chest, lowness of spirits, and general weakness in the limbs. Appetite good at present. Sallow anæmic complexion, white pearly conjunctiva; face and body thin, but not very. Pulse small, quick, compressible.	

Number; District; Disease; Date.	Age.	Father's Age, and whether alive or dead.	Father's Occupation, and the Cause of his Death.	Other Relatives.	Age at which he commenced working under ground.	Nature of Work.	General History of Occupation. where employed, Quality of Air, &c.
147. Liskeard; Miners' disease; August 1862.	61	71, Dead.	A miner -	- - -	14	Tutwork and tribute.	First worked at Wheal Friendship on wages for 4 years, in good air, in the 30 level. Then to Wheal Clowance for 9 years, on tutwork, in 22 level, in good air. Then to Wheal Fortune, on tribute, for 1¾ years, in good air. Then to West Basset, as a sinker, for 4 months. Then came to Cradock Moor mine, on tutwork, sinking a shaft, in "middling deadish air." Then went to West Caradon, on tribute, for 16 months, in poor air. He then went to Wheal Emma (Devon), for 6 weeks, on tutwork, in the 60 level, in good air. He has not worked for 6 months. Since then he has been a letter carrier.
148. Pengiggen; Miners' disease; August 1862.	32	50, Dead.	A miner -	- - -	14	Tutwork and tribute.	He first worked at Dolcoath for 7 years, in good air. Then went to North Wheal Francis for 4 years, in the 60 level. Air rather slight at times. Then to Gunnislake, to Drakewell's mine, for 4 or 5 years, in the 90 level, in good air. Then to Wheal Nelson for 6 months, in the 30 level, in bad air. Then to Wheal Francis for 5 or 6 years, on tutwork, in the 60 level, for 6 months; before that sinking a shaft from the surface. The air is bad where he is now working in the 60 level.
149. Pengiggen; Old bronchitis and debility; August 1862.	30	40, Dead.	A miner -	- - -	14	Tutwork -	He first worked at Trefina on tutwork, blowing a machine for 2 months, in the 40 level, in good air. Then to Carn Brea for 3 or 4 months on tribute, in the 18 and 34 levels, in good air. Then to Wheal Seaton for 3 or 4 years, "rolling," in the 80, 90, 70, and 60 levels, in good air. Then to Tincroft for 18 months, "rolling" in the 60 level. Then to Wheal Maria for 2 months, in the 80 level. Then to Carn Brea for 4 years, in the 165 level, in good air. Then to South Wheal Harriet for 4 months, in the 74 level, air tolerably good but smoky. Then to Condurra for 4 months, in the 130 level, in good air. Then to Cook's Kitchen for 16 months, on tutwork, in the 234 level, in good air but very warm. He was quite well there. Then went to West Wheal Bassett for 2 months, in the 104 level, good air but cold, and too much draught. He was ill there. Then he went to Wheal Seaton for 5 weeks, in the 130 level, in good air.
150. Newton Moor; Debility, anœmia; August 1862.	27	- - -	- - -	- - -	- - -	- - -	Has worked during the last 2 years at South Wheal Francis, in the 154 level, 120 from shaft and 10 from the nearest winze. It is a granite mine. He supposes there is cold damp in the place where he works, but says the air is good enough so far as he knows, for the candle will burn very well. He has had as good health there as in any other mine, and "as good as miners generally." He has been poorly for 2 or 3 days together at times with pain in the head and weakness, but it would go off after being away from work for a day or two. His living has been good, and he has had 3 or 4 lbs. of meat a week.

History and Duration of Illness.	Cause to which he refers his Illness.	Present Condition.	Remarks.
About 2 years ago he worked in bad air, and felt choked in the windpipes, had shortness of breath and headache, could not climb, and spat up stuff as black as ink. At Wheal Emma, about 6 months ago, he had tightness on the chest, shortness of breath, weakness in the legs, and after 6 weeks he was obliged to give up, and has not worked under ground since.	Working in bad air.	Has tightness on the chest and shortness of breath if he goes up hill, but, besides that, he is now pretty well. Chest apparently healthy.	
Has been ailing for 6 months. Has been losing flesh, and his breath is getting very short when he climbs. He takes cold very quickly, and then it goes to his "pipes."	Working in bad air.	Has inward weakness, pain in the stomach and bowels, and lightness in the head in the morning. Bowels habitually too much open. Tongue pale, clean, tremulous. Pulse small, quick, compressible. Heart's action quick, but otherwise healthy. Face thin, sallow complexion. General debility, but no disease detected.	
Three months ago he took cold from working in a draughty mine, and had shivering, followed by pain in the right side. He was at home for 4 days. Six weeks ago he again took cold, and had pain in the right breast, cough, and spitting, but not much. He continued to work until a week ago, when he was obliged to give up, owing to weakness in the limbs. He has not had good living for the last 2 months.	Exposure to cold.	Feels tightness across the chest, and has shortness of breath with a tickling cough. Has weakness in the legs, but that is better than it was. Sweats a good deal at night. Has hoarseness of voice. Chest resonant on percussion, respiration rather coarse on the left side in front. Heart sounds normal. Body and face thin, sallow complexion, eyes sunken.	
During the last 6 months he has felt pain in the left breast, going through to the shoulder blade, but he has felt quite well and able to work until last week, when he was taken poorly with pain and lightness in the head, pain and weakness in the knees. He also felt faint and generally weak.	- - -	He has still pain in the shoulder blade and left breast. The headache and weakness have in great part left him, and he is now feeling pretty well again, and he thinks of going to work to-morrow. Pale anæmic complexion, pearly white conjunctiva. Tongue clean, rather red at the edges. Bowels regular. Pulse soft and compressible. Trembling of the hands when extended. Chest resonant on percussion; respiratory murmur heard all over the chest, but very faintly except at the bases, even on deep inspiration. No prolonged expiration or abnormal sound of any kind, there being merely deficiency of the normal respiratory murmur. Heart sounds feeble, regular, clear; impulse very feeble.	

JAS. BANKART.

III.

STATISTICS and EVIDENCE by Dr. FARR, M.D., F.R.S.,

With Epitome of Tables, and Diagrams, and additional Returns prepared from the Census of 1861.

WILLIAM FARR, Esq., M.D., F.R.S., examined.

19,689. (*Chairman.*) I believe that you are Chief of the Statistical Department in the General Register Office?—I am.

19,690. You have had tables prepared under your direction giving the statistics of miners?—Yes.

19,691. For what purpose were they prepared?—They were prepared to illustrate the mode of determining the influence of occupation on the health of the population. I took the miners because I thought that a well defined occupation.

19,692. Were those tables prepared for the purpose of being laid before any public body?—They were prepared subsequently to the census of 1851, when the occupations of the country were taken out according to the different ages; and it gave us an opportunity for the first time of determining the influence of occupations on sound principles, that is, by a comparison of the living at each age and the deaths at each age. A selection of the tables was laid before the International Statistical Congress, in the hope that the method there employed might be adopted generally in Europe.

19,693. In order to get very correct statistical returns, will you describe in what way you prepared them?—As I have said, the occupations of the miners of Cornwall, for instance, were all returned at the Census of 1851. Each man's name was recorded, his age and his occupation. Those facts were analyzed at the Census Office in 1851, and in that way we got a very complete account of the number of miners living in Cornwall at the several ages. We then took from the Register books the births and deaths of miners in the same districts. We took a certain number of districts in which there was a great number of miners, and in that way we were enabled to determine the rate of mortality at the several ages among miners. I had before that time investigated the mortality in the healthiest districts of the country, and so I had a standard with which I could compare the results obtained from the occupation of the miners; and the comparison showed to what extent the mortality was increased by the occupation.

19,694. Will you state the districts with which you compared them?—I took for the metal miners the Cornish districts. I divided the coal miners into three classes:—the Staffordshire districts, where the coal is worked in a peculiar manner; I formed another group of the Durham and Northumberland districts; and I took, thirdly, a Welsh coal district. The results of that investigation are embodied in the Table which I have the honour to submit to the Commission.

19,695. Can you name the districts which you took in Cornwall especially?—The Cornish districts were Liskeard, St. Austell, Truro, Helston, Redruth, and Penzance. The Staffordshire districts were Wilstanton, Stoke-upon-Trent, Wolverhampton, Walsall, West Bromwich, and Dudley. The Durham and Northumberland districts were Auckland, Durham, Easington, Houghton-le-Spring, Chester-le-Street, and Tynemouth. In Wales the district taken was Merthyr Tydfil.

19,696. (*Dr. Greenhow.*) Did you make a separate calculation for each district, or one calculation for the whole of the Cornish districts taken together?—For the whole taken together. We have the population for each district and the number of deaths. It is absolutely necessary in order to get correct results to have a certain mass of facts, so as to get rid of accidental influences. I therefore, for the purpose of investigating the mortality at the several ages, put all the various results together.

19,697. (*Chairman.*) Then you consider these returns which you have prepared to be very complete?—I do.

19,698. (*Mr. Holland.*) Do you know of any returns more complete than those are?—I do not.

19,699. (*Chairman.*) The returns as to the miners in Cornwall comprise all the males working at the mines, whether underground or at the surface?—I believe that they do, they comprise all who return themselves in such a way as that we can distinguish them as miners.

19,700. They comprise all who returned themselves in the census of 1851 as miners?—Yes.

19,701. Can you show the comparative value of life in the different districts to which your return refers?—I will take the Cornish districts first. Without citing the figures I may state generally that the mortality among the miners from 15 years of age up to the age of 35 appears not to be higher than the mortality of the rest of the population in those districts, or of the rest of the population of other counties of England. I see no sensible effect in the tables up to that age. After the age of 35 the mortality rises among the Cornish miners; for instance, in the rest of the population of the same districts the mortality is at the rate of about 10 in 1,000; among the miners it is 14, that is a very great increase.

19,702. (*Mr. Kendall.*) After 35 to what age?—From 35 to 45; from 45 to 55 the increase is still greater. The mortality among the rest of the population is 15 in the 1,000, and among the miners it is 34; it is an immense increase of mortality. From 55 to 65 it is 24 in the rest of the population, and it is 63 among the miners. After that the number of men working in the mines is not considerable, and I think it is hardly worth while going any further, the facts being so few.

19,703. (*Sir P. Grey Egerton.*) After the age of 35 the ratio of mortality is increased as compared with the agricultural population of the same districts?—Yes, I may state that the residual population of the districts very fairly represents the mortality in other parts of the country. For instance, taking it at the ages which I have mentioned, where the mortality of miners becomes excessive; if we look at Norfolk, which is an agricultural county, from the age of 35 to 45, the mortality of the non-mining population in these Cornish districts being 10, it is in Norfolk also nearly 10. Then from 45 to 55 it is 15 in the non-mining population of Cornwall, and it is 13 in Norfolk, which is not quite so high. From 55 to 65 it is exactly the same in Norfolk, and in these districts of Cornwall—to take the very early ages, under 15, among children, the mortality of the whole population in these parts of Cornwall, including the children of miners as well as the children of the rest of the population, is less than the mortality of the population of Norfolk. For, under the age of five the mortality of the male children in Cornwall is at the rate of 55 per 1,000, and of the male children in Norfolk it is 65 per 1,000, so that it is quite evident that the districts them-

selves are healthy, and that there is nothing in the air of the locality necessarily injurious to health. I show the same facts with reference to the women. The children and the women of these districts enjoy as good health as the children and the women of Norfolk, or of any of the other counties.

19,704. (*Mr. Leveson Gower.*) Have you compared it with the average in the manufacturing districts?—In the manufacturing districts the mortality among the children and women is of course much higher.

19,705. Have you compared the mortality in Cornwall with that in the manufacturing districts?—It would be much less in Cornwall at these early ages. I have not the facts before me, but I can easily supply them.

19,706. (*Mr. St. Aubyn.*) Have you any comparative statement of the mortality of the children of miners in Cornwall, distinguished from the children of the rest of the population?—No; we have not the means in our returns of distinguishing the deaths of miners' children from the deaths of other children.

19,707. Have you any comparative statement with regard to Norfolk and the rest of England. Is Norfolk a fair specimen of an agricultural population?—I have compared it with the adjoining counties to Cornwall, namely Devonshire and Somersetshire, and other counties, and the result is pretty nearly the same.

19,708. There is no material difference?—There is no material difference. The south-western counties are among the healthiest in England, so that it is evident that whatever may be the cause of the mortality among the miners, it is not in the situation, or even in the general sanitary condition of the people.

19,709. At what age do you begin to distinguish between the mining population and the agricultural population?—After the age of 15. The occupations are not so well defined as to enable us to deal with them under the age of 15.

19,710. (*Chairman.*) Can you give us a comparison between the four different districts which you have specified, namely the Cornish district, the Staffordshire district, the Durham and Northumberland district, and the South Wales district?—I can; I will begin at the age of 35.

19,711. Will you state the character of the mining in the different districts?—In Staffordshire the work is in coal and iron. In South Staffordshire it is the ten-yard coal, and many accidents occur. I believe that the work is carried on by small capitalists, and that the arrangements are not so good as they might be for working the mines. The consequence is that the number of violent deaths is excessive in Staffordshire. The same remark might be applied to Merthyr Tydfil, which represents very fairly the South Wales districts. The works are recent, and all the arrangements are less perfect than they are in Durham and Northumberland, where mining is conducted upon scientific principles and generally under great proprietors.

19,712. So that you consider that the large amount of deaths in those two districts which you have last named is attributable in a great degree to accidents, and to the want of sanitary arrangements?— To those two causes, namely, the state of the dwellings of the mining population, and the great number of violent deaths. As many as 8 miners are killed annually by negligence or accident to every 1,000 miners living.

19,713. Out of the four districts, you find that in Durham and Northumberland, notwithstanding that it is a coal district, with large explosions, the number of deaths, whether by natural causes or by accident, according to the proportion of the population, is not so great as in any of the other three districts?—It is not.

19,714. Will you state the comparative amount?—Under the age of 35, where we find that the mortality among the Cornish miners is low, the mortality among the Northumberland and Durham miners is still lower.

19,715. (*Dr. Greenhow.*) Will you mention the rates of mortality per 1,000?—Without going into decimals, there are 9 deaths in 1,000 in Cornwall, and rather less than 9, you may say $8\frac{1}{2}$, in Durham and Northumberland. The difference is not great, but it is in favour of Durham and Northumberland. I will now take Staffordshire. At the same ages the mortality in the Staffordshire districts is 14 and 15 per 1,000; that is to say, 14 in the ages from 15 to 25, and 15 in the ages from 25 to 35; that is an immense increase in the mortality. Then in the South Wales districts, (Merthyr Tydfil is the only one of which I have taken the mortality) it is 20 in 1,000 in the ages from 15 to 35 It is 20·72 in the ages from 15 to 25, and it is 20·42 in the ages from 25 to 35. Passing to the ages from 35 to 45, I will take the Durham and Northumberland districts; there the mortality among the miners is 10 in the 1,000. You will recollect that it was 14 in Cornwall. In the Staffordshire district it is 18.

19,716. (*Mr. Kendall.*) In Durham and Northumberland is there any difference between the miners and the rest of the population?—Yes; the mortality is 12 in the rest of the population. The mining people of Durham and Northumberland experience a lower rate of mortality than the rest of the population.

19,717. (*Chairman.*) What is the amount of mortality in the agricultural population in Staffordshire?—In the agricultural population it is 13, it being 18 in the mining population. You will observe that the mortality among miners in Staffordshire is enormously increased. Then in South Wales the mortality is 24 among miners between the ages of 35 and 45.

19,718. What is the mortality in the agricultural population of South Wales?—It is 19 in the rest of the population.

19,719. (*Dr. Greenhow.*) Is it not the fact with regard to the non-mining population in Durham and Northumberland that you have a large urban element, that is to say, a large proportion of the population living in towns?—That is so to some extent in the districts of Durham and Northumberland which I have taken.

19,720. Therefore it would not be fair to institute a comparison between the rates of mortality among the miners of Durham and Northumberland and the rest of the population, as contrasted with the case of Cornwall and Devon, where there are few large towns?—There are no very large towns in Cornwall; and that is no doubt an element which influences the comparison to a certain extent, but not an element which influences the comparison so much as you may suppose. Tynemouth is, I think, the only large town in the Durham and Northumberland districts which I have taken. As regards Wales, I have only taken the district of Merthyr Tydfil; the rest of the population was in a very deplorable sanitary state at the time when this return was made; cholera and other epidemics were exceedingly fatal among the whole population; it is an undrained district, and all the bad consequences of a neglected sanitary condition existed there. If I took the age from 45 to 55, the result would be similar to what I have mentioned. Taking the miners of Durham and Northumberland, the mortality among them between 45 and 55 was 17, while you will recollect that the mortality among the Cornish miners was 34; among the Staffordshire miners it was 28, and among the Merthyr Tydfil, or South Wales miners, it was 34, being as bad as Cornwall and rather worse. From 55 to 65—I will take Durham and Northumberland—the mortality among the miners was 24, whereas in Cornwall it was 63, in Staffordshire it was 50, in Merthyr Tydfil, it was 57. That completes the table as far as I think it would be safe to go.

19,721. (*Chairman.*) In the returns of the Registrar General, what are the class of diseases which appear chiefly to affect these districts?—In order to show the rate at which the mining population died off, I

constructed four tables, showing out of 100,000 entering at the age of 20, how many remained, and how many died off every year in the same districts, namely, in the Cornish districts, the Staffordshire districts, the Durham and Northumberland districts, and the Merthyr Tydfil district. I will state briefly the result of that. It will put what I have said before in another form, which, perhaps, may be equally striking. To begin with Cornwall. Out of 10,000 men at the age of 15, you have 8,364 surviving and attaining the age of 35; in Durham and Northumberland 8,437; in Staffordshire 7,516 attain that age: in South Wales only 6,627 would live to the age of 35 at the rates of mortality which we have before described. In Cornwall, from 35 to 45, in the next ten years, 1,114 have died out of 8364, leaving 7,250 to attain the age of 45. In Durham and Northumberland 7,623 attain that age, which is rather more. In Staffordshire 6,301 attain the age of 45, and in South Wales only, 5,225. The men are reduced to nearly half the number in the Merthyr Tydfil district. The Cornish miners are reduced to 5,185 at the age of 55. At that age the miners of Durham and Northumberland are reduced only to 6,443, in Staffordshire to 4,779, and in South Wales to 3,709. I will take another age, namely, 65; the Cornish miners are reduced to 2,756 at the age of 65; that is to say, to about one fourth of the original number; in Durham and Northumberland they are only reduced to about 5,046, that is only about half the original number. In Staffordshire they fall to 2,899; that is nearly as low as in Cornwall. In South Wales they fall to 2,088, that is nearly to one-fifth of the original number. You will, therefore, observe that this table shows, as you would expect, that the number of miners decreases in Cornwall up to the age of 35 nearly at the same rate as in the country generally; that after 35 they begin to die off more rapidly; and that from 45 to 55 they die off in immense numbers, leaving few men to attain the age of 65. The state of things, however, is very much worse in the early ages, 15-35, in Staffordshire and South Wales, where the numbers of the deaths at the ages 35 and upwards, are as low in Staffordshire and lower in South Wales than they are in Cornwall. The same table shows the causes from which the men die in each 10 years in these several classes of districts. In the first place, there is small-pox, which produces only a slight effect on the mortality at these ages; then there is cholera and diarrhœa. This was during the years from 1849 to 1853, and, therefore, includes the great epidemic of cholera in 1849. That epidemic was not severe in Cornwall. The mortality from cholera among the Cornish districts was low, and a great number of the miners did not die of this class of disease. In Staffordshire the mortality was very great; in Durham and Northumberland it was excessive from cholera; in South Wales it was also exceedingly fatal. That shows, I think, pretty clearly that the general sanitary condition of the mining population is much better in Cornwall than it is in these other mining districts. It is better I think than in Durham and Northumberland as regards the epidemics of this class,—as regards the water supply. Cornwall has suffered a good deal from typhus fever. The mortality is greater in Cornwall from typhus and typhoid fever than it is in Northumberland and Durham in early life. Typhus is less fatal in Cornwall than it is in Merthyr Tydfil. Then there is nothing remarkable I think in diseases of the brain, as far as I can discover, nor is there anything very striking even under heart disease and dropsy. But when we come to consumption, as it is termed, we have an enormous discrepancy. For instance, in the earlier ages the mortality from that disease is not much raised; but when we get to the ages from 35 to 45 for instance, there are 1,114 deaths; of those 549 are referred to consumption, exclusive of the other lung diseases.

19,722. (*Dr. Greenhow.*) These are not ratios, these are actual numbers?—Actual numbers out of equal numbers living at the age of 15. In the next 10 years 1,206 of these men die; and in the next 10 years 1,394 more of them die from consumption. There is nothing like it in any of the other districts. For instance, I take Durham and Northumberland; between 35 and 45 the number is 111; in the next 10 years it is 118; in the next 10 years it is 119; that takes us up to the ages from 55 to 65, where I will stop. If you will cast your eye back you will see that while you have 118 deaths between 45 and 55 in Durham and Northumberland, you have 1,206 in Cornwall.

19,723. Is that out of the same number of persons?—No.

19,724. Then we cannot compare the one mortality with the other without knowing also the number of the living?—No.

19,725. Is this then a mere statement of figures without any ratio?—I take 10,000 entering at the age of 15; in all cases there is the same basis. Out of 10,000 entering at the age of 15, for instance, in Cornwall, you have 1,206 dying between the ages of 45 and 55 of this particular disease, and 1,394 dying of the same disease in the next 10 years; while in Durham and Northumberland the deaths do not exceed 118 and 119. Out of 7,250 Cornish miners living at the age of 45, the deaths by consumption are 1,206 in the next ten years of age; while 86 die out of 6,301 Stafford coal miners of the same age. The ratios are seen by simple inspection of the Table. Staffordshire shows nearly the same result. In Merthyr Tydfil the mortality is higher; for instance, from 45 to 55 it is 272; from 55 to 65 it is 179: that is of phthisis. If we take the lung diseases, of course we get different results. Dr. Greenhow knows that they are sometimes confounded, but in Cornwall this disease seems to be so well characterised, that all the medical men have apparently agreed in the returns to call it by the name of consumption, and nearly all the deaths from these diseases of the lungs, whatever they may be, are put under that head in Cornwall. [The witness subsequently supplied the annexed Table showing the ratio of mortality from lung diseases in three groups of districts.]

Mortality from Consumption and Diseases of the Lungs in the following Groups of Mining Districts.

Age.	Years of Life.	Numbers Dying from Consumption and Diseases of Lungs in next 10 Years.	Death Rate to 1,000 Living
	Cornish Districts.		
35	7807	660	84·5
45	6217	1498	241·0
55	3970	1709	430·5
65	1830	930	508·2
	Staffordshire Districts.		
35	6908	231	33·4
45	5540	440	79·4
55	3839	761	198·2
65	1957	634	324·0
	Durham and Nothumberland Districts.		
35	8030	149	18·6
45	7033	245	34·8
55	5744	277	48·2
65	3837	515	134·2

19,726. Do you not think that it would be better to take the two together, namely, phthisis and diseases of the respiratory organs?—Yes, I think it would. I have given them separately here and in the table which I have put in, so that you can join them together. The next point of importance is to show how the violent deaths go. In Cornwall out of the same 10,000, at the age of 15; 192 died in the next 10 years of violent deaths of various kinds,—that is from the age of 15 to 25, and so on in each successive 10 years, 184, 146, 146, and 57 in the last 10 years of age extending from 55 to 65. Then in Durham and North-

umberland the number of violent deaths is higher. In the first 10 years it is 233, in the next 196, then 268, then 260, and 214. It is not double, but it is certainly more than 50 per cent. higher than the mortality from violence in the Cornish districts. In Staffordshire the difference is enormous. Out of 10,000, 705 died in the first 10 years from violent deaths, 621 in the second, 568 in the third, 485 in the fourth, and 256 in the fifth. I have the particular forms of violence in a subsequent table. Then in South Wales, the mortality is not so high from violence as in Staffordshire, but it is exceedingly high, 636 died in the first 10 years, namely, from 15 to 25, 450 in the next 10 years, 425 in the next 10 years, 359 in the following 10 years; and 206 died between the ages of 55 and 65 out of 3,709. The general result is that in Cornwall the mortality from violence is greater than it is in the rest of the country. If you take all England, the number who die from violence is nearly equal in every 10 years. For instance, out of 10,000 between 15 and 25, 86 men died from violence in the general population of all England; in Cornwall it was 192. In the next 10 years, namely, from 25 to 35, the violent deaths in all England were 86, in the next 10 years 90, in the next 10 years 96, and in the next 10 years 83. It is always higher in Cornwall than it is in the rest of the country, but it is much lower in Cornwall than it is in the other mining districts even in those of Durham and Northumberland.

19,727. (*Chairman.*) You can perhaps state the different kind of accidents?—I have a return of the different forms of violence in the same period, but these are not ratios, they are mere numbers. There were 4,532 violent deaths in the coal districts, and 382 in the copper, tin, lead, and iron districts which I have taken during the five years 1849–53.

19,728. That is to say in the four districts?—In the whole of the districts. I have the figures and I have the proportions; perhaps I had better state the proportions. I will give the average annual number of deaths out of 100,000 miners living. I will do it without distinction of age. Out of 100,000 copper, tin, lead, and iron miners living you had 4 drowned, 35 fell in the pit or shaft, 42 were crushed and injured by the fall of stone, 11 were killed by blasting, and 17 by all other causes. Those are the proportions. The actual numbers returned were 382 as killed in 5 years from all causes; 13 were drowned, 122 fell in the pit or shaft, 149 were crushed and injured by fall of stone, 39 died by blasting, and 59 by other causes. The proportion of deaths by violence was about 1 in 1,000. In the copper, tin, lead, and iron mines which I have taken, there are 109 out of 100,000. Then in the coal mines instead of 109 you have 498, that is nearly five times as many deaths by violence as you have in these metal mines. In the coal mines, out of 100,000 miners living, 4 were drowned, which is the same as in the metal mines, 92 died by falls in the pit or shaft, 236 were crushed and injured by fall of coal, 5 were killed by blasting, 145 were killed by explosions and choke-damp annually. These last are the deaths which make so much noise in the country, and yet there are only 145 in 100,000, while the deaths by crushing and other causes in mines raise that 145 to 498. The number of violent deaths from other causes was only 16. The mortality at all ages above 10 is 5 in 1,000 from violence alone in the whole of the mining districts.

19,729. (*Mr. Kendall.*) In Cornwall what have you under the head of "Typhus?"—123 out of the 10,000 died of typhus in Cornwall. As a complement of that table I may mention that of course the mean duration of life depends upon the mortality, but I have completed the inquiry by determining the average duration of life on the same principle as the insurance offices adopt.

19,730. (*Chairman.*) Do you know the rate charged by insurance offices on Cornish miners?—I happen to know that in one office which does a good deal of business among the miners, the charge is 1*l.* per cent. additional over the ordinary charge; if the ordinary premium at the age say of 26 is 2*l.*, they charge a Cornish miner 3*l.*, and the miners pay it, as they appear to be aware that their lives are of that character.

19,731. (*Dr. Greenhow.*) Is the same increased rate charged throughout life?—It is one uniform rate at all ages. A great number of Cornish miners I know apply to insure their lives also to go abroad, to Chili for instance; a good many emigrate, and they charge that 1*l.*, and in addition there is the sea risk, and so on. The mean duration of life of the Cornish miners is 35 years from the age of 20, that is the number of years they live on the average after 20. If you took a certain number of them, say 10,000, and followed them from the age of 20 till the end of their lives, and added up their ages and divided the sum of years by the number 10,000, you would find that they live on an average one with another 35 years. In the healthy districts of England the mean duration of life is 43 years, (I am always speaking of males), in all England it is 39 years, including the large towns. In the Durham and Northumberland districts it is 42 years; it does not differ much from the healthy districts of the country. In the Staffordshire districts it is 33 years, being rather less than in the Cornish. In the Merthyr Tydfil district it is 31 years. In all there is a very great reduction of the natural duration of life. I have taken the healthy districts generally as a standard. We cannot get the duration of life in the most favourable conditions possible. We have therefore taken these districts as representing that ideal, and we find that life lasts there 43 years, and we consider anything below that as a shortening of life by unnatural means.

19,732. (*Chairman.*) To keep up a certain amount of population how many would it require?—For instance, to keep up a population in Cornwall of 34,862, 1,000 must enter every year. If the miners were made, as they clearly ought to be made, as healthy as they are in the healthy districts of England, the same numbers entering would amount to a body of 43,456 men. You will observe how in that way there is a great waste of the productive means of the country by the premature death of the skilled and experienced workmen.

19,733. (*Mr. Davey.*) How far back do your statistics go?—I conceive that these statistics represent the state of things nearly as it is now, but they are based on the last census.

19,734. You do not go further back than that?—No.

19,735. (*Dr. Greenhow.*) Are these statistics for one year only or for several years?—For 5 years. After the age of 40 of course there is a much greater difference in proportion between the duration of life in Cornwall, and the duration of life in healthy districts of the country. For instance, the Cornish men, after having lived to the age of 40, live on an average 20 years, in Durham and Northumberland 27 years, and in the healthy districts of the country 29 years.

19,736. (*Mr. Kendall.*) If, in Cornwall, we could reduce our deaths from the miner's disease and from tpyhus, we should then become a healthy county?—Yes.

19,737. And attention ought to be drawn to those two points?—Yes.

19,738. The miners' consumption cannot, I suppose, be like the ordinary consumption?—I do not think that it is the ordinary consumption.

19,739. In ordinary consumption are not children very apt to inherit it from their parents?—Yes, it is considered hereditary.

19,740. But I find that from 15 to 35 they are all healthy?—Yes, it is so well characterised that they themselves call it miners' consumption.

19,741. (*Dr. Greenhow.*) It is a different disease from tubercular consumption?—Yes, it will be very well worthy of investigation.

19,742. (*Mr. Leveson Gower.*) Cannot you give us any comparison between the period to which you have referred and a previous period?—No; the ages of the living miners were not enumerated before so as to enable us to distinguish the numbers living, and again the registers of deaths were only instituted in 1837, and the returns of occupation were very imperfect at that time.

19,743. When was the first time that that information was sufficient to enable you to give these facts?—In the five years of which 1851 is the centre.

19,744. And that is what you have given us now?—It is; I consider that perfectly satisfactory.

19,745. Can you give us any comparison between the statistics of the Cornish miners and those of miners in other districts, other than coal and ironstone?—I cannot.

19,746. Have you none from North Wales?—None.

19,747. Can you give us a comparison between Cornwall and some manufacturing district; you have compared Cornwall with an agricultural district, can you give a comparison of the rate of mortality among the Cornish miners, and the rate of mortality among the workmen in a manufacturing district?—I can supply such a table if it is the wish of the Commission.

19,748. I will request you to do so.—I will take two or three districts.

19,749. When you talk of miners, I understand you to say that in Cornwall you included those who work on the surface who are connected with the mines?—Those who were returned as miners, so as to enable us to classify them as miners, we dealt with in that way.

19,750. Are those working on the surface included in that term?—I should think that they are, unless they would return themselves under some other name, and then we should not have them.

19,751. Can you ascertain that?—I do not think that I can. We find that a good many of the women are returned, and they of course only work at the mouth of the pit.

19,752. Do you know whether that is the same in the iron districts, that is to say, whether those working in the mills or furnaces are included?—No, they are not included; that would be quite distinct from those working underground.

19,753. (*Mr. Kendall.*) How are those working above ground in the iron mines classed?—They would be classed under "iron manufacture." We have several heads in our tables which would include various groups of persons engaged in the iron manufacture. We have come to the conclusion that it is absolutely necessary to have a sort of industrial census in order to get at all these details minutely. Such a return as the census obtains of numbers and occupations is of course general; you cannot go into detail without losing yourself. In order to get a good mining return of the whole country you must have a special inquiry on the spot by competent persons. In the iron districts they are very close to the coal, but in Cornwall they are not so.

19,754. (*Dr. Greenhow.*) In classifying the miners of Northumberland for these calculations, are lead miners included?—Yes, all who are returned as miners are included; but there are not many lead miners in the districts which I have taken.

19,755. What is the average duration of life after 40 in the miners of South Wales?—20 years.

19,756. In Staffordshire what is it?—22 years.

19,757. And in the healthy districts of England?—29 years.

(*The witness delivered in the following diagrams.*)

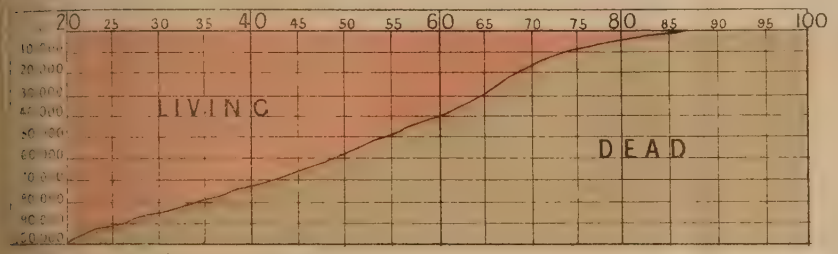
The witness withdrew.

ENGLAND AND WALES.—LIFE TABLE. Showing (Col. 1.) to 10,000 Males at the Age 15 the Numbers surviving and attaining the Age 25, 35, 45, &c.; also the Numbers dying in the Decennial Intervals (Col. 2.); with the Causes of their Death (Cols. 3-15). (Constructed by approximative method.)

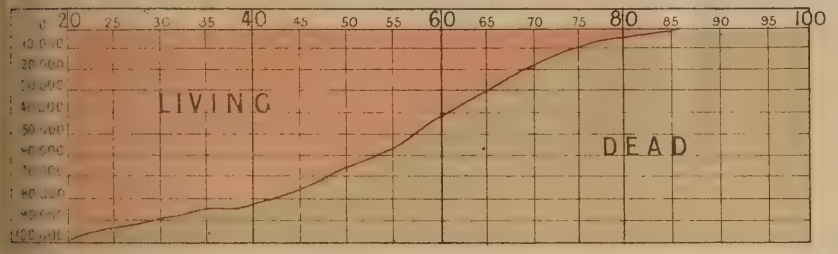
AGES.	Numbers living at each Age.	Dying between each Decennial Interval of Age, from All Causes.	DYING BY												
			Small-pox.	Cholera and Diarrhœa.	Typhus.	Other Zymotic Diseases.	Diseases of the Brain.	Heart Disease and Dropsy.	Consumption.	Diseases of the Lungs.	Diseases of the Stomach and Liver.	Diseases of the Kidneys.	Diseases of the Joints.	Violent Deaths.	Other Causes.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
15	10,000	782	13	39	95	24	40	32	312	39	31	8	13	86	50
25	9,218	884	9	63	67	22	62	44	354	63	41	15	9	86	49
35	8,334	1016	5	74	60	25	101	75	309	108	70	21	11	90	67
45	7,318	1265	3	87	62	32	135	126	263	191	115	29	13	96	113
55	6,053	1651	1	99	61	41	213	209	186	314	159	48	17	83	220
65	4,402	2126	1	102	56	55	305	279	85	384	153	80	17	59	550
75	2,276	1727	—	68	22	34	192	144	13	208	59	51	7	26	903
85 and upwards	549	549	—	15	3	7	33	19	1	36	8	8	1	6	412

DIAGRAMS

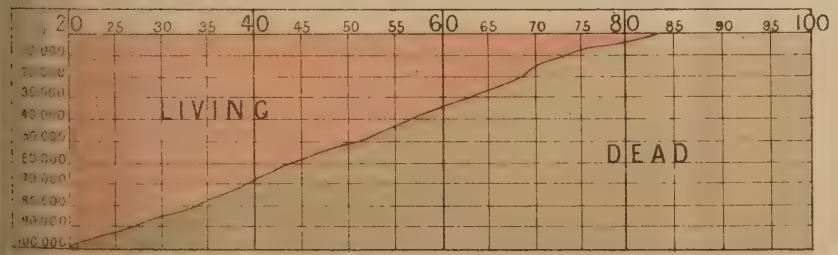
SHOWING OF 100,000 MEN ENTERING AS MINERS AT THE AGE OF 20, IN 4 GROUPS OF MINING DISTRICTS, THE NUMBERS LIVING AND DEAD AT EACH YEAR OF AGE FROM 20 TO 100; ALSO THE RELATIVE NUMBERS LIVING AT EACH AGE, SUSTAINED BY EQUAL NUMBERS ENTERING. GIVEN IN BY DR FARR.



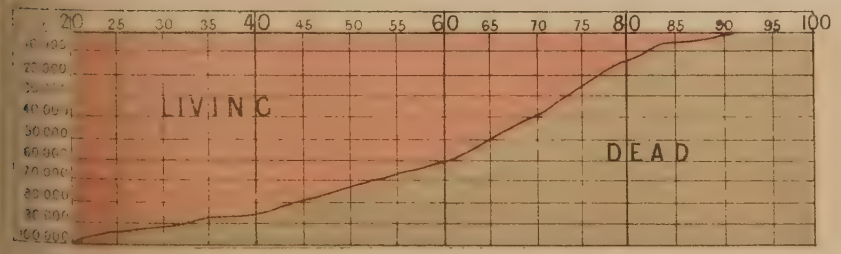
STAFFORDSHIRE DISTRICTS.



CORNISH DISTRICTS.



MERTHYR TYDFIL

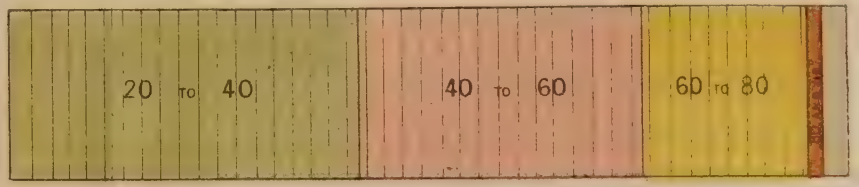


DURHAM AND NORTHUMBERLAND DISTRICTS.

Day & Son, Lith. to the Queen

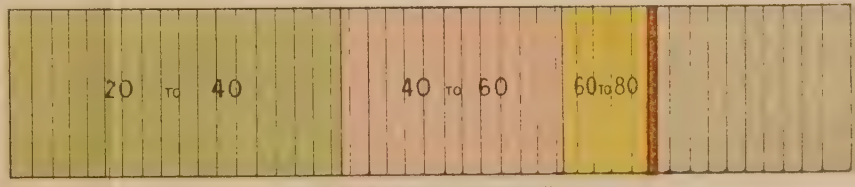
DIAGRAMS

SHOWING OF A RACE OF MINERS BORN IN 4 GROUPS OF MINING DISTRICTS PROPORTIONAL NUMBERS LIVING IN 4 PERIODS OF AGE. GIVEN IN BY DR FARR

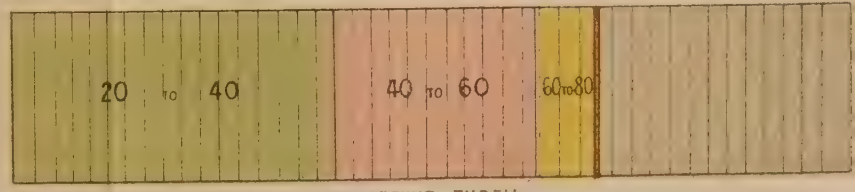


DURHAM AND NORTHUMBERLAND DISTRICTS

CORNISH DISTRICTS.



STAFFORDSHIRE DISTRICTS

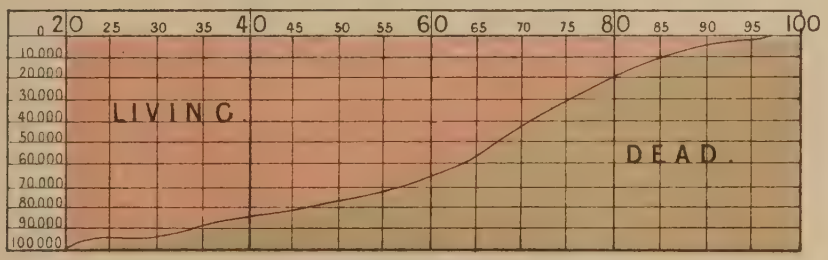


MERTHYR TYDFIL.

ROYAL CLUB
PALL MALL

DIAGRAM

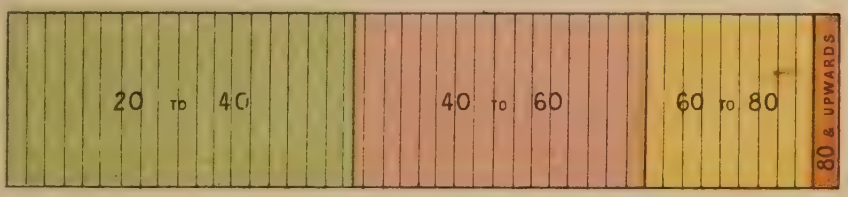
SHOWING OF 100,000 MEN LIVING AT THE AGE OF 20, IN 63 HEALTHY DISTRICTS OF ENGLAND, THE NUMBERS LIVING AND DEAD AT EACH YEAR OF AGE FROM 20 TO 100; ALSO THE RELATIVE NUMBERS LIVING AT EACH AGE, SUSTAINED BY EQUAL NUMBERS ENTERING.—GIVEN IN BY DR FARR.



HEALTHY DISTRICTS.

DIAGRAM

SHOWING OF MALES BORN IN 63 HEALTHY DISTRICTS OF ENGLAND, PROPORTIONAL NUMBERS LIVING IN 4 PERIODS OF AGE.



HEALTHY DISTRICTS.

Day & Son Ltd to the Queen

MINERS LIFE TABLE.—SHOWING (Col. 1.) to 10,000 MINERS (Males) at the Age 15, the Numbers surviving and attaining the Age 25, 35, 45, &c.; also the Numbers dying in the Decennial Intervals (Col. 2.) with the Causes of their Deaths (Col. 3. to 15.)

AGES.	Numbers living at each Age.	Dying between each Decennial Interval of Age from all Causes.	Dying by: Small-pox.	Cholera and Diarrhœa.	Typhus.	Other Zymotic Diseases.	Diseases of the Brain.	Heart Disease and Dropsy.	Consumption.	Diseases of the Lungs.	Diseases of the Stomach and Liver.	Diseases of the Kidneys.	Diseases of the Joints.	Violent Deaths.	Other Causes.
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
AGGREGATE OF 19 MINING DISTRICTS.															
15	10,000	1081	34	90	117	19	34	27	254	34	26	4	7	394	41
25	8,919	1023	14	160	84	5	17	34	218	55	34	8	1	363	30
35	7,896	1117	5	158	47	21	32	54	248	95	37	14	5	354	47
45	6,779	1588	3	178	54	24	65	84	457	244	82	12	5	302	78
55	5,191	1906	—	177	58	22	123	141	545	378	86	26	16	177	157
65	3,285	1989	—	170	46	35	167	182	282	435	78	46	17	84	447
75	1,296	1119	—	61	—	6	77	70	38	144	22	10	—	19	672
85 and upwards	177	177	—	2	—	—	7	2	—	15	2	—	2	5	142
CORNISH DISTRICTS.															
15	10,000	852	47	28	123	20	57	22	247	45	24	6	4	192	37
25	9,148	784	15	26	64	3	12	23	331	56	32	12	—	184	26
35	8,364	1114	4	40	32	32	40	47	549	111	36	16	8	146	53
45	7,250	2065	—	37	55	27	41	73	1206	292	69	14	—	146	105
55	5,185	2429	—	57	25	19	145	120	1394	315	69	13	25	57	190
65	2,756	1851	—	35	26	26	139	139	652	278	61	17	17	35	426
75	905	808	—	7	—	—	67	60	60	60	—	—	—	22	532
85 and upwards	97	97	—	—	—	—	—	—	—	—	—	—	—	—	97
STAFFORDSHIRE DISTRICTS.															
15	10,000	1275	24	148	81	12	36	36	141	33	24	—	5	705	30
25	8,725	1209	15	172	56	5	18	30	144	73	40	8	—	621	27
35	7,516	1215	—	131	69	17	31	62	93	138	34	14	10	568	48
45	6,301	1522	5	157	40	46	86	86	86	354	101	10	15	485	51
55	4,779	1880	—	175	88	13	108	182	168	593	108	34	—	256	155
65	2,899	1884	—	205	51	20	154	174	20	614	82	41	20	123	380
75	1,015	880	—	56	—	—	34	34	23	147	11	11	—	11	553
85 and upwards	135	135	—	8	—	—	15	8	—	23	—	—	8	8	65
DURHAM AND NORTHUMBERLAND DISTRICTS.															
15	10,000	815	18	74	80	14	16	26	265	16	24	6	8	233	35
25	9,185	748	8	144	86	5	8	39	162	26	26	5	3	196	40
35	8,437	814	15	187	23	8	31	54	111	38	31	15	—	268	33
45	7,623	1180	5	225	54	15	78	118	118	127	78	20	5	260	77
55	6,443	1397	—	238	16	40	151	158	119	158	95	40	32	214	136
65	5,046	2417	—	251	48	84	215	311	156	359	108	84	24	108	669
75	2,629	2168	—	136	—	34	169	152	17	237	51	34	—	17	1321
85 and upwards	461	461	—	—	—	—	16	—	—	49	16	—	—	16	364
SOUTH WALES DISTRICT; viz. *Merthyr Tydfil.*															
15	10,000	1871	57	166	266	43	19	28	470	47	38	5	19	636	77
25	8,129	1502	23	367	161	9	37	46	266	69	37	5	—	450	32
35	6,627	1402	—	343	70	32	25	51	266	82	51	6	—	425	51
45	5,225	1516	—	403	79	—	53	44	272	166	79	—	—	359	61
55	3,709	1621	—	330	137	14	55	69	179	440	55	14	—	206	122
65	2,088	1569	—	241	69	—	155	69	138	500	52	52	—	69	224
75	519	465	—	65	—	—	26	26	13	129	39	—	—	13	154
85 and upwards	54	54	—	—	—	—	—	—	—	—	—	—	—	—	54

LIFE TABLE.—Showing to 10,000 Males living at the Age 15 the Numbers surviving and attaining the Age 25, 35, 45, &c.; also the Numbers dying in the Decennial Intervals, (1) for all Classes in England and Wales, according to the English Life Table No. 2.; (2) for all Classes in England and Wales, in the Five Years 1849-53; and (3) for the 19 Miners in the Mining Districts, 1849-53.

AGES.	England and Wales, English Life Table No. 2.		England and Wales, in the Five Years 1849-53. (By the approximative method.)		Miners in the 19 Mining Districts, 1849-53. (By the approximative method.)	
	Numbers living at each Age.	Dying between each Decennial Interval of Age.	Numbers living at each Age.	Dying between each Decennial Interval of Age.	Numbers living at each Age.	Dying between each Decennial Interval of Age.
15 - - -	10000	723	10000	782	10000	1081
25 - - -	9277	860	9218	884	8919	1023
35 - - -	8417	997	8334	1016	7896	1117
45 - - -	7420	1217	7318	1265	6779	1588
55 - - -	6203	1696	6053	1651	5191	1906
65 - - -	4507	2223	4402	2126	3285	1989
75 - - -	2284	1761	2276	1727	1296	1119
85 and upwards	523	523	549	549	177	177

LIFE TABLE.—Males 20 Years of Age and upwards.—Healthy Districts and Mining Districts of England in the Five Years 1849–1853.

x	Numbers Dying in each Year of Age.					Numbers Living at each Age.					Sum of the Numbers Living at each Age (L_x) from x to the last Age in the Table.				
	Healthy Country Districts.	Miners.				Healthy Country Districts.	Miners.				Healthy Country Districts.	Miners.			
		Cornish Districts.	Stafford-shire Districts.	Durham & North-umberland Dis.	Merthyr Tydfil Dis-trict.		Cornish Dis-tricts.	Stafford-shire Dis-tricts.	Durham & North-umberland Dis.	Merthyr Tydfil Dis-trict.		Cornish Districts.	Stafford-shire Districts.	Durham & North-umberland Districts.	Merthyr Tydfil District.
	d_x					l_x					L_x				
20	695	887	1360	369	896	100000	100000	100000	100000	100000	4395621	3536167	3380663	4251630	3107454
21	705	904	1365	474	1096	99305	99113	98640	99631	99104	4295621	3436167	3280663	4151630	3007454
22	715	911	1366	560	1263	98600	98209	97275	99157	98008	4196316	3337054	3182023	4051999	2908350
23	724	908	1361	628	1399	97885	97298	95909	98597	96745	4097716	3238845	3084748	3952842	2810342
24	731	900	1356	682	1505	97161	96390	94548	97969	95346	3999831	3141547	2988839	3854245	2713597
25	738	887	1347	721	1589	96430	95490	93192	97287	93841	3902670	3045157	2894291	3756276	2618251
26	744	873	1336	750	1650	95692	94603	91845	96566	92252	3806240	2949667	2801099	3658989	2524410
27	749	859	1326	771	1693	94948	93730	90509	95816	90602	3710548	2855064	2709254	3562423	2432158
28	753	847	1314	784	1720	94199	92871	89183	95045	88909	3615600	2761334	2618745	3466607	2341556
29	756	837	1303	792	1736	93446	92024	87869	94261	87189	3521401	2668463	2529562	3371562	2252647
30	760	833	1292	798	1740	92690	91187	86566	93469	85453	3427955	2576439	2441693	3277301	2165458
31	762	835	1284	799	1738	91930	90354	85274	92671	83713	3335265	2485252	2355127	3183832	2080005
32	765	842	1276	802	1731	91168	89519	83990	91872	81975	3243335	2394898	2269853	3091161	1996292
33	767	858	1271	803	1718	90403	88677	82714	91070	80244	3152167	2305379	2185863	2999289	1914317
34	770	881	1269	806	1704	89636	87819	81443	90267	78526	3061764	2216702	2103149	2908219	1834073
35	772	914	1268	810	1689	88866	86938	80174	89461	76822	2972128	2128883	2021706	2817952	1755547
36	775	956	1271	818	1675	88094	86024	78906	88651	75133	2883262	2041945	1941532	2728491	1678725
37	780	1007	1277	829	1662	87319	85068	77635	87833	73458	2795168	1955921	1862626	2639840	1603592
38	784	1066	1287	842	1652	86539	84061	76358	87004	71793	2707849	1870853	1784991	2552007	1530134
39	790	1136	1300	860	1643	85755	82995	75071	86162	70144	2621310	1786792	1708633	2465003	1458338
40	797	1213	1317	882	1639	84965	81859	73771	85302	68501	2535555	1703797	1635562	2378841	1388194
41	806	1298	1337	908	1638	84168	80646	72454	84420	66862	2450590	1621938	1559791	2293539	1319693
42	817	1391	1361	937	1641	83362	79348	71117	83512	65224	2366422	1541292	1487337	2209119	1252831
43	830	1489	1389	970	1648	82545	77957	69756	82575	63583	2283060	1461944	1416220	2125607	1187607
44	845	1593	1419	1008	1659	81715	76468	68367	81605	61935	2200515	1383987	1346464	2043032	1124024
45	862	1698	1455	1048	1674	80870	74875	66948	80597	60276	2118800	1307519	1278097	1961427	1062089
46	882	1807	1491	1089	1666	80008	73177	65493	79549	58602	2037930	1232644	1211149	1880830	1001813
47	906	1915	1532	1135	1664	79126	71370	64002	78460	56936	1957922	1159467	1145656	1801281	943211
48	931	2021	1574	1180	1661	78220	69455	62470	77325	55272	1878796	1088097	1081654	1722821	886275
49	962	2124	1619	1226	1658	77289	67434	60896	76145	53611	1800576	1018642	1019184	1645496	831003
50	994	2220	1665	1273	1660	76327	65310	59277	74919	51953	1723287	951208	958288	1569351	777392
51	1007	2305	1742	1276	1661	75333	63090	57612	73646	50293	1646960	885898	899011	1494432	725439
52	1029	2471	1800	1250	1663	74326	60725	55870	72370	48632	1571627	822808	841399	1420786	675146
53	1063	2545	1845	1287	1664	73297	58254	54070	71030	46969	1497301	762083	785529	1348416	626514
54	1106	2592	1881	1298	1666	72234	55709	52225	69803	45305	1424004	703829	731459	1277326	579545
55	1157	2616	1911	1316	1672	71128	53117	50344	68505	43639	1351770	648120	679234	1207523	534240
56	1218	2622	1939	1342	1668	69971	50501	48433	67189	41967	1280642	595003	628890	1139018	490601
57	1286	2613	1966	1379	1750	68753	47879	46494	65847	40299	1210671	544502[2]	580457	1071829	448634
58	1361	2591	1992	1427	1842	67467	45266	44528	64468	38649	1141918	496623[2]	533963	1005982	408335
59	1444	2562	2020	1487	1936	66106	42675	42536	63041	36707	1074451	451357	489435	941514	369783
60	1531	2524	2047	1560	2026	64662	40113	40516	61554	34771	1008345	408682	446899	878473	333070
61	1625	2481	2075	1645	2105	63131	37589	38469	59994	32745	943683	368569	406383	816919	298308
62	1723	2432	2099	1743	2169	61506	35108	36394	58349	30640	880552	330980	367914	756925	265563
63	1823	2381	2122	1851	2211	59783	32676	34295	56606	28471	819046	295872	331520	698576	234923
64	1926	2324	2137	1970	2229	57960	30295	32173	54755	26260	759263	263196	297225	641970	206452
65	2030	2264	2145	2096	2220	56034	27971	30036	52785	24031	701303	232901	265052	587215	180192
66	2133	2200	2143	2226	2185	54004	25707	27891	50689	21811	645269	204930	235016	534430	156161
67	2233	2130	2130	2359	2122	51871	23507	25748	48463	19626	591265	179223	207125	483741	134350
68	2328	2056	2101	2486	2034	49638	21377	23618	46104	17504	539394	155716	181377	435278	114724
69	2418	1975	2059	2608	1924	47310	19321	21517	43618	15470	489756	134339	157759	389174	97220
70	2498	1887	2000	2716	1798	44892	17346	19458	41010	13546	442446	115018	136242	345556	81750
71	2567	1792	1924	2806	1655	42394	15459	17458	38294	11748	397554	97672	116784	304546	68204
72	2623	1692	1834	2873	1506	39827	13667	15534	35488	10093	355160	82213	99326	266252	56456
73	2662	1582	1729	2913	1351	37204	11975	13700	32615	8587	315333	68546	83792	230764	46363
74	2685	1468	1612	2919	1197	34542	10393	11971	29702	7236	278129	56571	70092	198149	37776
75	2685	1347	1485	2892	T046	31857	8925	10359	26783	6039	243587	46178	58121	168447	30540
76	2666	1224	1351	2827	904	29172	7578	8874	23891	4993	211730	37253	47762	141664	24501
77	2623	1096	1213	2725	771	26506	6354	7523	21064	4089	182558	29675	38888	117773	19508
78	2557	970	1076	2587	650	23883	5258	6310	18339	3318	156052	23321	31365	96709	15419
79	2467	845	941	2419	541	21326	4288	5234	15752	2668	132169	18063	25055	78370	12101
80	2355	725	811	2221	445	18859	3443	4293	13333	2127	110843	13775	19821	62618	9433
81	2223	610	691	2005	363	16504	2718	3482	11112	1682	91984	0332	15528	49285	7306
82	2070	504	579	1775	292	14281	2108	2791	9107	1319	75480	7614	12046	38173	5624
83	1905	409	479	1540	234	12211	1604	2212	7332	1027	61199	5506	9255	29066	4305
84	1727	324	390	1307	184	10306	1195	1733	5792	793	48988	3902	7043	21734	3278
85	1542	250	314	1086	144	8579	871	1343	4485	609	38682	2707	5310	15942	2485
86	1356	190	249	880	112	7037	621	1029	3399	465	30103	1836	3967	11457	1876
87	1171	139	195	697	87	5681	431	780	2519	353	23066	1215	2938	8058	1411
88	994	100	151	537	66	4510	292	585	1822	266	17385	784	2158	5539	1058
89	826	69	114	402	50	3516	192	434	1285	200	12875	492	1573	3717	792
90	674	47	87	293	38	2690	123	320	883	150	9359	300	1139	2432	592
91	538	31	64	207	28	2016	76	233	590	112	6669	177	819	1549	442
92	419	19	48	142	22	1478	45	169	383	84	4653	101	586	959	330
93	318	11	34	95	15	1059	26	121	241	62	3175	56	417	576	246
94	236	7	25	60	12	741	15	87	146	47	2116	30	296	335	184
95	170	4	18	37	9	505	8	62	86	35	1375	15	209	189	137
96	120	2	13	22	7	335	4	44	49	26	870	7	147	103	102
97	80	1	9	13	4	215	2	31	27	19	535	3	103	54	76
98	54	1	7	7	4	135	1	22	14	15	320	1	72	27	57
99	34	.	4	4	2	81	.	15	7	11	185	.	50	13	42
100	20	.	3	1	2	47	.	11	3	9	104	.	35	6	31
101	12	.	2	1	2	27	.	8	2	7	57	.	24	3	23
102	7	.	2	1	1	15	.	6	1	5	30	.	16	1	15
103	4	.	1	.	1	8	.	4	.	4	15	.	10	.	10
104	2	.	1	.	1	4	.	3	.	3	7	.	6	.	6
105	1	.	1	.	1	2	.	2	.	2	3	.	3	.	3
106	1	.	1	.	1	1	.	1	.	1	1	.	1	.	1

AFTER-LIFETIME of MALES of DIFFERENT CLASSES.

AGE.	Males of all Classes.		Miners.			
	England and Wales.	63 Healthy Country Districts.	(1) Cornish Districts.	(2) Staffordshire Districts.	(3) Durham and Northumberland Districts.	(4) Merthyr Tydfil District.
	Years.	Years.	Years.	Years.	Years.	Years.
20 - -	39·425	43·456	34·862	33·307	42·016	30·575
25 - -	36·041	39·972	31·390	30·557	38·110	27·401
30 - -	32·681	36·483	27·755	27·706	34·563	24·841
35 - -	29·338	32·945	23·987	24·716	30·999	22·352
40 - -	26·018	29·342	20·314	21·644	27·387	19·765
45 - -	22·741	25·700	16·963	18·591	23·836	17·121
50 - -	19·545	22·078	14·064	15·666	20·447	14·463
55 - -	16·506	18·505	11·702	12·992	17·127	11·742
60 - -	13·614	15·094	9·688	10·530	13·772	9·079
65 - -	10·910	12·016	7·827	8·324	10·625	6·998
70 - -	8·524	9·356	6·131	6·502	7·926	5·535
75 - -	6·547	7·146	4·674	5·111	5·789	4·557
80 - -	4·992	5·378	3·501	4·117	4·196	3·934

TABLE .—LIFETIME ENJOYED and LIFETIME LOST by DIFFERENT CLASSES of ENGLISHMEN.

AGES.	(A) LIFETIME PAST in *Health* or in *Sickness* after the Age of 20 years.						(B) LIFETIME LOST after the Age of 20 years.					
	Healthy Districts.	Miners.				*England and Wales.*	*Healthy Districts.*	Miners.				*England and Wales.*
		Durham and Northumberland.	Staffordshire.	Merthyr Tydfil.	Cornwall.			Durham and Northumberland.	Staffordshire.	Merthyr Tydfil.	Cornwall.	
AFTER-LIFETIME - - -	43·5	42·0	33·3	30·6	34·9	39·4	36·5	38·0	46·7	49·4	45·1	40·6
20–40 (Athletic Age) - - -	18·5	18·6	17·3	17·0	18·2	18·2	1·5	1·4	2·7	3·0	1·8	1·8
40–60 (Intellectual Age) - -	15·2	14·9	11·7	10·4	12·8	13·8	4·8	5·1	8·3	9·6	7·2	6·2
60–80 (Mature Age) - - -	8·8	7·9	4·1	3·1	3·8	6·8	11·2	12·1	15·9	16·9	16·2	13·2
80 and upwards (Monumental Age) -	1·0	·6	·2	·1	·1	·6	19·0	19·4	19·8	19·9	19·9	19·4

AGES.	(C) Estimated HEALTH-TIME after the Age of 20 years.						(D) Estimated SICK and INFIRM-TIME after the Age of 20 years.					
	Healthy Country Districts.	Miners.				*England and Wales.*	*Healthy Country Districts.*	Miners.				*England and Wales.*
		Durham and Northumberland.	Staffordshire.	Merthyr Tydfil.	Cornwall.			Durham and Northumberland.	Staffordshire.	Merthyr Tydfil.	Cornwall.	
AFTER-LIFETIME - - -	40·5	39·0	30·3	27·6	31·9	36·4	3·0	3·0	3·0	3·0	3·0	3·0
20–40 (Athletic Age) - - -	18·0	18·2	16·5	16·1	17·7	17·6	·5	·4	·8	·9	·5	·6
40–60 (Intellectual Age) - -	14·6	14·2	10·7	9·4	11·5	13·0	·6	·7	1·0	1·0	1·3	·8
60–80 (Mature Age) - - -	7·4	6·4	3·0	2·1	2·7	5·6	1·4	1·5	1·1	1·0	1·1	1·2
80 and upwards (Monumental Age) -	·5	·2	·1	·0	·0	·2	·5	·4	·1	·1	·1	·4

This Table shows the AFTER-LIFETIME (A) at the age of 20 in the whole male population of 63 of the HEALTHIEST DISTRICTS of England and Wales, among the MINERS of *four great mining fields*, and in the whole male population of England and Wales. The *after lifetime* is the *average number of years* that people live *after* any given age; it is sometimes called the *expectation of life*. Thus at the age 20 the *after-lifetime* is 43·5 years in the Healthy Districts; and that is the number of years which, *on an average*, persons there at the age 20 will live; of these years 18·6 will be enjoyed on an average at the age 20–40; 15·2 at the age 40–60; 8·8 at the age 60–80; and 1·0 at the age 80 and upwards. Again, *one* entering annually at the age 20 would maintain a constant population of 43·5; namely, 18·5 of the age 20–40; 15·2, 8·8, and 1·0 of the three subsequent ages.* Contrast this result with that deduced from the law of mortality in the mining field of Staffordshire; there one entering annually would maintain a constant population of only 33·3 miners; namely, 17·3, 11·7, 4·1, and ·2 of the four ages.

This *Lifetime* is divisible into two portions, which may be called *Health-time* (C) and *Sick-time* (D), including all real infirmity. The proportions of these times have not yet been precisely determined; but it has been assumed, hypothetically, that there are 3 constantly sick or infirm persons to every annual death; and this hypothesis represents tolerably well the results of several observations on sickness and infirmity. The numbers in the columns under part (D) are derived from the deaths in the Life Table, and with the numbers in part (C) they make up the *Lifetime* in part (A).

If every person of the age of 20 lived to the age of 100 years they would live through 80 years of *after-life time*; while in the Healthy Districts they only live on an average 43·5: when this is deducted from 80 it leaves 36·5 years of *Lifetime lost* (B), namely, 1·5 years, 4·8 years, 11·2 years, and 19·0 years in the four ages of life. The *lifetime lost* in the mining districts of Staffordshire is 46·7 years; namely 2·7, 8·3, 15·9, and 19·8 years in the four ages.

* These numbers may be read without reference to the decimal points by assuming that *ten* persons instead of *one* enter annually. Thus ten persons entering annually at the age 20 would maintain a constant population of 435; namely, 185, 152, 88 and 10 of the four ages.

TABLE .—ANNUAL DEATH RATE per Cent. of different CLASSES of ENGLISHMEN (1849-53).

AGES.	ANNUAL DEATH RATE PER CENT.					
	Healthy Country Districts.	MINERS.				ENGLAND AND WALES.
		Durham and Northumberland.	Staffordshire.	Merthyr Tydfil.	Cornwall.	
Age of 20 and upwards - -	2·30	2·38	3·00	3·27	2·87	2·54
20–40 (Athletic Age) - - -	·81	·79	1·51	1·85	·99	1·02
40–60 (Intellectual Age) -	1·34	1·60	2·84	3·25	3·28	1·97
60–80 (Mature Age) - -	5·24	6·09	8·86	10·62	9·74	6·18
80 and upwards (Monumental Age) -	18·60	23·83	24·29	25·42	28·57	20·03

TABLE .—ESTIMATED ANNUAL RATE per Cent. of the NUMBERS constantly SICK or INFIRM amongst different CLASSES of ENGLISHMEN (1849-53).

AGES.	CONSTANTLY SICK OR INFIRM.					
	Healthy Country Districts.	MINERS.				ENGLAND AND WALES.
		Durham and Northumberland.	Staffordshire.	Merthyr Tydfil.	Cornwall.	
Age of 20 and upwards - -	6·90	7·14	9·00	9·81	8·61	7·62
20–40 (Athletic Age) - - -	2·43	2·37	4·53	5·55	2·97	3·06
40–60 (Intellectual Age) - - -	4·02	4·80	8·52	8·75	9·84	5·91
60–80 (Mature Age) - - -	15·72	18·27	26·58	31·86	29·22	18·54
80 and upwards (Monumental Age) -	55·80	71·49	72·87	76·26	85·71	60·09

NUMBER of MINERS (Males) living in ENGLAND and WALES in 1851.

——	AGES OF MINERS LIVING.									
	Total Living at 10 Years and upwards.	10—	15—	25—	35—	45—	55—	65—	75—	85 and upwards.
TOTAL MINERS living in 1851	252,398	30,668	84,708	59,568	37,442	22,888	11,497	4,386	1,118	123
Coal Miners - - - -	182,180	23,038	61,604	42,591	26,556	15,955	8,192	3,309	838	97
Copper, Tin, Lead, and Iron Miners	70,218	7,630	23,104	16,977	10,886	6,933	3,305	1,077	280	26

VIOLENT DEATHS at different Ages in the MINES of ENGLAND and WALES during the Five Years 1849-53.

	Ages at Death.										
	Total Deaths at 10 Years and upwards.	10—	15—	25—	35—	45—	55—	65—	75—	85 and upwards.	?
ALL MINERS	4,914	715	1,487	1,156	763	470	224	76	9	2	12
COAL MINERS	4,532	685	1,368	1,063	702	429	201	68	8	2	6
Drowned	39	2	11	13	7	4	2	—	—	—	—
Fall in Pit or Shaft	836	152	240	171	144	72	39	13	3	1	1
Crushed and injured by fall of Coal, &c.	2,141	284	597	504	344	244	124	36	4	1	3
Blasting	45	4	17	11	7	4	1	—	—	—	1
Explosions and Choke Damp	1,321	218	462	337	175	88	25	14	1	—	1
All other Causes	150	25	41	27	25	17	10	5	—	—	—
COPPER, TIN, LEAD, AND IRON MINERS	382	30	119	93	61	41	23	8	1	—	6
Drowned	13	2	7	3	—	1	—	—	—	—	—
Fall in Pit or Shaft	122	11	43	28	23	11	6	—	—	—	—
Crushed and injured by fall of Stone, &c.	149	6	46	34	23	17	13	5	1	—	4
Blasting	39	—	8	10	10	7	2	—	—	—	2
All other Causes	59	11	15	18	5	5	2	3	—	—	—

ANNUAL MORTALITY by VIOLENT DEATHS in MINES in ENGLAND during the Five Years 1849-53.

	Average Annual Number of Deaths to 100,000 Miners Living.										
	10 Years of Age and upwards.	Years of Age.									
		10—	15—	25—	35—	45—	55—	65—	75—	85—	95 and upwards.
ALL MINERS	389	466	353	389	409	411	390	347	161	325	—
COAL MINERS	498	595	446	500	529	538	491	411	191	412	—
Drowned	4	2	4	6	5	5	5	—	—	—	—
Fall in Pit or Shaft	92	132	78	80	108	90	95	79	72	206	—
Crushed and injured by fall of Coal, &c.	236	247	195	238	260	307	304	217	95	206	—
Blasting	5	3	6	5	5	5	2	—	—	—	—
Explosion and Choke Damp	145	189	150	158	132	110	61	85	24	—	—
All other Causes	16	22	13	13	19	21	24	30	—	—	—
COPPER, TIN, LEAD, AND IRON MINERS	109	79	105	112	116	118	139	149	71	—	—
Drowned	4	5	6	4	—	3	—	—	—	—	—
Fall in Pit or Shaft	35	29	37	33	42	32	36	—	—	—	—
Crushed and injured by fall of Stone, &c.	42	16	42	41	45	49	79	93	71	—	—
Blasting	11	—	7	13	20	20	12	—	—	—	—
All other Causes	17	29	13	21	9	14	12	56	—	—	—

The Deaths of Miners whose Ages were not stated have been distributed proportionally over the several Ages in the Tables.

TABLE 1.—MINING DISTRICTS. Miners living at the Ages 15 and upwards, 1861.

Districts.	Total Living.	Ages of Miners living (Males).								
		15–	25–	35–	45–	55–	65–	75–	85–	95 and upwards.
Total of 19 Mining districts.	100,948	36,931	26,241	18,025	11,235	5,985	2,078	430	23	—
1. Cornish Districts	25,866	11,054	5,471	4,101	2,937	1,640	555	102	6	—
2. Staffordshire Districts	28,108	9,298	8,085	5,473	3,123	1,496	527	101	5	—
3. Durham and Northumberland Districts.	31,766	11,040	8,354	5,741	3,562	2,057	804	198	10	—
4. South Wales Districts	15,208	5,539	4,331	2,710	1,613	792	192	29	2	—

Note.—The following are the 19 Districts comprised in this Table:

1. CORNISH DISTRICTS.—303, Liskeard. 306, St. Austell. 307, Truro. 309, Helston. 310, Redruth. 311, Penzance.
2. STAFFORDSHIRE DISTRICTS.—370, Wolstanton. 371, Stoke-on-Trent. 379, Wolverhampton. 380, Walsall. 381, West Bromwich. 382, Dudley.
3. DURHAM and NORTHUMBERLAND DISTRICTS.—542, Auckland. 545, Durham. 546, Easington. 547, Houghton-le-Spring. 548, Chester-le-Street. 553, Tynemouth.
4. SOUTH WALES DISTRICT.—582, Merthyr Tydfil.

The Table may be read thus:—Of the 100,948 Miners in 19 Mining Districts, living, of the ages 15 and upwards, 36,931 were aged 15 and under 25 years; 26,241 were aged 25 and under 35 years; 18,205 were aged 35 and under 45 years, and so on for the other ages given in the Table.

TABLE 2.—MINING DISTRICTS. Deaths from all Causes, of Miners aged 15 and upwards, in the Three Years 1860–2.

Districts.	Total Deaths.	Ages of Miners dying.								
		15–	25–	35–	45–	55–	65–	75–	85–	95 and upwards.
Total of 19 Mining Districts.	5,246	1,124	841	752	734	846	613	275	60	1
1. Cornish Districts	1,504	313	157	186	262	311	184	74	17	—
2. Staffordshire Districts	1,381	232	231	230	197	225	183	70	13	—
3. Durham and Northumberland Districts.	1,524	359	274	204	170	201	188	103	24	1
4. South Wales District	837	220	179	132	105	109	58	28	6	—

TABLE 3.—AGGREGATE NUMBER of Deaths of Miners in 19 Districts during the Three Years 1860–2.

Ages.	Deaths registered from													
	All Causes.	Smallpox.	Cholera and Diarrhœa.	Fever.	Other Zymotic Diseases.	Diseases of the Brain.	Heart Disease and Dropsy.	Consumption.	Diseases of the Lungs.	Diseases of the Stomach and Liver.	Diseases of the Kidneys.	Diseases of the Joints.	Violent Deaths.	Other Causes.
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
15–	1,124	16	4	109	22	29	23	293	51	41	7	8	476	45
25–	841	13	5	46	17	23	35	216	42	33	11	3	362	35
35–	752	5	5	33	7	29	56	189	70	33	11	6	268	40
45–	734	2	10	30	7	43	62	187	143	44	11	3	151	41
55–	846	1	10	20	14	64	94	190	226	46	7	3	100	71
65–	613	—	5	10	5	70	67	51	159	31	10	2	26	177
75–	275	—	9	1	2	19	10	6	47	9	9	—	3	160
85–	60	—	1	—	—	1	—	—	1	—	—	—	1	56
95 and upwards.	1	—	—	—	—	—	—	—	—	—	—	—	—	1
Total	5,246	37	49	249	74	278	347	1,132	739	237	66	25	1,387	626

TABLE 4.—ANNUAL RATE of MORTALITY per cent., (1) of MINERS; (2) of MALES EXCLUSIVE OF MINERS; (3) of MALES OF ALL CLASSES, in the Aggregate of the 19 Mining Districts, and in each of the Four Groups of Mining Districts, at different periods of Age, in the Three Years 1860–62.

Ages.	Aggregate of Mining Districts.			Cornish Districts.			Staffordshire Districts.			Durham and Northumberland Districts.			South Wales District.			Ages.
	Deaths annually to every 100 Males living at each Age.															
	Miners.	Males exclusive of Miners.	Males of all Classes.	Miners.	Males exclusive of Miners.	Males of all Classes.	Miners.	Males exclusive of Miners.	Males of all Classes.	Miners.	Males exclusive of Miners.	Males of all Classes.	Miners.	Males exclusive of Miners.	Males of all Classes.	
15 and upwards -	1·732	1·566	1·613	1·938	1·785	1·841	1·638	1·504	1·527	1·599	1·490	1·530	1·835	1·700	1·756	15 and upwards.
15–	1·015	·625	·749	·944	·750	·838	.832	·541	·593	1·084	·716	·861	1·324	·676	·986	15–
25–	1·068	·760	·854	·957	·832	·883	·952	·706	·754	1·093	·746	·878	1·378	1·023	1.181	25–
35–	1·391	1·107	1·185	1·512	1·008	1·187	1·401	1·137	1·183	1·184	1·023	1·081	1·624	1·297	1·424	35–
45–	2·178	1·661	1·789	2·974	1·250	1·789	2·103	1·839	1·878	1·591	1·617	1·608	2·170	1·586	1·801	45–
55–	4·712	2·940	3·322	6·321	1·996	3·014	5·013	3·396	3·601	3.257	2·598	2·804	4·588	4·112	4·269	55–
65–	9·833	6·656	7·169	11·051	5·331	6·173	11·575	7·535	7·942	7·794	6·231	6·651	10·069	8·188	8·598	65–
75–	21·318	14·043	14.820	24·183	13·356	14·222	23·102	15·331	15·859	17·340	12·595	13·508	32·184	15·137	17·232	75–
85 and upwards -	88·406	29·302	32·303	94·444	35·821	38·333	86·667	26·793	28·630	83·333	29·123	34·286	100·000	18·605	22·222	85 and upwards.

The Table may be read thus:—To every 100 Miners living in the aggregate of 19 Mining Districts at the age 15 and under 25 there were 1·015 deaths of Miners of the same age. In Cornish Districts ·944 Miners aged 15 and under 25 died annually to every 100 Miners of the same age living in those Districts.

TABLE 5.—ANNUAL RATE of MORTALITY per cent. (1) of MALES OF ALL CLASSES; (2) of MINERS; (3) of MALES EXCLUSIVE OF MINERS, in the aggregate of the 19 Mining Districts, and in each of the Four Groups of Mining Districts, at different periods of Age, in the Five Years 1849–53, and in the Three Years 1860–2.

Ages	Aggregate of Mining Districts.		Cornish Districts.		Staffordshire Districts.		Durham and Northumberland Districts.		South Wales District.		Ages.
	1849–53.	1860–2.	1849–53.	1860–2.	1849–53.	1860–2.	1849–53.	1860–2.	1849–53.	1860–2.	
	Annual Rate of Mortality among Males of all Classes.										
15 and upwards -	1·799	1·613	1·834	1·841	1·740	1·527	1·649	1·530	2·366	1.756	15 and upwards.
15–	·883	·749	·787	·838	·783	·593	·865	·861	1·669	·986	15–
25–	1·016	·854	·889	·883	·985	·754	·900	·878	1·619	1·181	25–
35–	1·343	1·185	1·148	1·187	1·386	1·183	1·129	1·081	2·057	1·424	35–
45–	2·190	1·789	2·025	1·789	2·308	1·878	1·853	1·608	3·016	1·801	45–
55–	3·546	3·322	3·203	3·014	3·897	3·601	2·960	2·804	4·689	4·269	55–
65–	7·243	7·169	6·469	6·173	8·143	7·942	6·468	6·651	8·522	8·598	65–
75–	16·332	14·820	15·066	14·222	18·185	15·859	14·905	13·508	20·213	17·232	75–
85 and upwards -	30·308	32·303	33·289	38·333	29·620	28·630	29·851	34·286	24·348	22·222	85 and upwards.
	Annual Rate of Mortality among Miners.										
15 and upwards -	1·811	1·732	1·797	1·938	2·024	1·638	1·312	1·599	2·618	1·835	15 and upwards.
15–	1·143	1·015	·890	·944	1·363	·832	·850	1·084	2·072	1·324	15–
25–	1·217	1·068	·896	·957	1·492	·952	·849	1·093	2·042	1·378	25–
35–	1·525	1·391	1·430	1·512	1·761	1·401	1·013	1·184	2·378	1·624	35–
45–	2·667	2·178	3·351	2·974	2·765	2·103	1·681	1·591	3·426	2·170	45–
55–	4·575	4·712	6·317	6·321	4·996	5·013	2·443	3·257	5·742	4·588	55–
65–	9·293	9·833	11·123	11·051	10·484	11·575	6·516	7·794	13·893	10·069	65–
75–	20·000	21·318	22·268	24·183	20·526	23·102	17·655	17·340	22·500	32·184	75–
85 and upwards -	40·000	88·406	72·000	94·444	30·000	86·667	35·000	83·333	53·333	100·000	85 and upwards.
	Annual Rate of Mortality among Males exclusive of Miners.										
15 and upwards -	1·795	1·566	1·854	1·785	1·685	1·504	1·855	1·490	2·214	1·700	15 and upwards.
15–	·764	·625	·712	·750	·656	·541	·876	·716	1·375	·676	15–
25–	·932	·760	·884	·832	·874	·706	·933	·746	1·352	1·023	25–
35–	1·277	1·107	·999	1·008	1·314	1·137	1·194	1·023	1·875	1·297	35–
45–	2·038	1·661	1·476	1·250	2·235	1·839	1·945	1·617	2·801	1·586	45–
55–	3·295	2·940	2·412	1·996	3·742	3·396	3·182	2·598	4·295	4·112	55–
65–	6·914	6·656	5·861	5·331	7·925	7·535	6·453	6·231	7·263	8·188	65–
75–	15·914	14·043	14·441	13·356	18·015	15·331	14·370	12·595	19·744	15·137	75–
85 and upwards -	29·534	29·302	31·944	35·821	29·589	26·793	29·153	29·123	22·326	18·605	85 and upwards.

TABLE 6.—ANNUAL RATE of MORTALITY per Cent. of MINERS by different Diseases and at different Ages in the Three Years 1860–62, in the Aggregate of the 19 Mining Districts.

Ages.	Annual Rate of Mortality to 100 living at each Age.														Ages.
	All Causes.	Small-pox.	Cholera and Diarrhœa.	Fever.	Other Zymotic Diseases.	Diseases of the Brain.	Heart Disease and Dropsy.	Consumption.	Diseases of the Lungs.	Diseases of the Stomach and Liver.	Diseases of the Kidneys.	Diseases of the Joints.	Violent Deaths.	Other Causes.	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	
15 and upwards	1·732	·012	·016	·082	·024	·092	·115	·374	·244	·078	·022	·008	·458	·207	15 and upwards.
15–	1·015	·014	·004	·098	·020	·026	·021	·264	·046	·037	·006	·007	·430	·042	15–
25–	1·068	·017	·006	·058	·022	·029	·044	·274	·053	·042	·014	·004	·460	·045	25–
35–	1·391	·009	·009	·061	·013	·054	·104	·350	·129	·061	·020	·011	·496	·074	35–
45–	2·178	·006	·030	·089	·021	·128	·184	·555	·424	·131	·033	·009	·448	·120	45–
55–	4·712	·006	·056	·111	·078	·356	·524	1.058	1·259	·256	·039	·017	·557	·395	55–
65–	9·833	—	·080	·160	·080	1·123	·075	·818	2·551	·497	.160	·032	·417	2·840	65–
75–	21·318	—	·698	·078	·155	1·473	·775	·465	3·643	·698	·698	—	·233	12·402	75–
85 and upwards	88·406	—	1·449	—	—	1·449	1—	—	1·449	—	—	—	1·449	82·610	85 and upwards.

TABLE 7.—LIFE TABLE showing (Col. 1.) to 10,000 MINERS (Males) at the Age 15, the Numbers surviving and attaining the Ages 25, 35, 45, &c.; also the Numbers dying in the Intervals (Col. 2.), with the Causes of their Death (Cols. 3. to 15.)

Ages.	Numbers living at each Age.	Dying between each Interval of Age from all Causes.	Dying by												
			Small-pox.	Cholera and Diarrhœa.	Fever.	Other Zymotic Diseases.	Diseases of the Brain.	Heart Disease and Dropsy.	Consumption.	Diseases of the Lungs.	Diseases of the Stomach and Liver.	Diseases of the Kidneys.	Diseases of the Joints.	Violent Deaths.	Other Causes.
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
15–	10,000	966	14	3	94	19	25	20	252	44	35	6	7	409	38
25–	9,034	915	14	5	50	18	25	38	235	46	36	12	3	394	39
35–	8,119	1,055	7	7	46	10	41	79	265	98	46	15	8	376	57
45–	7,064	1,383	4	19	57	13	81	117	352	269	83	21	6	285	76
55–	5,681	2,135	3	25	50	35	162	237	480	570	116	18	8	252	179
65–	3,546	2,221	—	18	36	18	254	243	185	576	112	36	7	94	642
75–	1,325	1,169	—	38	4	9	81	43	26	200	38	38	—	13	679
85 and upwards.	156	156	—	3	—	—	3	—	—	3	—	—	—	3	144

TABLE 8.—NUMBER of MINERS (Males) living in ENGLAND and WALES in 1861.

	Ages of Miners living.										
	Total living at 10 Years and upwards.	10–	15–	25–	35–	45–	55–	65–	75–	85–	95 and upwards.
Total miners living in 1861	324,060	38,571	106,766	76,259	49,967	29,998	15,428	5,676	1,302	92	1
Coal miners	248,975	31,032	81,940	59,003	37,853	22,287	11,407	4,337	1,038	77	1
Copper, tin, lead, and iron miners	75,085	7,539	24,826	17,256	12,114	7,711	4,021	1,339	264	15	—

NOTE.—At the census of 1861 there were 7,460 males aged 10 years and upwards returned indefinitely as "*Miners*," and it was ascertained that the greater proportion of these were in the Metal Mining Districts. In this Table 3,197 of those indefinitely returned have been added to the coal miners, and 4,263 to the copper, tin, lead, and iron miners, distributed proportionally over the several Ages in the Table.

TABLE 9.—VIOLENT DEATHS at different Ages among the MINERS of ENGLAND and WALES during the Three Years 1860–2.

	Ages at Death.										
	Total Deaths at 10 Years and upwards.	10–	15–	25–	35–	45–	55–	65–	75–	85–	95 and upwards.
All miners	3,746	521	1,047	836	635	398	240	64	5	—	—
Coal miners	3,235	468	906	690	554	346	209	57	5	—	—
Drowned	58	8	13	8	13	9	5	2	—	—	—
Fall in pit or shaft	360	46	105	73	61	44	23	7	1	—	—
Crushed and injured by fall of coal, &c.	1,492	167	423	313	272	178	108	27	4	—	—
Blasting	46	2	14	11	10	3	4	2	—	—	—
Explosions and choke damp	849	96	255	222	142	76	47	11	—	—	—
Rope breaking	8	1	3	2	1	1	—	—	—	—	—
All other causes	422	148	93	61	55	35	22	8	—	—	—
Copper, tin, lead, and iron miners	511	53	141	146	81	52	31	7	—	—	—
Drowned	18	—	2	7	6	2	1	—	—	—	—
Fall in pit or shaft	122	22	40	24	20	6	8	2	—	—	—
Crushed and injured by fall of stones	270	19	73	87	40	30	17	4	—	—	—
Blasting	33	2	9	11	6	3	2	—	—	—	—
Other causes	68	10	17	17	9	11	3	1	—	—	—

TABLE 10.—ANNUAL MORTALITY by VIOLENT DEATHS in MINES in ENGLAND during the Three Years 1860–2.

	Average annual Number of Deaths to 100,000 Miners living at each Age.									
	Years of Age.									
	10 Years of Age and upwards.	10–	15–	25–	35–	45–	55–	65–	75–	85 and upwards.
All miners	385	450	327	365	424	442	519	376	128	—
Coal miners	433	503	369	390	488	517	611	438	160	—
Drowned	8	9	5	5	11	13	15	15	—	—
Fall in pit or shaft	48	49	43	41	54	66	67	54	32	—
Crushed and injured by fall of coal, &c.	198	179	172	177	240	266	316	208	128	—
Blasting	6	2	6	6	9	4	12	15	—	—
Explosions and choke damp	114	103	104	125	125	114	137	85	—	—
Rope breaking	1	1	1	1	1	1	—	—	—	—
All other causes	58	160	38	35	48	53	64	61	—	—
Copper, tin, lead, and iron miners	227	234	190	282	223	225	257	175	—	—
Drowned	8	—	3	14	17	9	8	—	—	—
Fall in pit or shaft	54	97	54	46	55	26	66	50	—	—
Crushed and injured by fall of stones, &c.	120	84	98	168	110	130	141	100	—	—
Blasting	15	9	12	21	17	13	17	—	—	—
All other causes	30	44	23	33	24	47	25	25	—	—

TABLE 11.—TABLE showing the Effects of the high Mortality of CORNISH MINERS on the VALUE OF THEIR LIVES, and on the PREMIUMS which they would have to pay for the Insurance of their Lives, as compared with the corresponding Value and Premiums in the HEALTHY DISTRICTS of England, and in ENGLAND generally (Rate of Interest 3 per cent.)

Age.	SINGLE PREMIUM which will insure £100 over the whole Term of Life.			ANNUAL PREMIUM which will insure £100 over the Whole Term of Life.			Age.
	Πx			πx			
x.	HEALTHY DISTRICTS. (Males.)	ENGLAND. (Males.)	CORNISH MINERS.	HEALTHY DISTRICTS. (Males.)	ENGLAND. (Males.)	CORNISH MINERS.	x.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	
20	32 3 5	35 14 11	39 4 0	1 7 7	1 12 5	1 17 6	20
21	32 13 4	36 5 9	39 16 10	1 8 3	1 13 2	1 18 7	21
22	33 3 5	36 16 10	40 9 11	1 8 11	1 14 0	1 19 8	22
23	33 13 7	37 8 2	41 3 3	1 9 7	1 14 10	2 0 9	23
24	34 4 0	37 19 8	41 17 1	1 10 3	1 15 8	2 1 11	24
25	34 14 6	38 11 5	42 11 6	1 11 0	1 16 7	2 3 2	25
26	35 5 4	39 3 5	43 6 6	1 11 9	1 17 6	2 4 6	26
27	35 16 5	39 15 8	44 2 2	1 12 6	1 18 6	2 6 0	27
28	36 7 10	40 8 2	44 18 7	1 13 4	1 19 6	2 7 6	28
29	36 19 6	41 1 0	45 15 8	1 14 2	2 0 7	2 9 2	29
30	37 11 7	41 14 1	46 13 5	1 15 1	2 1 8	2 11 0	30
31	38 4 0	42 7 6	47 11 10	1 16 0	2 2 10	2 12 11	31
32	38 16 10	43 1 3	48 10 11	1 17 0	2 4 1	2 14 11	32
33	39 10 0	43 15 3	49 10 6	1 18 0	2 5 4	2 17 2	33
34	40 3 7	44 9 7	50 10 8	1 19 1	2 6 8	2 19 6	34
35	40 17 7	45 4 3	51 11 3	2 0 3	2 8 1	3 2 0	35
36	41 12 1	45 19 2	52 12 3	2 1 6	2 9 7	3 4 8	36
37	42 6 11	46 14 6	53 13 6	2 2 9	2 11 1	3 7 6	37
38	43 2 3	47 10 0	54 15 0	2 4 2	2 12 8	3 10 6	38
39	43 18 0	48 5 11	55 16 8	2 5 7	2 14 5	3 13 7	39
40	44 14 1	49 2 1	56 18 4	2 7 1	2 16 2	3 16 11	40
41	45 10 9	49 18 6	58 0 0	2 8 8	2 18 1	4 0 5	41
42	46 7 9	50 15 4	59 1 8	2 10 5	3 0 1	4 4 1	42
43	47 5 3	51 12 5	60 3 2	2 12 2	3 2 2	4 7 11	43
44	48 3 1	52 9 9	61 4 5	2 14 1	3 4 4	4 12 0	44
45	49 1 5	53 7 4	62 5 5	2 16 1	3 6 8	4 16 2	45
46	50 0 1	54 5 3	63 6 2	2 18 3	3 9 1	5 0 6	46
47	50 19 2	55 3 6	64 6 6	3 0 6	3 11 8	5 5 0	47
48	51 18 8	56 2 0	65 6 6	3 2 11	3 14 5	5 9 9	48
49	52 18 7	57 0 9	66 6 1	3 5 6	3 17 4	5 14 7	49
50	53 18 10	57 19 9	67 5 3	3 8 3	4 0 5	5 19 8	50
51	54 19 5	58 19 1	68 4 0	3 11 1	4 3 8	6 4 11	51
52	56 0 5	59 18 3	69 1 9	3 14 2	4 7 1	6 10 2	52
53	57 1 10	60 17 7	69 18 9	3 17 6	4 10 8	6 15 6	53
54	58 3 6	61 17 1	70 15 2	4 1 0	4 14 6	7 0 11	54
55	59 5 8	62 16 11	71 11 2	4 4 10	4 18 6	7 6 6	55
56	60 8 1	63 16 10	72 6 10	4 8 10	5 2 10	7 12 4	56
57	61 11 0	64 17 0	73 2 4	4 13 3	5 7 6	7 18 5	57
58	62 14 2	65 17 3	73 17 8	4 18 0	5 12 5	8 4 10	58
59	63 17 10	66 17 8	74 13 0	5 3 1	5 17 8	8 11 6	59
60	65 1 3	67 18 2	75 8 3	5 8 6	6 3 3	8 18 8	60
61	66 4 3	68 18 9	76 3 7	5 14 2	6 9 3	9 6 3	61
62	67 7 0	69 19 3	76 18 10	6 0 2	6 15 8	9 14 4	62
63	68 9 5	70 19 9	77 14 1	6 6 6	7 2 6	10 3 0	63
64	69 11 6	72 0 1	78 9 4	6 13 3	7 9 10	10 12 3	64
65	70 13 5	73 0 3	79 4 7	7 0 4	7 17 7	11 2 2	65
66	71 15 0	74 0 2	79 19 8	7 8 0	8 5 11	11 12 9	66
67	72 16 4	74 19 10	80 14 9	7 16 0	8 14 8	12 4 1	67
68	73 17 4	75 19 2	81 9 7	8 4 8	9 4 1	12 16 3	68
69	74 18 0	76 18 2	82 4 3	8 13 10	9 14 0	13 9 3	69
70	75 18 3	77 16 8	82 18 8	9 3 7	10 4 7	14 3 1	70
71	76 18 1	78 14 9	83 12 10	9 13 11	10 15 9	14 17 11	71
72	77 17 5	79 12 5	84 6 9	10 5 0	11 7 7	15 13 8	72
73	78 16 4	80 9 6	85 0 3	10 16 9	12 0 1	16 10 5	73
74	79 14 9	81 6 1	85 13 5	11 9 3	12 13 4	17 8 3	74
75	80 12 7	82 2 1	86 6 1	12 2 6	13 7 3	18 7 1	75
76	81 9 11	82 17 6	86 18 4	12 16 6	14 1 11	19 7 0	76
77	82 6 7	83 12 4	87 10 2	13 11 5	14 17 4	20 8 2	77
78	83 2 9	84 6 8	88 1 8	14 7 2	15 13 6	21 10 6	78
79	83 18 2	85 0 4	88 12 6	15 3 9	16 10 6	22 13 10	79

TABLE 12.—TABLE showing the Effects of the SHORTENING OF THEIR LIVES on the VALUE of INCOMES or ANNUITIES secured on the Lives of CORNISH MINERS, as compared with the corresponding Value in the HEALTHY DISTRICTS OF ENGLAND, and in ENGLAND generally. (Rate of Interest 3 per cent.)

Age.	PRESENT VALUE of an ANNUITY of £1 a Year for Life (first Payment at Age x).		
	A x.		
x	HEALTHY DISTRICTS (Males).	ENGLAND (Males).	CORNISH MINERS.
	£ s. d.	£ s. d.	£ s. d.
20	23 5 9	22 1 3	20 17 6
25	22 8 2	21 1 10	19 14 4
30	21 8 7	20 0 3	18 6 2
35	20 6 0	18 16 3	16 12 7
40	18 19 8	17 9 6	14 15 10
45	17 9 9	16 0 2	12 19 1
50	15 16 3	14 8 6	11 4 9
55	13 19 7	12 15 2	9 15 4
60	11 19 11	11 0 4	8 8 10
65	10 1 5	9 5 4	7 2 8
70	8 5 5	7 12 2	5 17 2
75	6 13 0	6 2 11	4 14 0
80	5 5 5	4 18 5	3 14 6
85	4 3 2	3 18 9	2 19 2
90	3 6 1	3 3 7	2 6 6

EXAMPLE.—The present value of 1*l.* a year, to be paid during the life of a male aged 40 living in the healthy districts of England is 18*l.* 19*s.* 8*d.*; and the same value taken on an average male life in England generally is 17*l.* 9*s.* 6*d.*; whilst on the life of a Cornish miner aged 40 the present value of 1*l.* per annum is only 14*l.* 15*s.* 10*d.*

In the evidence of Dr. Farr, Chief of the Statistical Department of the General Register Office, is given the results of a very elaborate inquiry on the vital statistics of Miners in four of the chief mining districts of England and Wales, namely, in Cornwall, Durham, Northumberland, and Staffordshire, and Merthyr Tydfil, in South Wales. The number of Miners living between various ages in each group of districts was ascertained by the census of 1851, and the numbers dying between the corresponding ages, and of several diseases, were obtained from the Registrars of Deaths during the five years 1849-53, in nearly the middle of which period the census of 1851 was taken. Corresponding calculations have been made, based upon the census of 1861, and the Death Registers of the three years 1860–1 and 2. From these very extensive data the numbers and proportions of Miners living who survive to different ages have been calculated, and the numbers and proportions also who died at different periods of life and of various diseases are shown; the whole forming a more complete view of the vital statistics of a particular class of men than has ever been before obtained.

In the first place, Dr. Farr in his evidence proves, as is shown in the following table, compiled from those given by him, that there is an excessive death-rate amongst Cornish miners as compared with that amongst men of similar ages inhabiting the same districts, and therefore exposed to the same influences of climate, &c.; and must therefore be caused by peculiarities connected with their occupation.

ANNUAL DEATH-RATE per Cent.,—(1) of MINERS; (2) of MALES EXCLUSIVE OF MINERS; (3) of MALES OF ALL CLASSES, in SEVEN CORNISH DISTRICTS.

Ages.	In the Five Years 1849–53.			In the Three Years 1860–2.		
	Miners.	Males (exclusive of Miners).	Difference in the Death-rate of Miners and Non-Miners.	Miners.	Males (exclusive of Miners.)	Difference in the Death-rate of Miners and Non-Miners.
15 and upwards	1·797	1·854	·057	1·938	1·785	·153
15	·890	·712	·178	·944	·750	·194
25	·896	·884	·012	·957	·832	·125
35	1·430	·999	·431	1·512	1·008	·504
45	3·351	1·476	1·875	2·974	1·250	1·724
55	6·317	2·412	3·905	6·321	1·996	4·325
65 to 75	11·123	5·861	5·262	11·051	5·331	5·720

The table may be read thus:—the mortality among miners above 35 and below 45 years of age was 1·430 per cent. in the five years 1849–53, and 1·512 per cent. in the three years 1860–2.

It will be observed that at neither of these periods was there any marked excess in the death-rate amongst Miners below the age of 35, but that of those between 35 and 45 more than 4 per thousand died per annum of Miners than of other Cornishmen in the former, and 5 per thousand in the latter period. Between the ages of 45 and 55 more than twice as many, and between 55 and 65 three times as many Miners died in proportion to the number living as of other men not Miners residing in the same districts. The table indicates a small improvement in the health of Miners, or a postponement of the diseases which increase the death-rate at that age, and confirms the evidence given that the mines have been improved of late years, but shows that the improvement is not so great or so general as to have produced a marked diminution of the excessive mortality of miners.

The fact of there being a great excess of mortality amongst Miners above 35 years of age, beyond that amongst other men living in the same district, proves that Miners must be more exposed to causes of fatal disease than other Cornishmen, and while the fact that there is no marked excess of mortality among the younger men proves either that those causes do not generally produce fatal diseases quickly, or that the diseases produced are slow in their progress, conclusions which the direct inquiry of Dr. Peacock and Mr. Bankart fully confirm, as does also the evidence of all the medical and other witnesses examined on this point. The following tables quoted from Dr. Farr's evidence show that all Miners are not liable to such excess of fatal disease, for notwithstanding the greater liability of colliers to fatal accidents, the death-rate amongst them from all causes including accidents is considerably less than that of Cornish Miners, who are much less exposed to such dangers.

ANNUAL DEATH PER CENT. of MALES MINERS, and of MALES EXCLUSIVE of MINERS, in each of three Groups of MINING DISTRICTS at different Periods of Age:—

Ages.	1849–53.			1860–62.	
	Miners.	Excluding Miners.	Death-rate of Miners by violence.	Miners.	Excluding Miners.
CORNISH DISTRICTS.					
15 and upwards	1·797	1·854	—	1·943	1·785
15	·890	·712	·200	·944	·750
25	·896	·884	·211	·957	·832
35	1·430	·939	·188	1·512	1·008
45	3·351	1·476	·237	2·974	1·250
55	6·317	2·412	·148	6·321	1·996
65 to 75	11·123	5·861	·209	11·051	5·331
STAFFORDSHIRE DISTRICTS.					
15 and upwards	2·024	1·685	—	1·638	1·504
15	1·363	·656	·754	·832	·541
25	1·492	·874	·768	·952	·706
35	1·761	1·314	·823	1·401	1·137
45	2·765	2·235	·882	2·103	1·839
55	4·996	3·742	·680	5·013	3·396
65 to 75	10·484	7·925	·684	11·575	7·535
DURHAM AND NORTHUMBERLAND DISTRICTS.					
15 and upwards	1·312	1·855	—	1·599	1·490
15	·850	·876	·243	1·084	·716
25	·849	·933	·223	1·093	·746
35	1·013	1·194	·333	1·184	1·023
45	1·681	1·945	·370	1·591	1·617
55	2·443	3·182	·375	3·257	2·598
65 to 75	6·516	6·453	·290	7·794	6·231

Average Death per cent. of Males Miners—*cont.*

Ages.	1849-53.			1860-62.	
	Miners.	Excluding Miners.	Death-rate of Miners by violence.	Miners.	Excluding Miners.
SOUTH WALES DISTRICT (Merthyr Tydfil).					
15 and upwards	2·618	2·214	—	1·835	1·700
15	2·072	1·375	·705	1·324	·676
25	2·042	1·352	·612	1·378	1·023
35	2·378	1·875	·721	1·624	1·297
45	3·426	2·801	·812	2·170	1·586
55	5·742	4·295	·730	4·588	4·112
65 to 75	13·893	7·263	·611	10·069	8·188

Examination of the above tables shows no such marked difference in the death-rate of the mining and non-mining population of the colliery districts as is shown in the Cornish tables, and a great part of the difference is due to the excess of fatal accidents, particularly in the Staffordshire and South Wales districts. The following tables show the death-rate among different classes of Miners from violence, and the death-rate excluding deaths by violence. When these latter are excluded it will be seen that amongst colliers there is no such excess of death-rate as amongst Cornish Miners. Amongst the colliers of the Durham and Northumberland districts the death-rate, if deaths from violence be excluded, is at all ages below 75 considerably below the average, thus proving that mining is not necessarily an unhealthy occupation.

DEATH-RATE PER CENT. of MALES aged 15 Years and upwards in 5 Years 1849–53.

DEATH-RATE by VIOLENCE to 100 LIVING.

Ages.	All England.	MINERS.			
		Cornish.	Stafford.	Durham.	South Wales.
15	·089	·200	·754	·243	·705
25	·098	·211	·768	·223	·612
35	·115	·188	·823	·333	·721
45	·144	·237	·882	·370	·812
55	·160	·148	·680	·375	·730
65 to 75	·183	·209	·684	·290	·611
DEATH-RATE, excluding DEATHS by VIOLENCE.					
15	·725	·690	·609	·607	1·367
25	·910	·685	·724	·626	1·430
35	1·185	1·242	·938	·680	1·657
45	1·753	3·114	1·883	1·311	2·614
55	3·023	6·169	4·316	2·068	5·012
65 to 75	6·412	10·914	9·800	6·226	13·282

The following table shows the class of diseases by which the excessive death-rate of the Cornish Miners is chiefly produced.

Out of 10,000 deaths (from all causes) of males above 15, there were registered as deaths from consumption:—

——	In England.	Of Cornish Miners.	Difference.
15	312	247	65 less.
25	354	331	23 „
35	309	549	240 more.
45	263	1,206	943 „
55	186	1,394	1,208 „
65 to 75	85	652	567 „
Total -	1,509	4,379	2,970 more.

From other Lung Disease.

—	In England.	Of Cornish Miners.	Difference.
15	39	45	6 more.
25	63	56	7 less.
35	108	111	3 more.
45	191	292	101 „
55	314	315	1 „
65 to 75	384	278	106 less.
Total -	1,099	1,097	2 less.

From Consumption and other Lung Diseases.

15	351	292	59 less.
25	417	387	30 „
35	417	660	243 more.
45	454	1,498	1,044 „
55	500	1,709	1,209 „
65 to 75	469	930	461 „
Total -	2,608	5,476	2,868 more.

Out of 10,000 males who attain the age of 15, there were registered as dying of the following diseases :—

—	In England, all Occupations.	Miners in			
		Cornwall.	Stafford.	Durham.	S. Wales.
Diarrhœa and cholera	547	230	1,052	1,255	1,915
Fever - -	426	324	385	307	782
Diseased heart and dropsy - -	928	484	612	928	333
Consumption -	*1,523	4,439	680	948	1,604
Other lung disease -	1,343	1,157	1,975	1,010	1,433
Accident or violence	532	782	2,782	1,312	2,158
All lung disease -	2,866	5,596	2,655	1,958	3,037
Lung disease and accident - -	3,498	6,378	5,437	3,270	5,195

From the above table it appears that nearly three times as many Cornish Miners above 15 as of males above 15 in England are registered as dying of consumption, and a much greater proportion as compared with the coal miners of the Staffordshire and Durham districts, but it is certain that many, and probable that a large proportion, of the deaths registered as from consumption in Cornwall would be registered as from bronchitis, asthma, or other lung disease had the cases occurred in the other districts; it may therefore be expedient to make the comparison also between the deaths from all lung diseases, including consumption registered in the different districts. If this be done, it will be seen that 28⅔ per cent. of all the deaths in England among males above 15 are from lung disease, nearly twice as many in proportion or 56 per cent. are from lung disease amongst Cornish Miners, 26½ per cent. amongst the Miners of Staffordshire, 30⅓ amongst those at Merthyr, South Wales, but only 19½ per cent. amongst those of Durham. Part of the excessive mortality of the Staffordshire and Merthyr districts may be attributable to a very defective sanitary condition. The Durham and Northumberland Miners are chiefly colliers, and enjoy much greater domestic advantages than those of the other districts, there is a much lower death-rate, and especially a much smaller proportion of the deaths are caused by lung disease, and not much more than a third of the proportion amongst Cornish Miners, a fact which conclusively proves that the lung disease which causes two-thirds of the total number of deaths amongst them is not occasioned wholly or chiefly by working underground; the proportion of deaths from lung disease, including consumption, is little more than two-thirds (19½ to 28⅔ per cent.) of the average of Englishmen of like ages. It may be that the steady temperature of mines, (if they are well ventilated, free from gritty dust and gunpowder smoke, and where the men are not compelled to climb ladders,) may contribute to the comparative exemption of Durham colliers from consumption and other lung disease. The Iron Miners of Ulverston and Cleveland, and the Salt Miners of Cheshire are comparatively free from lung disease for the same reasons. If the Cornish Miners enjoyed a similar exemption from these causes of death, the average duration of their lives would be considerably greater instead of considerably less than that of other Englishmen, as is apparent from the following table :—

* These numbers include the deaths of men above 75.

Annual Death-rate, excluding Deaths from Consumption and other Lung Disease in Miners.

Ages.	Males: England.	Miners			
		Cornish.	Stafford.	Durham.	South Wales.
15	·450	·585	1·177	·556	1·498
25	·533	·454	1·223	·635	1·586
35	·766	·583	1·426	·827	1·786
45	1·216	·920	1·966	1·333	2·436
55	2·217	1·871	2·977	1·957	3·552
65	5·139	5·536	6·951	5·129	8·245

It will be remarked that at all ages between 25 and 65 the proportion of Cornish Miners who die from other causes than consumption and lung disease is small, and if the death-rate from those diseases were the same as it is amongst the Miners of Durham, the death-rate between the ages of 25 and 65 would be considerably below the average, notwithstanding the greater liability of Miners to fatal accidents, which is considerable, though very much less than that to which Coal Miners are exposed.

This is distinctly shown by the following table of the death-rate per thousand, excluding deaths by violence as well as those from consumption and from other lung disease :—

Annual Death-rate in 1,000 Males living above 15 at various Periods of Life, excluding Deaths from Violence, Consumption, and other Lung Disease.

—	In all England.	In Mining Districts.	
		Cornish.	Durham.
15	4	4	3
25	4	2·4	4
35	6	4	5
45	11	7	10
55	21	17	15
65 to 75	50	53	48

It will be noticed that if the excess of deaths above the average from violence and consumption be excluded, the death-rate of the miners in both the Cornish and Durham districts at no age below 65 is greater, and at most ages is much less, than that of the average of Englishmen.

The following tables show the difference in the death-rate from consumption, from other lung disease, and from violence amongst the Miners of the seven Cornish districts, at the two periods examined :

Annual Death-rate per Cent. of Miners in Cornish Districts at different Periods of Time.

Consumption.

Ages.	For 5 Years, 1849-53.	For 3 Years, 1860-62.	Difference.
15	·258	·332	·074 more.
25	·378	·366	·012 less.
35	·705	·650	·055 „
45	1·957	1·339	·618 „
55	3·626	3·008	·618 „
65 to 75	3·9 5	2·102	1·814 „

From other Diseases of the Lungs.

Ages.	For 5 Years, 1849-53.	For 3 Years, 1860-62.	Difference.
15	·047	·045	·002 less.
25	·064	·049	·015 „
35	·142	·139	·003 „
45	·474	·636	·172 more.
55	·820	1·321	·501 „
65 to 75	1·671	2·402	·731 „

Annual Death-rate per Cent. from Consumption and other Lung Diseases.

15	·305	·377	·065 more.
25	·442	·415	·027 less.
35	·847	·789	·158 „
45	2·431	1·975	·456 „
55	4·446	4·329	·117 „
65 to 75	5·587	4·504	1·083 „

It will be remarked that the death-rate from the diseases registered as consumption has been 6 per 1,000 less during the latter than in the earlier period among Miners between the ages of 45 and 65, and 18 per 1,000 less amongst those between 65 and 75, while the death-rate from other diseases of the lungs has been higher at the later period.

This may be owing to a difference of registration, some cases being now called by another name that might before have been registered as cases of consumption; but it further appears that the total death-rate from both consumption and from other lung diseases has been reduced by between four and five per thousand amongst Miners between 45 and 55 years old, but only rather more than one per thousand among those between 55 and 65. At that age the average death-rate from consumption amongst Englishmen in the years 1860–2, was ·317, and from other lung disease ·691, or together 1·008 per cent. or 10 per 1,000. Among Miners of the Cornish districts it was 4·329 per cent. or above 43 per 1,000, more than three times as great. The death-rate from consumption and other lung diseases in the years 1860–2 among Englishmen of all ages above 15 was ·635 per cent. or 6½ per 1,000. Among Miners of the Cornish districts it was 1·080 per cent. or nearly 11 per 1,000.

This great destruction of life amongst Miners of middle age of course diminishes their "expectation of life," *i.e.*, the probability of their surviving as long as other men of like ages. The amount of this shortening of life has been calculated by Dr. Farr.

Table 1.

Average Annual Rate of Mortality per Cent. in the Three Years 1860–62 from Pulmonary Diseases amongst the Non-Mining Population of the Cornish Mining Districts.

Ages.	Males (exclusive of Miners) living in 1861.	Deaths from Pulmonary Diseases in the 3 Years 1860–62.	Average Annual Rate of Mortality per Cent.
15 and upwards - -	45,107	657	·486
15— - - - -	13,327	132	·330
25— - - - -	8,009	92	·383
35— - - - -	7,470	95	·424
45— - - - -	6,452	84	·434
55— - - - - -	5,328	83	·519
65— - - - -	3,214	101	1·048
75— - - -	1,173	61	1·733
85 and upwards - -	134	9	2·239

Note.—The districts comprised in this table are the same six districts as were given in the previous tables for Cornish Miners, viz., Liskeard, St. Austell, Truro, Helston, Redruth, and Penzance.

Pulmonary diseases comprise phthisis and diseases of the respiratory organs.

The table is read thus :—To every 100 living of the non-mining population aged 15 and upwards, of the six Cornish districts, ·486 died annually in the three years (or 4·86 in 1,000).

TABLE 1 A.

AVERAGE ANNUAL RATE OF MORTALITY per Cent. in the Three Years 1860–62 from PULMONARY DISEASES among the NON-MINING POPULATION in Six Groups of NORTHERN METAL MINING DISTRICTS.

(For contents of these groups see note to Table 2.)

Ages.	Males (exclusive of Miners) living in 1861.	Deaths from Pulmonary Diseases in the 3 Years 1860–62.	Average Annual Rate of Mortality per Cent.
15 and upwards - -	39,296	688	·583
15— - - - -	11,092	132	·397
25— - - - -	8,163	128	·515
35— - - - -	7,108	74	·352
45— - - - -	5,563	86	·521
55— - - - -	3,880	83	·722
65— - - - -	2,466	131	1·744
75— - - - -	901	49	1·776
85 and upwards - -	123	5	1·626

NOTE.—This table is to be read in a similar manner to Table 1.

Table 2.

Average Annual Rate of Mortality per Cent. in the Three Years 1860—62 from All Causes, and from Pulmonary Diseases amongst the Metalliferous Miners, and amongst the Male Population, exclusive of Metal Miners, in the Lead Mining Districts of Lancashire, Northumberland, Durham, Cumberland, Westmoreland, and Yorkshire and in the Lead and Copper Mining Districts of North Wales.

Ages.	Average Annual Deaths to 100 Living.																Ages.
	Aggregate of 6 groups of districts (excluding North Wales).		Lancashire Districts.		Yorkshire Districts.		Durham. Districts.		Northumberland Districts.		Cumberland Districts.		Westmoreland Districts.		North Wales Districts.		
	All Causes.	Pulmonary Diseases.	All Causes.	Pulmonary Diseases.	All Causes.	Pulmonary Diseases.	All Causes.	Pulmonary Diseases.	All Causes.	Pulmonary Diseases.	All Causes.	Pulmonary Diseases.	All Causes.	Pulmonary Diseases.	All Causes.	Pulmonary Diseases.	
Metal Miners.																	
15 and upwards -	2·100	1·102	2·270	·826	2·077	1·009	2·107	1·104	2·342	1·471	1·998	1·138	·803	—	2·524	1·251	15 and upwards.
15— - -	·953	·340	·397	·397	1·097	·425	1·141	·269	·421	·253	·881	·474	—	—	·604	·302	15—
25— - -	1·238	·640	1·626	·813	1·263	·536	1·267	·828	1·320	·770	1·166	·486	—	—	1·572	·419	25—
35— - -	1·764	1·176	3·390	1·130	2·235	1·213	1·401	1·120	1·746	1·429	1·455	·794	—	—	1·805	1·062	35—
45— - -	3·311	2·318	5·051	1·010	2·626	1·826	3·444	2·333	4·464	3·571	3·486	2·179	—	—	2·574	1·471	45—
55— - -	7·834	4·147	1·852	—	5·517	2·529	8·108	4·054	12·727	7·879	8·995	6·878	13·333	—	5·519	3·532	55—
65— - -	12·752	5·369	22·222	11·111	11·728	6·790	11·333	4·000	14·286	4·762	17·949	7·692	—	—	8·696	4·831	65—
75— - -	26·667	6·667	11·111	—	33·333	8·333	19·048	9·524	11·111	5·556	50·000	16·667	—	—	22·222	—	75—
85 and upwards -	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50·000	—	85 and upwards.
Males, exclusive of Metal Miners.																	
15 and upwards -	1·965	·583	2·645	·792	1·908	·508	1·779	·612	1·899	·537	2·005	·756	2·375	·519	1·938	·681	15 and upwards.
15— - -	·757	·397	·737	·527	·784	·385	1·178	·565	·491	·333	·742	·353	·381	·286	·746	·339	15—
25— - -	·919	·515	·976	·751	·902	·475	·856	·494	·826	·469	1·098	·605	·939	·782	1·052	·579	25—
35— - -	1·013	·352	1·720	·491	·873	·274	·853	·310	1·043	·451	1·195	·398	1·314	·493	1·257	·541	35—
45— - -	1·618	·521	2·047	·487	1·451	·380	1·227	·393	1·701	·622	2·001	·794	2·094	·698	1·519	·706	45 —
55— - -	2·938	·722	3·492	1·270	2·440	.526	2·931	1·005	3·051	·455	3·776	1·187	3·881	·685	2·811	1·221	55—
65— - -	6·610	1·744	9·259	2·083	6·278	1·689	6·938	2·112	6·610	1·635	6·522	2·174	6·250	·417	7·578	1·696	65—
75— - -	15·427	1·776	26·667	3·333	13·768	1·087	13·655	2·008	14·545	1·010	18·018	5·706	20·833	—	12·940	2·110	75—
85 and upwards -	28·455	1·626	200·000	—	31·148	1·639	22·917	—	23·333	1·111	18·519	3·704	27·778	—	37·681	1·449	85 and upwards.

Note.—The following are the Districts and Sub-Districts comprised in this table, being those comprised in the printed abstracts of "Deaths of Males aged ten years and upwards":—

1. Lancashire - - Ulverstone (Sub-district).
2. Yorkshire - - Skirlaugh, Marske, Kirkleatham Sub-districts; the Districts of Bedale, Leyburn, Askrigg, and Reeth; and the Sub-districts of Kettlewell, Skipton, Grassington, Ramsgill, and Pateley Bridge.
3. Durham - - Sub-district of Middleton; and the District of Weardale.
4. Northumberland - Sub-districts of Bywell, Hexham, and Allendale.
5. Cumberland - - District of Alston, and Sub-districts of Keswick and Whitehaven.
6. Westmorelard - Sub-district of Lowther.
7. North Wales - District of Hollywell.

Pulmonary Diseases comprise Phthisis and Diseases of the Respiratory Organs.

The facts on which the above Rates are calculated are in many instances so few in number that deductions drawn from them should be made with some caution. (*See accompanying Table of Facts.*)

TABLE 3.

MALES LIVING aged 15 and upwards in the Year 1861 in the undermentioned Groups of Districts.

Groups of Districts.	—	Males of 15 and upwards.	AGES.							
			15—	25—	35—	45—	55—	65—	75—	85 and upwards.
1. Lancashire Districts	Males of all occupations	2,554	717	567	466	375	228	147	53	1
	Metal Miners	323	84	123	59	33	18	3	3	—
	Males, exclusive of Metal Miners	2,231	633	444	407	342	210	144	50	1
2. Yorkshire Districts	Males of all occupations	20,243	5,703	4,383	3,805	2,658	1,921	1,238	472	63
	Metal Miners	2,840	942	871	522	292	145	54	12	2
	Males, exclusive of Metal Miners	17,403	4,761	3,512	3,283	2,366	1,776	1,184	460	61
3. Durham Districts	Males of all occupations	7,285	2,351	1,696	1,336	979	546	271	90	16
	Metal Miners	2,658	993	684	476	300	148	50	7	—
	Males, exclusive of Metal Miners	4,627	1,358	1,012	860	679	398	221	83	16
4. Northumberland Districts	Males of all occupations	8,306	2,500	1,797	1,393	1,131	787	497	171	30
	Metal Miners	1,110	396	303	210	112	55	28	6	—
	Males, exclusive of Metal Miners	7,196	2,104	1,494	1,183	1,019	732	469	165	30
5. Cumberland Districts	Males of all occupations	7,936	2,378	1,831	1,424	1,119	681	381	113	9
	Metal Miners	1,318	492	343	252	153	63	13	2	—
	Males, exclusive of Metal Miners	6,618	1,837	1,488	1,172	966	618	368	111	9
6. Westmoreland Districts	Males of all occupations	1,304	380	232	215	207	151	81	32	6
	Metal Miners	83	30	19	12	16	5	1	—	—
	Males, exclusive of Metal Miners	1,221	350	213	203	191	146	80	32	6
7. North Wales Districts	Males of all occupations	12,626	3,773	2,505	2,224	1,830	1,325	698	246	25
	Metal Miners	1,466	331	318	314	272	151	69	9	2
	Males, exclusive of Metal Miners	11,160	3,442	2,187	1,910	1,558	1,174	629	237	23
Total of 6 Groups of Districts, North, (excluding Wales Districts)	Males of all occupations	47,628	14,029	10,506	8,639	6,469	4,314	2,615	931	125
	Metal Miners	8,332	2,937	2,343	1,531	906	434	149	30	2
	Males, exclusive of Metal Miners	39,296	11,092	8,163	7,108	5,563	3,880	2,466	901	123

NOTE.—For names of Districts, &c., included in the above Groups see Table 2.

TABLE 4.—DEATHS of MALES (OF ALL OCCUPATIONS) aged 15 and upwards in the undermentioned Groups of Districts in the Three Years 1860–62.

Groups of Districts.	Cause of Death.	Males of 15 and upwards.	Ages. 15—	25—	35—	45—	55—	65—	75—	85 and upwards.
1. Lancashire Districts	All causes	199	15	19	27	26	23	42	41	6
	Pulmonary diseases	61	11	13	8	6	8	10	5	—
2. Yorkshire Districts	All causes	1,173	143	128	121	126	154	242	202	57
	Pulmonary diseases	351	67	64	46	43	39	71	18	3
3. Durham Districts	All causes	415	82	52	42	56	71	63	38	11
	Pulmonary diseases	173	31	32	24	29	30	20	7	—
4. Northumberland Districts	All causes	488	36	49	48	67	88	105	74	21
	Pulmonary diseases	165	24	28	25	31	23	27	6	1
5. Cumberland Districts	All causes	477	55	61	53	74	87	79	63	5
	Pulmonary diseases	195	27	32	20	33	35	27	20	1
6. Westmoreland Districts	All causes	89	4	6	8	12	19	15	20	5
	Pulmonary diseases	19	3	5	3	4	3	1	—	—
7. North Wales Districts	All causes	760	83	84	89	92	124	161	98	29
	Pulmonary diseases	283	38	42	41	45	59	42	15	1
Total of six groups, 1–6 (excluding North Wales Districts)	All causes	2,841	335	315	299	361	442	546	438	105
	Pulmonary diseases	964	163	174	126	146	138	156	56	5

TABLE 5.—DEATHS of MALES (EXCLUSIVE OF METALLIFEROUS MINERS) aged 15 and upwards in the undermentioned Groups of Districts in the Three Years 1860–62.

Groups of Districts.	Cause of Death.	Males of 15 and upwards.	Ages. 15—	25—	35—	45—	55—	65—	75—	85 and upwards.
1. Lancashire Districts	All causes	177	14	13	21	21	22	40	40	6
	Pulmonary diseases	53	10	10	6	5	8	9	5	—
2. Yorkshire Districts	All causes	996	112	95	86	103	130	223	190	57
	Pulmonary diseases	265	55	50	27	27	28	60	15	3
3. Durham Districts	All causes	247	48	26	22	25	35	46	34	11
	Pulmonary diseases	85	23	15	8	8	12	14	5	—
4. Northumberland Districts	All causes	410	31	37	37	52	67	93	72	25
	Pulmonary diseases	116	21	21	16	19	10	23	5	1
5. Cumberland Districts	All causes	398	42	49	42	58	70	72	60	5
	Pulmonary diseases	150	20	27	14	23	22	24	19	1
6. Westmoreland Districts	All causes	87	4	6	8	12	17	15	20	5
	Pulmonary diseases	19	3	5	3	4	3	1	—	—
7. North Wales Districts	All causes	649	77	69	72	71	99	143	92	26
	Pulmonary diseases	228	35	38	31	33	43	32	15	1
Total of groups, 1–6 (excluding North Wales Districts)	All causes	2,315	251	226	216	271	341	489	416	105
	Pulmonary diseases	688	132	128	74	86	83	131	49	5

TABLE 6.—DEATHS of METALLIFEROUS MINERS aged 15 and upwards in the undermentioned Groups of Districts in the Three Years 1860–62.

Groups of Districts.	Cause of Death.	Males of 15 and upwards.	Ages.							
			15—	25—	35—	45—	55—	65—	75—	85 and upwards.
1. Lancashire Districts	All causes	22	1	6	6	5	1	2	1	—
	Pulmonary diseases	8	1	3	2	1	—	1	—	—
2. Yorkshire Districts	All causes	177	31	33	35	23	24	19	12	—
	Pulmonary diseases	86	12	14	19	16	11	11	3	—
3. Durham Districts	All causes	168	34	26	20	31	36	17	4	—
	Pulmonary diseases	88	8	17	16	21	18	6	2	—
4. Northumberland Districts	All causes	78	5	12	11	15	21	12	2	—
	Pulmonary diseases	49	3	7	9	12	13	4	1	—
5. Cumberland Districts	All causes	79	13	12	11	16	17	7	3	—
	Pulmonary diseases	45	7	5	6	10	13	3	1	—
6. Westmoreland Districts	All causes	2	—	—	—	—	2	—	—	—
	Pulmonary diseases	—	—	—	—	—	—	—	—	—
7. North Wales Districts	All causes	111	6	15	17	21	25	18	6	3
	Pulmonary diseases	55	3	4	10	12	16	10	—	—
Total of groups, 1-6, excluding North Wales Districts	All causes	526	84	89	83	90	101	57	26	—
	Pulmonary diseases	276	31	46	52	60	55	25	7	—

TABLE 7.—Average Annual Number of Deaths per 1,000 Males at the undermentioned Ages in six groups of Mining Districts during the Three Years 1860-62.

Ages.	Cornish Districts.		Durham and Northumberland Coal Districts.		Staffordshire Districts.		Merthyr Tydfil.		North Wales (Holywell District) lead and tin.		Northern Counties Metal Mining Districts (principally Lead.)	
	Miners.	Males (exclusive of Miners).	Miners.	Males (exclusive of Miners).	Miners.	Males (exclusive of Miners).	Miners.	Males (exclusive of Miners).	Miners.	Males (exclusive of Miners).	Miners	Males (exclusive of Miners).
Between 25 and 35 years	9·57	8·32	10·93	7·46	9·52	7·06	13·78	10·23	15·72	10·52	12·38	9·19
„ 35 and 45 „	15·12	10·08	11·84	10·23	14·01	11·37	16·24	12·97	18·05	12·57	17·64	10·13
„ 45 and 55 „	29·74	12·50	15·91	16·17	21·03	18·39	21·70	15·86	25·74	15·19	33·11	16·18
„ 55 and 65 „	63·21	19·96	32·57	25·98	50·13	33·96	45·88	41·12	55·19	28·11	78·34	29·38

IV.

CORNISH MINES.

Report on Samples of Air and on Materials used by Miners, with Evidence.

By Alfred Swaine Taylor, M.D., F.R.S., of Guy's Hospital.

Gunpowder.

Two samples of powder used in blasting were submitted to examination, in the coarse form in which they were received, as well as in fine powder. They were compared with ordinary gunpowder.

The smaller grained sample burnt more slowly than the larger grained, and left a greater amount of residue of a brownish colour. The products of combustion were similar, namely, *sulphide of potassium*, in a dense white vapour, and the gases usually derived from the combustion of charcoal and nitre at a high temperature, namely, *carbonic acid* and *nitrogen*. Sulphide of potassium is a noxious vapour, and would be likely to prove injurious to health when evolved in a confined space in which there is deficient ventilation. It is this vapour which gives the fœtid odour to recently exploded powder. It soon subsides in a damp atmosphere, and is slowly converted into an innocent salt (sulphate of potash). It is estimated that a cubic inch of gunpowder weighing 251 grains is converted by explosion into 500 cubic inches of gaseous and vaporous matter. This quantity of gaseous matter is from its nature irrespirable, and would render unfit for respiration (unless it was rapidly diffused) a large quantity of air. Carbonic acid is noxious when it forms only ten per cent. of air; but nitrogen may be breathed in an atmosphere containing 80 per cent., provided there are about 20 per cent. of oxygen present. Carbonic acid is a poison; it enters the blood, and poisons that liquid, rendering it unfit to support life, even when oxygen is present. Nitrogen has no directly poisonous action.

The products of combustion in both samples are similar to those of gunpowder of the best quality, the only difference observed being in the production of a larger amount of sulphide of potassium (white offensive smoke) from the two blasting powders. This arises from the fact that it is customary to introduce a larger proportion of sulphur into mining powder. The products are, therefore, more noxious from this cause when the gunpowder is discharged in a confined space.

	Common gunpowder.	Miner's powder.
Saltpetre -	- 75·0	65·
Charcoal -	- 12·5	15·
Sulphur -	- 12·5	20·

The charcoal is also in larger proportion in miner's powder; hence in a complete combustion of the powder, a larger amount of carbonic acid is produced. An excess of sulphur promotes the rapid and uniform combustion of powder; hence it is an advantage for miners' use; but as the sulphur-products act corrosively on metal, the sulphur is kept down to its lowest point for fire-arms.

Fuzes.

Of these there were two sorts: 1st, with gutta-percha; and, 2d, with a pitch-cloth casing. In both, the gunpowder burns with violence and rapidity, giving rise to the products above-mentioned, and apparently in equal quantity for equal lengths. The pitch-casing (2) gives off in burning, acrid acid vapours irritating to the eyes, nose, and lungs. The gutta-percha fuze evolves, while burning, an acid vapour of a more offensive odour, but less irritating to the eyes and nose than the vapour of burning pitch. There is, however, this difference between them, that the gutta-percha fuze has its casing more easily ignited than the pitch fuze, and it gives off a large quantity of smoky carbonaceous matter. In practice, it is probable that both casings are consumed. These fuzes necessarily vitiate the air; of the two, the pitch fuze would be the most open to objection on this account.

Air from the Gallery of a Mine.

The bottle containing the air was well secured and sealed. It was opened under water at a temperature of about 65°. There was neither absorption nor depression of the liquid; the air of the bottle was decanted and tested. The capacity of the bottle at the temperature of 65° was 48 cubic inches.

1. A lighted wax taper burnt in it as in ordinary air, without any apparent diminution in the intensity of the light.

2. Phosphorus and deutoxide of nitrogen proved that there existed in it about the usual amount of oxygen. This was also determined by removing the oxygen from 100 parts of the air, transferred to a graduated tube.

3. A few cubic inches gave a white precipitate with lime water, showing an undue amount of carbonic acid.

4. A salt of lead underwent no change, hence no sulphuretted hydrogen was present.

Of this air, it may be remarked, that it has the characters possessed by air which is collected from underground excavations, in which there is no free communication with the atmosphere. Carbonic acid is the product of numerous causes, constantly in operation. Human respiration, combustion from any cause, as of candles or gunpowder, the action of humidity upon organic matter (woody fibre), and the ordinary process of decay, are all large sources of its production. Were it not owing to the law of diffusion, the air would soon cease to support life; but in spite of its great density, 1·527 (compared with air at 1·000), this gas rises and spreads in all directions, and is thus diluted to an innoxious standard. This law of diffusion is interfered with in the galleries and shafts of mines, in which there is too slight a communication with the atmosphere, or in which there is a want of ventilation. To this may be ascribed the presence of an undue proportion of carbonic acid in this sample of air. As this noxious gas is soluble in water, much of it must be dissolved and removed from the air of the galleries of mines, in which there is much water trickling over the sides and roof. So rapidly is carbonic acid diffused in the air of a crowded city, in which combustion and respiration are going on on a large scale, that the ordinary chemical test does not show the presence of any of this gas in 200 cubic inches of air. In only 3 or 4 cubic inches of the air taken from the Cornish mines, the test indicated at once the presence of the gas.

Air so contaminated is clearly unfit for human respiration. A gas which destroys life instantaneously, when in a pure state, cannot be breathed continuously day by day in a diluted state, without affecting the health of a person. It is calculated that an adult consumes a gallon of air per minute, *i.e.*, that the air becomes so vitiated by his respiration as to be unfitted to support life. *Inspired* air contains only 1-2000th part of carbonic acid; but expired air contains sixty times as much carbonic acid, or 1-33rd part by volume.

Miners' Candles.

Four samples of these were submitted to examination; and the results were compared with those produced by the combustion of candles of common tallow, stearine, and wax. They were tested by combustion in a glass vessel containing about *five gallons* of air. The experiments were chiefly directed to the amount of air consumed or rendered unfit for respiration in a given time, by each candle, and the condition of the air after combustion.

Each candle was extinguished in the glass vessel of air, in the periods under-mentioned:—

	Palmer	Read	Higgs	Webb	Tallow	Stearine	Wax
	Minutes	"	"	"	"	"	"
Exp. 1.	2½	1	3	3	2½	4½	4½
Exp. 2.	2	1½	3½	2¾	2½	5½	5½

In most of these experiments there was scarcely any light evolved during the last minute of combustion.

Carbonic acid and water were the products in all. Read's candle burnt with a thick smoky flame and a suffocating odour; and it left in the vessel an offensive and irritating odour of burnt fat or grease. It gave a greater body of flame, but a duller and redder light than the others.

The candles of Palmer, Higgs, Webb, and that marked "Tallow" left an offensive greasy odour; but this is more or less the case in all candles of inferior quality, which are allowed to burn out *slowly*. An irritating, fatty, acid vapour is produced by the red-hot wick before it is extinguished.

From these results it appears that the mining candles in burning vitiate air with great rapidity, and require for their combustion, in a given time, as much or even more air than is required for the respiration of an adult. This combustion, carried on in an ill-ventilated gallery, must, of course, contribute largely to render the air impure and unfitted to sustain health, if breathed continuously or for many hours together.

Alfred S. Taylor.

15, St. James's Terrace,
Regent's Park,
June 25th, 1862.

ALFRED SWAINE TAYLOR, Esq., M.D., F.R.S., examined.

19,782. (*Chairman.*) You are a Fellow of the Royal Society?—I am, and of the College of Physicians, and Professor of Chemistry in Guy's Hospital.

19,783. I believe that you visited Cornwall last autumn?—I did.

19,784. You also at my request very kindly analysed some bottles of air, which I sent up to you?—I did; I made a general examination of them.

19,785. Will you describe the bottles?—There were a number of samples taken from different depths, 12 samples were forwarded, but one, marked No. 18, was broken. This was the only one not examined. I did not know anything about the mines from which they were taken, but I had merely a reference to the depths in fathoms, and the temperature of the air at the time when they were taken.

19,786. I believe that in the report which you will hand in to the Commissioners, you state the result of your examination?—Yes, it is in this Report. The general result of my examination was that the principal contaminating gas was carbonic acid, and which existed in from 20 to 30 times the proportion in which it ought to exist.

19,787. And would, therefore, be injurious to health?—Yes.

19,788. (*Mr. Holland.*) Do you mean 20 times the least proportion?—20 times the average proportion.

19,789. Was that the least bad air?—No, it was the worst air. Two or three samples were very much alike; but I only made a quantitative analysis in one case. We judge very much in this way:—good air should not render lime-water white or milky. Lime water is a test for this gas in air, and it gives with carbonic acid a white precipitate, which is chalk. A number of these samples instantly affected the test, showing that the carbonic acid was in undue proportion. I took the sample, marked No. 2, which appeared to me to be the worst, and it contained a proportion of nearly $1\frac{1}{2}$ per cent. of carbonic acid, which is a very large proportion, because the proportion is generally only $\frac{1}{10}$th per cent. In the healthy air which we are breathing it is only $\frac{1}{20}$th per cent., that is to say, one part in two thousand, whereas in the case to which I am now referring, it was nearly $1\frac{1}{2}$ per cent.

19,790. (*Chairman.*) I believe that the result of your examination was that you recommended me to make further inquiries?—I did; I recommended your lordship to make an inquiry more minutely than I had done, but I was quite satisfied of the unwholesome character of the air. I had no doubt whatever on that point. With reference to the proportions, of carbonic acid, they may vary, being sometimes more and sometimes less; they are by no means fixed.

19,791. (*Mr. Kendall.*) How many samples did you test in a general way by trying the lime water?—I tested all (eleven samples).

19,792. And they all made it milky?—They were not all equally bad, but they were all worse than the ordinary atmosphere; some were very bad; in fact the air was as bad as it would be in the most crowded and close theatre or room, where there was no ventilation at all. As you are no doubt aware carbonic acid is a poison which when absorbed into the blood, slowly tends to debilitate the person, and to render him susceptible of numerous diseases. It is a blood-poison, and in that proportion, it would, of course be very unwholesome to breathe. A man would not suffer rapidly from the poisoning, but there would be a slow deterioration of the blood, which is even worse, perhaps, than a rapid action, for in the one case he may go on until he is exceedingly weak, but in the other case, he is warned of his danger, and can get away into fresh air: a remedy can be applied. I have myself breathed air mixed with carbonic acid, and therefore know pretty well what it is.

19,793. (*Chairman.*) You also, I think, recommended that I should institute some medical inquiry?—I did.

19,794. And you recommended Mr. Bankart?—Yes, a skilful gentleman in such a matter.

19,795. He is at Guy's Hospital?—Yes, he was a pupil of mine for some years, and is now one of the medical officers at Guy's Hospital.

19,796. (*Dr. Greenhow.*) What office does he hold there?—He is one of the Demonstrators of Anatomy there.

19,797. (*Chairman.*) You therefore consider that he would be quite competent to make the inquiry?—I think that he is a very well-informed professional man.

19,798. (*Dr. Greenhow.*) Did you make any investigation as to the deficiency of oxygen in the samples of air?—I did.

19,799. What deficiency did you find?—There was no very great deficiency in one of the measurements which I made:—it was about $\frac{7}{10}$ths per cent. I will state exactly what it was:—$20\frac{8}{10}$ths we consider to be the natural proportion of oxygen, and I found only 20 and barely $\frac{1}{10}$th. I estimate it at $20\frac{1}{10}$th, so that there was a deficiency. I do not attribute much to this. I should think that the noxiousness of the air arose more from the presence of carbonic acid than from the deficiency of oxygen.

19,800. Then you do not think that an air which contains only 20 per cent. of oxygen instead of $20\frac{8}{10}$ is very deleterious?—No, of itself I should say not. I have made many analyses of air, and sometimes I have found in the borough of Southwark not more than that.

19,801. In the open air?—In the open air; but then I have not found in undue proportion, what I have here described as being superadded, namely the carbonic acid, in the same air.

19,802. Have you any opinion as to what deficiency of oxygen would be dangerous to life?—I think that a deficiency of three or four per cent. would tell upon a person, but I am not prepared with any fact to show that. I say that if the atmosphere contained only 17 per cent. of oxygen, and that the rest was made up of nitrogen, or nitrogen and carbonic acid, I believe that it would be a very unwholesome air for a human being to breathe in.

19,803. But it would require a considerable reduction of the oxygen to affect health directly, exclusive of any other impurity?—Yes.

19,804. If it were reduced to 19 per cent. for instance, would you consider it likely to be injurious?—The respired air which comes out of the lungs is sometimes reduced to about 10 or 11 per cent. of oxygen. In breathing we do not consume all the oxygen, but we could not breathe that air, although there was 11 per cent. of oxygen left in it. I have tried the experiment with my assistant, and as nearly as one could make out, the quantity of oxygen left, assuming 21 per cent. to have existed, was only 11 per cent. after the air had been once perfectly breathed. A large per-centage of the oxygen comes out again as carbonic acid, so that the place of the oxygen is actually supplied by carbonic acid in respiration; but of course that depends upon the capacity of the lungs and a great many other conditions. With regard to your question, we have no instance that I know of by which we could test it, because there is such a providential arrangement of things, that oxygen will not be long deficient: there is so rapid a diffusion of it. I never remember to have found an atmosphere containing below 17 per cent. of oxygen. Generally ill health is caused not so much by the deficiency of oxygen, as by the presence of other noxious gases and vapours, in addition to the nitrogen ordinarily contained in air. A man might be killed by breathing 20 per cent. of oxygen if there was a certain amount of carbonic acid associated with the nitrogen. I have found that a candle will burn in an atmosphere which contains 50 per cent. of carbonic acid and 50 per cent. of oxygen, so that you would not have the slightest idea that that deadly gas was there.

19,805. If the air in a mine had 2 per cent. of carbonic acid gas, and was minus 2 per cent. of oxygen,

that is to say, having only 18 per cent. of oxygen, do you think that a candle would burn in that air?—I should say that it would burn for a short time; but, of course, for a much shorter time than it would burn in the ordinary atmosphere, because carbonic acid itself is to a certain extent antagonistic to combustion unless the oxygen is maintained at a high standard, so that it will fail for two reasons: first, the deficiency of oxygen; and secondly, the presence of a gas which is rather opposed to combustion. I have found from my experiments repeatedly with regard to the candles used in these mines, that they consume an enormous quantity of air.

19,806. (*Chairman.*) I sent you some samples of gunpowder and candles for analysis?—You did.

19,807. Have you fully stated in your Report the results of those experiments?—I have.

19,808. Will you state it shortly to the Commissioners?—With regard to the gunpowder, I found no trace of the products of its combustion, even where it seems the air had been collected only half an hour after the explosion. One of the products of burning gunpowder is sulphide of potassium, and this is rather deliquescent; so that where there is a damp atmosphere, as no doubt there is in these localities, it is speedily removed. I found, therefore, not a trace of the products of combustion in the air which had been collected; but with regard to the candles, I was rather surprised to find that they consumed the air in an enormous proportion. I tried the experiments by taking a 5 gallon jar, and noting accurately the time required for a candle to burn until it was extinguished; and I found that these candles consumed air about twice as fast as ordinary candles; they consumed five gallons of air in about two minutes, that is more than two gallons in a minute.

19,809. (*Mr. Holland.*) Were the ordinary candles burning with the same size of flame?—No; the flame of the candles, which are used in mines, is larger and more smoky. A candle like that which is now in the room would consume about a gallon a minute. One of the smoky thick-wicked candles which the miners use, would consume about twice that quantity, and therefore vitiate the air much faster.

19,810. (*Mr. St. Aubyn.*) Are these calculations mentioned in your report?—Yes.

19,811. (*Chairman.*) I submitted to you candles from different makers?—Yes, and the results are stated in the report, those results being derived not from one experiment but from several averages.

19,812. (*Dr. Greenhow.*) What would be the effect of sulphide of potassium on health?—It is a very deadly poison.

19,813. As given off in the combustion of gunpowder in a mine, what would be its effect?—The white vapour which comes off, and which forms the bloom on a piece when discharged, is the sulphide of potassium; it has a very offensive smell, like putrid eggs. If there is a damp atmosphere, I apprehend that there would scarcely be any effect, as it is so soon removed; but, of course, its presence would be at once announced by the smell, which is very offensive while it remains. A man breathing such air, is breathing a very poisonous vapour, and one much more destructive to health than carbonic acid:—it darkens the blood, it acts upon the brain and nervous system, and tends to enfeeble strength and destroy life. I had some experience of the effect of sulphuretted hydrogen gas during the construction of the Thames Tunnel many years ago. The late Sir Isambard Brunel applied to me respecting the health of the men who were engaged in making the excavation, before it had been carried completely under the river. I examined the air. I found there sulphuretted hydrogen and carbonic acid in large proportion. Several of the men came into Guy's Hospital, and I saw some of the strongest men brought from the western parts of England, fall off in strength during their work, and in about three or four months become emaciated, livid about the eyes, with compiete loss of muscular strength and loss of appetite, and attacked by a kind of wasting fever; several of them died. I suggested the use of lime, and pumping out the air and pumping in fresh air; but until the boring was carried completely under the river, there was no cessation of these effects. There was a complete want of ventilation.

19,814. (*Chairman.*) Should you say that that air was at all to be compared with the air which you have tested here?—I have said that I did not find in the air which was brought to me any trace of the products of combustion, but the effects of gunpowder would soon be lost, especially *in transitu* while the air was coming to me from Cornwall. If much gunpowder is used in a locality where the air is not easily renewed, I can easily conceive that a man breathing the vapour of it would suffer very much.

19,815. Much the same as was the case in the Thames Tunnel?—Yes; I have myself perceived it, not in Cornwall, but in the salt mines of Cheshire, where they have used gunpowder to blast the salt, and I have traced it for some time afterwards; but it soon disappears with good ventilation.

19,816. (*Mr. Holland.*) I think that the air was brought (*i.e.* collected) in sand?—Yes, that was what I advised.

19,817. That was the case with the specimens which you examined?—Yes.

19,818. Any traces of salts upon the sides of the bottles would not be perceived by you; they would be taken as sand, would they not?—Yes, they would be deposited.

19,819. Therefore there might have been sulphate of potash, or saline particles of various sorts upon the sides of the bottles without being noticed?—Yes.

19,820. And the sulphides would probably escape notice?—They would all turn to sulphates before I examined them. In order to discover these vapours and their influence on health one must be upon the spot.

19,821. You do not say that such things were not in the air, but only that they were not noticed in your examination?—I did not find any in my examination. The object of the sand was this: carbonic acid is very soluble in water, and therefore if the bottles had been rinsed out with water, the water hanging round the bottle would have removed this gas and I should not have discovered it; that is why I advised dry sand should be used.

19,822. Supposing that there had been sulphuretted hydrogen in the air when gathered, it might have been decomposed before it came to you?—Yes; it is very soon changed, it is very soon oxidized.

19,823. Did you try how fast the tallow of the candles was consumed?—No, I did not do that.

19,824. Did they burn very fast?—Yes, with the thick wicks.

19,825. I presume that the production of carbonic acid was in proportion to the consumption of the candles?—Yes.

19,826. Did the candles, in your opinion, give off any unusual proportion of acroleine?—No, I think not; there was a very disagreeable smell which I could perceive in the 5-gallon jar after the combustion was extinguished.

19,827. Did you try it for acroleine?—Merely by the nose, and there was a slight acid re-action upon test paper. I believe that all fats, without reference to the quality, are very disagreeable in that point of view.

19,828. (*Mr. Kendall.*) Did you ever see a candle burn well in air which on testing you found to contain matters injurious to health?—I have a recollection that it was so in the Thames Tunnel air sent to me by Sir Isambard Brunel; it was taken quite from the end of the Tunnel where the men were working in the shield, and it was of a very bad description, for it not only turned lime water very milky, but it also turned the lead paper brown.

19,829. Did the candles burn well?—No; they burnt dimly.

19,830. Have you ever known an instance where the candles have burnt well, and where the air has been tested and found to be deleterious?—With regard to these experiments I must tell you that I tested each sample of air with a candle, and it burnt very fairly as far as mere burning was concerned. The

amount of oxygen which I have mentioned, $20\frac{1}{10}$th per cent. was quite enough to maintain a fair combustion, and if I had had to form an opinion from the burning of a candle alone I could not have said that there was $1\frac{1}{2}$ per cent. of carbonic acid there.

19,831. The Cornish miners are always content if the candle burns well?—Yes.

19,832. But you are firmly of opinion that that is no test at all, but that the candle will burn where the air is deleterious?—Yes, and where a man might no doubt be killed. I have myself mixed equal amounts of carbonic acid and oxygen; I believe that if a man were to breathe that mixture he would die immediately and yet a candle burnt in this mixture much more brilliantly than in ordinary air. In my work upon medical jurisprudence I have long pointed out, in reference to well-digging, the great fallacy of trusting to the burning of a candle as a criterion of safety. I have found that a candle will actually burn where the proportion, as well as I remember, of carbonic acid mixed with the air amuonts to 12 or 15 per cent., so that the existence of 12 or 15 per cent. of carbonic acid, added to air, will not be revealed by the burning of a candle. The candle will not burn very long in it, but still if a man were to lower it into an atmosphere of this sort, and then hastily to withdraw it and think that he could go in with safety he might be killed.

19,833. (*Mr. Holland.*) Do you mean that when the oxygen is reduced to about 8 per cent. the candle will burn?—You must deduct the 12 per cent. from the 100 for the carbonic acid added: this leaves 88 per cent. of air, $\frac{1}{5}$th of which is oxygen; that would be 17 per cent. of oxygen.

19,834. (*Mr. Kendall.*) You say that you are quite satisfied that a candle may burn very well, and that still the air in which that candle is burning may be very injurious to the miner?—Yes; as a general principle.

19,835. Do you think that that will last for any time?—No.

19,836. Would he find it out within half an hour? Yes.

—19,837. Within a quarter of an hour?—Probably within ten minutes. The combustion will be less perfect, the candle will get dim and pale and the flame blueish coloured, and then go out.

19,838. In the corps of Cornwall the men generally work for eight hours; do you think it possible that a man would go on in such air without finding it out? —Not in the case of very vitiated air without some renewal of it.

19,839. The candle would tell a tale?—Yes; it would burn dimly.

19,840. (*Mr. St. Aubyn.*) Is it possible that air where the candle burns for its usual time, can be injurious to the health of the miner?—Unless there was a provision for the removal of the carbonic acid formed by the consumption of the candle it would be injurious, because that carbonic acid which is constantly produced by the candle, destroys five gallons of air in about every two minutes. Unless there are some means of renewal, it must be an unhealthy atmosphere for him.

19,841. (*Mr. Kendall.*) If there is any air in the same condition as the air which you start with, injurious to health, in the same relative quantities of oxygen and of carbonic acid gas, will the candle still burn on?—It will if the proportion of carbonic acid does not exceed what I have mentioned.

19,842. You may send in a supply of vitiated air, and the candle will still burn?—Yes; and the men might go on suffering.

19,843. (*Mr. Holland.*) Suppose that there is a constant current of vitiated air?—I think that the theory about the burning of a candle indicating what is fit for a man's breathing, is altogether a fallacious one. For instance, I will give you the case of ordinary sewers; there is an atmosphere in sewers which contains two and three per cent. of sulphuretted hydrogen; a candle will burn in that atmosphere readily; but if a man goes into it, he will be dead before very long; therefore there are many cases in which we must not measure the power of the human lungs to resist noxious gases and vapours by the combustion of a candle.

19,844. Is not the common instance of a crowded room a very good illustration?—Yes.

19,845. Are not the people almost choked when a candle will burn well?—Yes. I have noticed in travelling by railway, in passing through a very long tunnel, that the air has been so vitiated at the end of it, that I have seen the flame of the lamp in the centre of the carriage get lower and lower, and nearly extinguished, until we came into the air again at the other end. I have watched it; and it showed that there was a stagnation of impure air in the tunnel.

19,846. (*Chairman.*) Can you explain why the miners are in the habit, when the candle will go out if upright, of placing it in a slanting position? —If I am to give any theory on the point it would be this. The burning of a candle depends upon the melted oil getting into the ignited wick: it is drawn up by capillary attraction. Supposing that the oil is drawn up faster than it can be consumed by the amount of oxygen around it (which we consider to be deficient), then we shall have the wick choked; that is to say, there will be more of the melted oil ready for combustion than the oxygen can take; and if you place the candle on one side, you allow this surplus to flow away, and thus diminish the choking of the wick; it is like overcharging an oil lamp.

The witness withdrew.

Adjourned.

V.

REPORT ON THE AIR OF MINES.

By Dr. R. Angus Smith, F.R.S.

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PART I.

COMPOSITION OF THE ATMOSPHERE,

with special Reference to the Air of Mines.

When I began this investigation I had not given special attention to the air of mines, although I had long interested myself on the subject of air generally. At the same time I had reason to believe that little had been done towards the advancement of the chemical portion of the inquiry, simply because in the accidents of reading on allied subjects so little had been found. Lord Kinnaird who first engaged me to examine the atmosphere breathed by the workmen in the mines, considered that the best beginning of the inquiry would be an inspection of the mines themselves. In this opinion I fully agreed, and laid down no plan for work until I had descended a few shafts and walked along the levels to experience the movements of the air, sitting down with the workmen at the "ends," to compare the sensations of breathing below and above ground.

Lord Kinnaird wished me to examine the air for carbonic acid and for oxygen, and also suggested the propriety of considering whether any other gases ought to be estimated. My belief was that the only detrimental substances to be readily found besides carbonic acid were the organic matter and the powder smoke, and at any rate I did not see the propriety of making extensive inquiries into minute details, until after ascertaining, by numerous experiments, the actual condition of the underground air, with reference to carbonic acid and oxygen, because these bodies are better known than any others which would in all likelihood be found, and because they had been much more carefully studied.

After the examination of about 150 specimens of air the Commission wished that the same determination of oxygen and carbonic acid should be made in a still greater number of cases. Considering the small number of the analyses that had hitherto been made, there was ground for supposing that the conditions might be exceptional, and viewing the still more limited number of the mines from which specimens had been taken, there was a strong temptation to believe, and on the part of the miners an interest in asserting, that the mines from which such defective specimens had been taken were also exceptional.

It was soon found that air having the normal quantity of oxygen and carbonic acid was an exception in the mines. In some cases the deviation from the normal amount was very small and uncertain. This of course suggested the question, what is the normal amount? This question has been answered by many of the greatest chemists, and the answers have been constantly approaching nearer to a definite point. The composition of the air is now universally agreed to be constant within very small limits. When oxygen was discovered, the amount in the air was supposed to be a sure guide to the wholesomeness of a place. This test has been entirely abandoned. I was, to some extent, compelled to revive it, because not only was the above question suggested, but another followed, viz., what is the consequence of a deviation from the normal amount; or what does such a deviation indicate? Before speaking of the composition of the air of mines, it is necessary to deal with this part of the subject.

I begin by giving a short account of the results arrived at by chemists who have taken a prominent part in the inquiry.

Amount of Oxygen in Pure Air.

When Priestly discovered oxygen, he examined the air of various places, and found the amounts of this gas to differ to the extent of 6 per cent. He used as a test nitric oxide, which combines with the oxygen, after which both gases, viz., the combined oxygen and nitric oxide, are absorbed by water. At one time he obtained one-fifth of oxygen, which is nearly the

exact amount; but he did not seize the idea forcibly. Scheele found from 20 to 30 per cent., and others found still greater variations, until Cavendish showed by 500 examinations of atmospheric air that it had a nearly constant composition and arrived at a mean of oxygen

equal to *	20·833 p. c.
Gay-Lussac and Humboldt, after many experiments which gave from 20·9 to 21·2, settled on a mean of	21·0
Gay-Lussac himself gave as a mean of the air from mountains and from Paris	21·49
Th. Saussure examined the air at Chambeisy and found	21·08
	20·98
	21·03
	21·03
	21·13
	21·15
	21·08
	21·09
	20·98
	21·086
	21·006
	21·1
	21·0
	21·04
Mean	21·05

Berthollet found	21·05 p.c.
Thom. Thomson	21·
Davy	21·
Vogel found on the Baltic	21·59
Hermbstädt do.	21·5
Dalton, at Manchester	20·7
	20·8
(in a N.E. wind)	21·15
	20·9
	20·73
	20·85
	20·95
Doyère found	20·5 to 21·5

Regnault gave as mean of 100 specimens in Paris		20·913	20·999
9	from Lyons and around	20·918	20·966
30	„ Berlin	20·908	20·998
10	„ Madrid	20·916	20·982
23	„ Geneva and Switzerland	20·909	20·993
15	„ Toulon and Mediterranean	20.912	20·982
5	„ Atlantic Ocean	20·918	20·965
1	„ Ecuador		20·960
2	„ Pichincha, higher than Mount Blanc	20·949	20·981
Mean of all foregoing		20·949	20·988

Mean of the Paris specimens, 20·96.

Bunsen's analyses of air at Heidelberg are as follow:—

Oxygen.	
20·970	20·927
20·963	20·919
20·927	20·880
20·914	20·921
20·950	20·892
20·906	20·840
20·943	20·859
20·927	20·925
20·934	20·940
20·928	20·937
20·911	20·952
20·889	20·953
20·928	20·964
20·927	20·960

Average 20·924 - Lowest 20·840

* See Dr. George Wilson's calculations in his Life of Cavendish.

R. F. Marchand finds	20·9 to 21·03
Mean	20·97
Graham gives	20·9
Liebig gives	20·9

Regnault has made the greatest number of analyses; no man can doubt his power of analysing well, and he is famous, above all things, for his laborious accuracy. My belief is that his analyses represent most nearly the true composition of the atmosphere. The analyses made by Bunsen deserve equal respect; he is also a man famous for the minute accuracy of his details, and I would not for a moment put him second to Regnault, or to any man; both stand before us as the best specimens of chemical investigators; both living, and in their prime. This is a strong argument for preferring their work to the work of chemists of a past generation. These two have greatly improved the methods of analysis. Still I prefer to take Regnault's results, because they are obtained by a more extensive inquiry. Perhaps the court of the laboratory where Bunsen obtained his specimens may have contained less oxygen than the purest air; at any rate, we cannot doubt Bunsen's accuracy, especially when he gives us these as model analyses.

Judging from all the analyses I am more inclined to look on a very favourable specimen of air as proved to contain,—

Oxygen	20·96
Nitrogen	79·00
Carbonic acid	·04
	100·00

But this is evidently subject to numberless changes. To be moderate, I have assumed 20·9 of oxygen, and Graham and Liebig have done so before me.

Analyses made by various Methods.

The earliest analyses were made with gases soluble in liquids. Nitric oxide united with the oxygen of the air and the resulting compound was absorbed. But, taking all together, they agree with the latest results as well as can be expected. If we examine the results obtained by weighing, we find remarkable differences. It would be difficult to illustrate this difference more clearly than by the analyses of Lewy. When he used the balance he found—

Air of the German Ocean.

			Oxygen.
2d August 1841		Covered	20·459
3d do.		Fine	20·423
3d do.		Do.	20·450
4th do.		Do.	20·432
22d May 1842		Covered	20·884
22d do.		Fine	20·911
23rd do.		Covered	20·893
24th do.		Do.	21·010
24th do.		Do.	20·839

Air of Guadaloupe.

				Oxygen in 100 vol.
Petit Canal	20 Nov. 1842.	Calm		20·839
Do.	20 do.	Calm		20·821
Do.	21 do.	Fine		20·848
Do.	23 do.	Covered		20·929
Do.	23 do.	Calm		20·667
Mangrove on the river Salée	27 do.	Calm		20·839
Do.	28 do.	Fine		20·504
Do.	28 do.	-	-	20·522
Petit Bourg	29 do.	Fine		20·802

When he used explosion by hydrogen his results were as follow:—

LEWY'S ANALYSES of the Air of the Atlantic Ocean. Carbonic acid in 1000 parts. (Annales de Chimie et de Phys., vol. 34, 1852.)

1847.		Each a mean of 3 Analyses. Carbonic Acid.	Oxygen.	
1 Déc.	Cloudy - -	0·4881	21·05170	We left Havre on the 25th November. The weather was wet, and remained so all the time we were in the Channel.
4 Déc.	Clear - -	0·3338	20·96321	
8 Déc.	A little cloudy	0·5497	21·05945	54 leagues from Madeira.
17 Déc.	Clear - -	0.5771	21·06630	30 leagues south of tropics.
18 Déc.	Ditto - -	0·3346	20·96139	Middle between Africa and America.
18 Déc.	A little cloudy	0·5420	21·06099	
19 Déc.	Clear - -	0·3388	20·96074	Sea phosphorescent.
26 Déc.	Ditto - -	0·5288	21·05889	
28 Déc.	Ditto - -	0·5093	21·05686	
30 Déc.	Ditto - -	0.5143	21·05789	
31 Déc.	Ditto - -	0·3767	21·01114	Entering port of Santa Marta.

Air of New Granada.

Locality.	1848.	Weather.	Mean of three Analyses. Carbonic acid per 1,000.	Oxygen per cent.	
Santa Marta -	25 Jan.	Clear -	0·4616	21·02379	
Mompox -	7 Feb.	Do. -	0·3147	21·04936	
Rio-Magdalena	18 Feb.	Cloudy -	0·3259	21·03222	
Rio-Magdalena	3 Mar.	Covered -	0·4554	20·99826	
Honda - -	29 Mar.	Verycloudy	0·3226	20·99237	
Ambalema -	5 Aug.	Clear -	1·1203	20·51853	Suffocating hot,—wood burning near.
Esperanza -	2 Aug.	Do. -	2·4475	20·33075	Do.
Guaduas -	2 Apr.	Cloudy -	0·3068	20·99691	
Santa-Ana -	2 Aug.	Clear -	1.2333	20·51479	Do.
Bogota - -	5 July	Do. -	0·4994	21·03196	
Monserrate -	8 July	Cloudy -	0·5215	20·98995	Rain beginning.

LEWY'S ANALYSES of the air of Bogota, 2,645 mètres above the Sea.

		Carbonic acid in 1,000 parts.	Oxygen in 1,000 parts.	
1850.				
7 Mar.	Clear -	0·3864	21·02099	Fine.
12 April	Do. -	0·3664	21·00382	After rain.
8 May	Covered	0·3609	20·99032	Wet.
9 May	Do. -	0·3824	20·99259	Wet.
15 June	Do. -	0·4192	20·99506	Less wet.
24 July	Clear -	0·4249	21·01765	
19 Aug.	Cloudy	0·3043	21·01411	
23 Aug.	Clear -	0·4812	21·01826	Very fine.
1 Sept.	Cloudy	0·6178	21·02434	
2 Sept.	Clear -	0·7619	21·01760	
2 Sept.	Cloudy	1·6291	20·96629	The upper part of Montserrat was covered with clouds, and a white veil descended from the mountain. Many persons became ill.
2 Sept.	Do. -	1·7040	21·03011	
3 Sept.	Clear -	1·3853	21·01976	
3 Sept.	Cloudy	4·8963	21·03176	
3 Sept.	Do. -	4·9043	21·03197	
4 Sept.	Do. -	1·3261	21·02927	Thinks the carbonic acid due to a wind called Las Quemas. After rain it disappeared.
4 Sept.	Covered	0·8648	21·00355	
8 Sept.	Cloudy	1·2829	21·02097	
9 Sept.	Do. -	0·7512	21·03082	
10 Sept.	Clear -	0·4583	21·03199	
12 Sept.	Cloudy	0·4709	21·02689	
3 Oct	Do. -	0·4751	21·02377	

It would appear as if he went in both cases slightly to excess, but it is not well to attempt to judge on this point.

Dumas and Boussingault together and Brunner obtain also less oxygen ; they used weights ; and they also are men standing, like Regnault and Bunsen, in the foremost rank.

	Oxygen per Cent.	
Paris - - -	20·810	Dumas & Boussingault.
Brussels - - -	20·856	M. Stas.
Genève - -	20·784	M. Marignac.
Bern - - -	20·757	M. Brunner.
Faulhorn - -	20·773	
Groningen - -	20·793	Verver.
Copenhagen - -	20·811	

Air deviating from the adopted standard.

	Air from heights.	
Dalton -	Helvellyn - -	20·64
	-	20·63
	From a height of 9,600 feet -	20·70
	„ 15,000 „ -	20·62
Brunner -	Faulhorn - -	20·91
Boussingault -	548 metres high -	20·7
„ -	Sta. Fe 2643 - -	20.65
Air brought by Green from a height of 11,300 feet - - - -		21·
Frankland -	Chamounix - -	20·894
„ -	Top of Mont Blanc - -	20·963
„ -	Grand Mulêts - -	20·802
Berger -	Jura and other mountains -	20·3
	to - -	21·63
Configliachi -	Simplon - -	21·0
Mean - - - -		20·818

I leave out some under 20·2, and still we have a rather curious result,—a lower number on the hills than on the plains. I do not profess to be fully satisfied with these results ; we require a few hundred, or, at least, a few dozen analyses ; still these statements are before us, and cannot be removed without much labour. The results of Frankland and Boussingault especially are striking, and require an explanation. Let us again compare results obtained by Dumas and Boussingault (Annales de Chimie, 1841).

Air of Paris.

G. Weight.		Oxygen.
22·93	calculated to volume*	20·729
23·06	„	20·856
23·03	„	20·828
23·01	„	20·810
23·00	„	20·802
23·00	„	20·802
23·08	„	20·826
22·07	„	20·864
22·89	„	20·701
Mean 23·07	„	20·864
	From the Faulhorn.	
22·96	„	20·766
23·09	„	20·882
22·97	„	20·774
22·86	„	20·674
22·97	„	20·774
Mean 22·97	„	20·774

Again we find a smaller amount on elevated places.

Brunner found - - -	20·867
	20·750
	20·790
	20·842
	20·812
	20·837
	20·818

Although, for reasons given, I prefer the actual numbers obtained by Regnault, the comparative numbers in Paris and in the Faulhorn are equally valuable for the purpose of showing differences. These analyses were made by weighing.

* The results are calculated into volumes, taking 1.1057, the number taken by the analysts as the sp. gr. of oxygen.

Dr. W. A. Miller examined air collected during a balloon ascent, in August 1852, at a height of 18,000 feet, and also a sample collected near the surface at the same time, with the following results* :—

	Air 18,000 feet high.	Air near the earth.
Per-centage of oxygen -	20·88	20·92

Dr. Frankland found at—

	Oxygen.	Carbonic acid.
Grands Mulets - -	20·802	0·111
Summit of Mont Blanc	20·963	0·061
Chamounix - -	20·894	0·063

He thinks it probable that the carbonic acid is generally, but not invariably, greater in the higher regions of the atmosphere. Messrs. H. and A. Schlagintweit found the carbonic acid to increase up to the height of 11,000 feet.*

If the carbonic acid of the higher regions be really greater than in the best air below and the oxygen less, it will probably be in part owing to the oxidation having been completed more fully. De Saussure considered it to be owing to the action of vegetation decomposing the acid and giving out oxygen at the surface. The organic matter will probably be entirely removed by thorough oxidation in great oceans of air. The process which converts oxygen into ozone would seem very well fitted for removing all organic matter. This, then, might lead to the existence of a smaller amount of oxygen in the air above, and the riddle would be solved. The diminution of the oxygen is probably a disadvantage, although to such a small extent is it so that there is abundant compensation in the purification consequent on the removal of organic substances. We shall have then a distinct variety of air on mountains differing from that of the plains. In the one there would be more carbonic acid and less oxygen, with no organic matter; constituting mountain air: whilst air of the plains would have more oxygen, less carbonic acid, and more or less organic matter.

It is exceedingly probable that the difference of composition is somewhat connected with the existence of water in the atmosphere. Or it may be simply the result of separation caused by the weight of the gases, a result, certainly, which has been much discussed and is well known not to exist in proportion to the weight, and one by no means probable considering the investigations of Graham; but that the physical cause may after all be struggling so as to make itself in some way felt, it is perhaps rather daring for us to deny absolutely. If the oxygen were diminished without the increase of the carbonic acid, it would be safest to advocate the latter reason. The reasons given in the previous paragraph agree best with the state of our knowledge. However, the discussion on this subject would be better postponed until we become absolutely sure of more facts.

Air of impure places.

Reliable analyses on the air of impure places are less numerous than those given, but decided results have been obtained shewing at least a deviation from the numbers found on analysing fresh air.

Observer.		Oxygen.
Configliachi -	air of rice fields - -	20·8
„ -	crowded places - -	20·3
Regnault -	Toulon harbour - -	20·85
„	Algiers - - -	20·42
„ -	„	20·395
„ -	Bengal Bay - - -	20·46
„ -	Do. over bad water -	20·387
I found in the middle of Manchester in a place closely surrounded and exposed to smoke - - - - -		20·868
		20·808
		20·807
		20.613
		20·793
		20·179
	Average	20·652

The following results have been sent me by Dr. Frankland:

Air from laboratory of Owen's College, 1852.

	Oxygen.
November -	20·883
December - -	20·898
Ditto -	20·868
Ditto -	20·876

M. Leblanc, in his researches into the composition of the air (Ann. de Chimie et de Ph. t. 5, 3d series 1842, p. 248), gives the following analyses of inferior and impure air :—

The amounts are given in weights, but have been calculated into volumes.

——	Oxygen by Weight, per 1,000.	Oxygen by Volume, per Cent.	Carbonic Acid by Weight, per 1,000.
1. Conservatory of Equatorial Plants, Terre de Buffon, 6 o'clock in the evening -	230·1	20·81	?
2. Seven o'clock next morning -	229·6	20·76	0·1
3. Chemical Theatre, Sorbonne before lecture - - -	224·3	20·28	6·5
4. Do. after - - -	219·6	19·86	10·3
5. Bedroom in morning -	229·4	20·74	0·4
6. Hall of hospital three hours after shutting the windows -	229·1	20·72	0·8
7. Same at 8 o'clock morning -	227·2	20·54	2·8
8. Sleeping room at the Salt-petrière, atmosphere sensibly bad - - - -	225·2	20·36	8·0
9. Another in a similar state -	226·0	20·44	5·8
10. Salle d'Asyle, 116 children, smell bad also - -	227·1	20·53	2·7
11. Salle d'Ecole Primaire, 2d arrondissement - -	228·4	20·65	—
12. Same, incompletely ventilated, no smell - - -	—	—	4·7
13. Same, quite closed, a sensation of heat, quickened respiration - - -	—	—	8·7
14. Chamber of Deputies, in the ventilating shaft, no smell -	—	—	2·5
15. Opera Comique, pit before end of play - - -	—	—	2·3
16. Same theatre, centre boxes -	—	—	4·3
17. Close stable, Ecole Militaire	225·5	20·39	1·05
18. Same stable, ventilated by vasistas - - -	229·0	20·71	2·2

It was with these results before me that I began the enquiry, and although not expected to speak of the composition of the air generally, it seemed quite necessary to make some experiments, that it might be compared with the air of mines from my own point of view.

In looking over these analyses already presented, some of them means of hundreds and the whole representing many years of labour, we see at once how many give the amount of oxygen to be above 20·9. As a rule those numbers which fall below 20·9 repre-

* Dr. Frankland on the air of Mont Blanc;—Journal of the Chemical Society for 1861

sent air from cities and less pure places or from high mountains, or they have been obtained by weighing the oxygen, a method which seems always to give lower results. Take the conclusion of Cavendish, wonderful at the time, that the average was 20·833, we are surprised at the accuracy of the man who used a method by which no one now seems able to obtain any reliable results. It cannot be supposed to take from the honour of Cavendish, if we add one tenth of a per cent. to his figures after sixty years of scientific activity had made that apparatus the plaything of boys which in his time it required a philosopher to handle. He used acid liquids, and how easy it is to lose a fraction of a per cent. every man who has worked with gas must know and feel most keenly. If however any one shall object to this reasoning we must put up against him Saussure, a man using the same method, and we find his average much higher, viz. 21·05. This also is strengthened by the labours of Gay-Lussac, Berthollet, Thomson, Davy, and Humboldt, all men to whom we must attend. Cavendish could not decide that the London air differed from that of the country (see Dr. Wilson's Life of Cavendish).

Dalton laboured long on gases, and although his thoughts were generally greater than his experiments when a theory could be found, few men could so persistently labour out the facts where no theory existed. On the composition of the air of Manchester he is moderate and, it seems to me, just.

Dumas and Boussingault in conjunction, and also Brunner gave results by weighing the oxygen. The air was conveyed in bottles, and the bottles themselves were filled by sending them free of air and allowing the air for analysis to flow in. There are objections to this method. It is extremely dependent on the accuracy of the apparatus used, and if I am at all right in my judgment, the tendency is to diminish the amount of oxygen, for although the specific gravity of nitrogen does not differ greatly from that of oxygen, it does differ, and is lighter. At any rate I believe the list of analyses given to be a fair representation of the work done. They may be taken as the evidence of the scientific world on the subject.

Regnault's analyses are very beautiful, and the uniformity of his results predisposes us strongly in their favour. Their number comes in to increase their importance.

Another reason why I admire the results of Regnault is one of a kind which affects all men, and which may be excused. They agree with my own, made in an open part of Manchester. His results are 20·913,—20·99 for Paris, and all the numbers he made are above 20·9 until he comes to unwholesome places with putrid waters. A similar reason leads me to believe in the analyses by Bunsen and those of Dalton made in Manchester, as I found like results when air from close places was examined. Those of Dr. Frankland are also corroborative.

Having this great array of analyses, an abstract of the life-labours of many men, we seem to have before us proof sufficient of a decided variation in the composition of the air. The variation is really so great in some places that we must admit some powerful local cause. In filthy places, and in marshy spots at a high temperature the cause cannot be doubted, and how can we doubt the same change to occur in places that are badly ventilated? When carbonic acid increases is it wonderful that oxygen should diminish? In spite of all this there is no firmly founded faith amongst scientific men regarding the subject. The evidence has not been brought fully before them, and probably some links may be wanting. Seeing the question in this state, I was desirous of throwing some light upon it, and indeed I had already come to believe strongly in the variations, because of some which had been observed when making occasional analyses for the trial of new apparatus or for instruction and trial of skill.

Under this impression specimens of air were collected from the front of the laboratory and from behind near an ash-pit, each at the same time, and the analyses, along with some others, are given in the following table.

Afterwards it will be seen that the carbonic acid of the same spot was also estimated, and the result is that not only is there a diminution of oxygen in the less pure spot but the carbonic acid although greater than in the pure air is not sufficient to make up the vacancy left by the deficiency of oxygen, leading us to look for other gases also that tend to increase the impurity. This is an unexpected result, and, to my mind, one which has in it much value. But like all other investigations, after leading us onward one step, it shows us that there is another to take.

If emanations arise from foul places, they must occupy space. They are mixed gases and vapours. When we use caustic soda to absorb the carbonic acid, perhaps we absorb some vapours also, and indeed I always find that in a eudiometer we are apt to obtain too much carbonic acid in cases where the quantity is small unless extreme care is used.

STREET and SUBURB AIR, Manchester, compared with CLOSET or MIDDEN AIR.

Time.	Air from Closet or Midden behind Laboratory.	Air from Front Door of Laboratory.
1863.	Oxygen, vols. per cent.	Oxygen, vols. per cent.
Dec. 1	20·80	20·90
„ 10	20·85	20·96
„ 11	20·79	20·98
„ „	20·72	20·90
„ 15	20·87	20·90
„ „	20·76	20·02
„ 17	20·59	20 96
„ „	20·85	20·78
„ „	20·90	20·83
„ 18	20·21	20·91
„ „	20·58	20·92
„ „	20·74	20·87
„ „	20·40	21·02
„ „	20·77	21·00
„ 19	20·99	20·83
„ „	20·70	20·98
„ „	20·82	20·88
„ „	20·46	21·01
„ „	—	20·87
„ 21	20 56	20·92
„ „	20·79	21·02
„ „	20·64	20·88
„ „	20·94	20·91
„ „	20·67	21·01
„ 22	20·53	20·96
„ „	20·71	20·92
Feb. 26	20·66	21·01
„ 24	—	21·05
„ 20	—	20·98
„ „	—	20·99
„ „	—	21·01
„ „	—	20·94
	538·30	670·19
	Average 20·70	20·943

The results are very distinct; there is nothing exaggerated about them. There are no great deviations to astonish us, and there are so many irregularities that if two or three analyses only were made the effect would be bewildering or uncertain; but there are enough here to show a steady diminution of oxygen, on one side, with occasional risings as the wind may blow here or there, and a steady rise of oxygen on the other, with occasional fallings also, as the wind may chance to carry smoke or other gases.

The laboratory stands in an open space, which contains certainly a burial ground in the centre, but is very much freer from the smoke of the town than the streets are; no manufactories exist beyond or between it and the country. The wind from west and south blows over some houses but over no large chimneys.

The results clearly show a difference between the air of more and less pure places and render the oxygen test more valuable than it hitherto has been supposed to be. Unfortunately so many analyses are required that the test cannot be popular; but as one to be resorted to when the occasion warrants the labour it stands very clear. And indeed how can it be otherwise? We see putrid matter laid on the ground, and find it disappearing rapidly, and yet we are told that it is not accompanied by loss of oxygen; it is not credible, and the results given show it to be incorrect.

It may perhaps be said that although some of the specimens contained less than 20·9 oxygen if they came from a clear atmosphere, such air could not be considered very bad. This reasoning cannot hold. Analyses are after all subject to error, and the average is the only number on which we can rely. It may even happen that the small changes are caused by accidents which may give impurity. For example, take gusts of impure air even in the air of a street generally pure.

It is abundantly clear that whenever we leave the region of the uncontaminated or very little contaminated open air we obtain a diminution of oxygen although that diminution is very small; this small loss is therefore a proof of impurity. In crowded rooms, theatres, cow houses, stables, and laboratories it is easily proved, and that diminution is enough in decided cases to bring the figures various stages below 20·9.

Oxygen of the air in wet and in dry foggy weather.

Continuing the subject and going further into detail:

In very wet weather in Manchester, and still before the laboratory, the following results were obtained:—

	Oxygen.
	20·90
	21·01
	21·01
	21·05
	20·96
	104·93
Average -	20·98

In dry, foggy, and frosty weather, when the smoke of Manchester had no exit from the town:

The results were	Oxygen.
Near centre of town - -	20·90
	20·88
At laboratory - - -	20·90
	20·96
At laboratory, afternoon - -	20·91
„ forenoon - -	21·01
„ afternoon - -	20·82
	146·38
Average -	20·91

20·82 and 20·89 were found in a dense fog, such as has rarely visited Manchester. The eyes began to smart, and in walking on the pavement carters were met leading their horses into shops in the day-time—we can scarcely say in the day-light.

Thus we have certified by experiment as well as the testimony of the senses, the inferiority of the air at certain times, and these senses seem to estimate on certain occasions an amount as small as 0·07, but so far as we know they do not estimate the loss of oxygen, but the corresponding increase of impurities. In the yard at the back of the laboratory the amount is less than before the laboratory, andis as follows:

Oxygen.
20·80
21·01
20·94
20·84
21·09
Average 20·936

Thus we have the series:—

In very wet weather, in front -	20·98
At all times, an average of 32 experiments - -	20·947
Behind, in medium weather -	20·936
In foggy frost - - -	20·91
Over ash-pits - - -	20·706

These results surprise me as I write. They come from analyses made some months ago, and without the hope of such a fine gradation of qualities. They seem also to show that we are exposed to currents of good air in the worst, and of bad air in the best atmospheres in towns like Manchester. This is suggested also by that number, 21·01 or more, so curiously turning up in the analyses of most persons, although it is absent in the list of Regnault's given.

In dwelling rooms, &c.

If we go to dwelling rooms, &c., we find the same diminution of oxygen where there is insufficient ventilation:—

Before the door of a house in a suburb of Manchester, the air gave of oxygen -	20·96
In the sitting room, not very close -	20·89
In a very small room, with a petroleum lamp burning, a good deal of draught	20·84
After 6 hours - - - - -	20·83
Pit of theatre, February 13th, 1864, 11.30 p.m. - - - -	20·74
Gallery, February 15th, 10.30 p.m. -	20·63

In cow-houses and stables.

If, again, we enter cow houses and stables, the same results are attained. The following six are so uniform, they seem to be as good as thousands, and are obtained from the only specimens collected. I went in the morning after the cows had been milked and fed, and therefore after the air had been allowed to enter. The houses still had a close smell. The stables were badly closed and one was open; the specimens were taken near to the horses, as far from the doors as possible, avoiding the direct breath of the animals. I cannot say they are fair examples of the air breathed by the horses or cattle alone; but they are very fair specimens of the kind of air breathed by those who work in or visit stables. Two of the stables were for cab horses, the doors half open; a third was a gentleman's stable of four stalls, but there was only one horse; the door was shut. The air seemed good for a stable, and still the loss of oxygen is visible in the analysis.

	Oxygen.
Cowhouses	20·70
,,	20·78
,,	20·75
Stables	20·82
,,	20·74
,,	20·74

In such places as have been last described it would not be pleasant to live, and in the atmosphere of the theatre we know how much desire of fresh air is produced. Yet none of these numbers are so low as 20·6, the number assumed as marking the beginning of very bad air. The temperature of the theatre in the pit was 78° F., and this is a common temperature in the mines. By taking Leblanc's analyses a somewhat different number might be arrived at; but even he finds 20·54 only after a hospital window had been shut all night, and 20·53 in a room with 116 children. Five of his analyses give numbers below 20·6. These are bad cases.

Experiment has led me to form the following Table of the Composition of the Air of pure and impure places, beginning with that containing most oxygen, although probably not the very richest specimen:—

In a suburb of Manchester in wet weather	20·98
Do.	20·96
In the outer circle of Manchester	20·947
At the back of the house	20·936
In fog and frost in Manchester	20·91
In sitting room which felt close but not excessively so	20·89
In a small room with petroleum lamp, well ventilated	20·84
Do. After six hours	20·83
Pit of theatre, 11.30 p.m.	20·74
Gallery, 10·30 p.m.	20·36
In large cavities in mines	20·77
In currents	20·65
Under shafts	20.424
In sumps	20·14
When candles go out	18·5
The worst specimen yet examined in the mine	18·27
Very difficult to remain in for many minutes	17·2

It seems to me clear that air in places where putrefaction may be supposed to be going on is found generally by all observers to contain less oxygen than pure air. This enquiry puts the subject in a somewhat clearer light, and shows us that those places containing impurities and which are in or near all our houses are also subjected to a diminution of oxygen. The diminution is not entirely made up by carbonic acid, and must be made up by other substances. This diminution is very sensible when it comes to 20·75, or even in some places 20·85, being equal to a removal of 0·2 to 0·1 of oxygen. We do not require to seek deadly places for air with diminished oxygen; the air of every house is subjected to this diminution, which must of necessity be an indication of the amount of impurity existing in the air, although giving no clue to the quality of that impurity which may be more or less innocent or noxious.

It is well known that oxygen over putrid substances is absorbed, whilst carbonic acid and other gases take its place. This reasoning does not touch the question, What is the effect of a loss of oxygen when no impurities take its place?—a condition little known.

CARBONIC ACID OF THE ATMOSPHERE.

Horace de Saussure first paid minute attention to the carbonic acid of the atmosphere, and showed its presence on the mountains of Switzerland as well as on the plains. He used lime water. His results were published in his *Voyages dans les Alpes* in 1796. His son Theodore in 1828 published a resumé of a much fuller inquiry, and in 1830 the complete account. He used a vessel of 34 litres in volume, and washed the air with baryta water, collecting the carbonate of baryta precipitated. This is a laborious process; but, considering the great accuracy of the operator and the long experience which he gained, we may place the greatest confidence in his results. I am disposed to think that there may be a little excess in his experiments, but this will not affect the comparative amounts found at different times, and which form the most interesting part of the inquiry. He says:*

"The quantity of carbonic acid in the open air in the same place is subject to almost continual change equally with the temperature, the winds, the rain, and the atmospheric pressure. The observations which I have made since 1816 until the month of June of this year, in a prairie of Chambeisy, three quarters of a league from Geneva, indicate that the mean quantity of carbonic acid in volume which 10,000 parts of air contain is equal to 5· or more exactly to 4·9. The maximum of this gas is 6·2; the minimum is 3·7.

"The observations published (Bibliothèque Univ., v.1.) show as maximum in the same place a greater proportion of acid, but it is probable that this excess was the result of the imperfection of the experiment.

"The augmentation of the average quantity of carbonic acid in summer, and its diminution in winter, are manifested at different stations,—in the country as in the city, upon the lake of Geneva and upon a hill, in calm and disturbed air. According to an average of thirty observations made at Chambeisy, during seven years, with baryta water, the quantity of carbonic acid in the months of December, January, and February, at mid-day, is to that of June, July, and August as 100 to 77.

* Annales de Ch. & de Ph., vol. 38, 1828.

"This ratio is not constant throughout every year. There are times which form exceptions, and in which the quantity of carbonic acid in summer is inferior to that in winter, or vice versâ. Thus after many years of observation, the mean quantity of carbonic acid of the month of January in 10,000 of air is 4·23; but the quantity of carbonic of the month of January 1828, which was extraordinary for the mildness of its temperature, rises to 5·1. The average quantity of carbonic acid of the month of August, taken in different years, is 5·68; but after an average taken from four observations (the results of which closely approximate) in the month of August 1828, which was singularly cold and wet the quantity of carbonic acid at noon was only 4·45.

"The difference in the quantities of carbonic acid contained in the atmosphere in calm weather, during day and night, is one of the most remarkable results of my late observations. The following is the table of experiments which I have made, in open country at noon, and at eleven o'clock in the evening, of the same day.

The Table of Carbonic Acid in the original is given in 10,000 parts, but for uniformity sake is here altered into per-centage.

Time.	Noon.	Evening. 11 o'clock.
May 22nd, 1827	·0581	·0623
July 7th ,,	·058	·062
Sept. 3rd ,,	·0561	·0601
Nov. 6th ,,	·043	·0486
May 31st, 1828	·0475	·0565
June 13th ,,	·0506	·0583
June 26th ,,	·0539	·0522
August 1st ,,	·0432	·0606
August 12th ,,	·0429	·0582

"It results from these observations, that the air contains in calm weather more carbonic acid during the night than during the day. The only exception to this result was on June 26th, 1828, during extremely violent wind, whilst all the other observations were made in calm weather, or in slightly disturbed air. I have acquired sufficient experience in this kind of work, to affirm that the general difference which is found in this table could not result from errors of observation.

"It remains for me to discover if this difference is maintained in the middle of winter, or when vegetation is inactive.

"The air taken at the middle of the Lake Leman opposite to Chambeisy contains on an average a little less carbonic acid than the air taken a hundred toises from the bank. After eight observations, made at different periods, on the same days at noon, the quantities of carbonic acid at the two stations are as 100 to 98·5; but the air of both places follows the same variations relatively to the seasons.

"The air of Geneva contains more carbonic acid than the air of a prairie of Chambeisy, almost in a ratio of 100 to 92, from six observations made at the same time at both stations. A greater purity in the air of the country could be foreseen. I cite this result only because the other eudiometrical experiments indicate no difference in the air of those two places, and as it shows the utility of the experiment of which this is the subject."

At first Saussure was led to believe that rain increased the carbonic acid, but changed his mind, finding the contrary, and also that this acid increased in dry weather even with a freezing temperature.

For the lake of Geneva and the neighbouring Chambeisy, his numbers are:—*

——	——	Carbonic Acid at Chambeisy.	On the Lake of Geneva.
1826.			
Dec. 29	Mid-day -	·0421	·0385
1827.			
May 22	Ditto -	·0540	·0502
July 2	Ditto -	·0523	·0578
Aug. 9	Ditto -	·0521	·0542
1828.			
Sept. 28	Ditto -	·0495	·0474
Jan. 19	- - -	·0491	·0446
July 7	- - -	·0481	·0441
Aug. 12	- - -	·0408	·0392
Aug. 26	- - -	·0422	·0410
Sept. 26	- - -	·0414	·0320
,,	Night - -	·0493	·0430
1829.			
Feb. 5	Mid-day -	·0445	·0476
March 7	- - -	·0463	·0465
April 18	- - -	·0429	·0422
July 7	Night - -	·0534	·051
July 8	Mid-day -	·0435	·0408
Oct. 13	- - -	·0354	·0342
,,	Night - -	·0416	·0368
	Mean -	·0460	·0439

De Saussure found also more carbonic acid in the town of Geneva than outside at Chambeisy. The numbers are:—

——	——	At Chambeisy.	In Geneva.
1827.			
Feb. 12	Mid-day -	·0358	·0455
May 22	- - -	·0540	·0569
May 26	- - -	·0471	·0528
Aug. 9	- - -	·0453	·0476
1828.			
Jan. 28	- - -	·0426	·0427
Feb. 19	- - -	·0462	·0482
April 10	- - -	·0465	·05
July 25	- - -	·0390	·0445
July 1	Midnight -	·0407	·0385
Sept. 4	11 at night -	·0441	·0439
Sept. 5	- - -	·0382	·0420
Oct. 1	- - -	·0414	·0423
Oct. 2	- - -	·0367	·0405
	Mean -	·0437	·0468

Showing that night increases the carbonic acid in the country more than in a town. This we may imagine, as the influences in a town are towards a diminution at night.

One of the most curious results of De Saussure's inquiry is, that the carbonic acid on the mountains is actually greater than on the plains. It will be interesting to give these figures, as they are often referred to, and seldom seen. It may be remembered here that there was some reason to believe in a diminution of oxygen in mountain air to a minute extent. The increase of carbonic acid is a corroboration.

* Ann. de Ch. et de Ph. Vol. 44.—1830.

Name of Mountain.	Height of Mountain in Metres.	Carbonic Acid in the Air of the Mountain.	Carbonic Acid in the Air of the Plain.
La Dôle - -	1267	·0461	·0474
Grand Salève-sur-Crevin.	877	·0557	·0482
Hermitage (Petit Salève).	331	·0544	·0482
La Dôle - -	1267	·0491	·0446
Vasserode-sous-la-Dôle.	908	·0481	·0446
Grand Salève-sur-Grange-Tournier.	945	·0413	·367 at foot, ·359 at Chambeisy.
Col de la Faucille	963	·0443	·0414
Ditto - -	963	·0454	·0415
Ditto - -	- -	·0369	·0387
Ditto - -	- -	·0360	·2322
Ditto - -	- -	·0422	·0355
Ditto - -	- -	·0395	·0315

He refers the difference to the rain below, and the moisture of the ground, and to vegetation, which diminishes the carbonic acid and increases the oxygen. He finds also that the mountain air does not change at night as the air below does. He finds a minute increase of carbonic acid arising from violent winds, and thinks this may arise from the upper mixing with the lower strata; his evidence on this point may be explained by the fact, that he found a decrease on June 20th during a violent wind, probably from the same cause, namely, mixing.

De Luna has lately examined the air of Madrid with the following results:—

Air of Madrid, outside Walls, during month of March.

(1st series.)

Place.	Oxygen.	Carbonic Acid per cent.
1 - - -	20·71	0·05
2 - - -	20·79	0·03
3 - - -	20·77	0·03
4 - - -	20·77	0·05
5 - - -	20·73	0·06
6 - - -	20·75	0·03
7 - - -	20·70	0·06
8 - - -	20·74	0·05
9 - - -	20·69	0·09
10 - - -	20·81	0·02
11 - - -	20·79	0·03
12 - - -	20·78	0·04

Air of Madrid, inside Walls, during month of April.

(2d series.)

Place.	Oxygen.	Carbonic Acid.
1 - - -	20·70	0·06
2 - - -	20·70	0·06
3 - - -	20·77	0·03
4 - - -	20·75	0·05
5 - - -	20·70	0·06
6 - - -	20·69	0·06
7 - - -	20·78	0·05
8 - - -	20·69	0·08
9 - - -	20·70	0·06
10 - - -	20·78	0·04
11 - - -	20·80	0·03
12 - - -	20·73	0·04

The amounts of oxygen are very small, and the carbonic acid very high. Solutions were used for the oxygen, and permanganate for the organic matter.

Hospitals.

Rooms.	Oxygen.	Carbonic Acid.
(1st series.)		
1 - - -	20·58	·32
2 - - -	20·50	·38
3 - - -	20·49	·43
(2nd series.)		
1 - - -	20·65	·27
2 - - -	20·52	·30
3 - - -	20·60	·29

The experiments of Mr. Lewy on the Atlantic Ocean and in America show a great irregularity. They are given in the previous chapter. We do not see clearly why there should be a rise in the carbonicacid from 0·333 to 0·577 at sea. The great inequalities on the land are interesting, and especially at Bogota, where meteorological influences interfere to render the amount great and diminish health.

Dalton had made experiments on the atmosphere with lime-water, but by no means such as are satisfactory. Mr. Hadfield, who had learned in his school, improved the process very much. He used a bottle of 471—498 cub. in. fitted with a brass cap and stop-cock, and filled it by means of a bellows. He tested the lime-water with sulphuric acid, before and after shaking with the air, or after it had stood for some days. He obtained 0·80 vol. per 1,000. This is high as a constant result, but as he lived on the borders of a putrid canal it may not be too high. His results are found in the Mem. of the Literary and Philosophical Society of Manchester, 2d series, vol. vi., 1842.

Dr. Boswell Reid* made trials with various amounts of carbonate of lime in water, as indications of the carbonic acid absorbed. After passing the air through a solution he compared the result with these trials, keeping the precipitates in bottles. This use of lime he called a carbonometer. The results were comparative, but I do not find that they were quantitative. These precipitates change so much that they cannot be used for comparison after a few hours.

Pettenkofer next took up the subject, using lime, now, I believe, baryta, to remove the carbonic acid from the air, and oxalic acid to test the solution. The bottles in which the experiments were made were dried with great care, and the solution of oxalic acid made very delicate. One cubic centimetre of this solution was made equal to a milligram of lime, but it may also be made equal to a cubic centimetre of carbonic acid. The strength, however, must vary with the air. If the air is very bad, a stronger solution may be used. Indeed this is rather a difficulty in the process, as you cannot use one solution for all conditions, on account of its extreme delicacy. The carbonic acid saturates part of the lime, and the amount remaining is tested with oxalic acid to see how much is still unaltered. The point of neutralization is found by putting a drop of the liquid on a piece of turmeric paper.

The plan is very beautiful and complete. In principle it is exactly that of Hadfield's, but oxalic acid is used, and the experiment made more delicately.

* "Illustrations of the Theory and Practice of Ventilation," by David Boswell Reid, M.D., F.R.S.E. &c, ; Longman, 1844.

He gives 0·5 per mille, or ·05 per cent., as the amount in the air generally at Munich. This is above the number of Saussure, and both are above the numbers found here. Munich is 1,690 feet, Geneva 1,154 above the sea. In the Handwörterbuch der Chemie, under "Ventilation," Pettenkofer gives a summary of the amount of carbonic acid in dwelling houses, as follows:

In a dwelling house, during the day, 0·054.

After a while it increased to 0·065, 0·061, 0·064, 0·068, 0·074, and 0·087. Mean 0·068.

In a bed room at night with closed windows, 0·230.

Partly open, 0·082.

He found the following amounts of carbonic acid per cent. on examining public places, hospitals, prisons, &c.:—

	·232	·143	·223
	·226	·307	·247
	·334	·261	·131
	·186	·278	·495
	·362	·429	·536
	·317		
Schools	·410	·567	·200
	·229	·558.	

Limit of Carbonic Acid in Dwelling Houses.

Dr. Reid's labours are much to be admired; he did much for the subject of ventilation in this and other countries. I am disposed, therefore, to have great respect for his opinion, that air containing between 0·1 and 0·2 per cent. of carbonic acid cannot be proved to be injurious, although certainty has not been arrived at. This, however, we know, that this amount of carbonic acid, at least when given out by human beings and at a temperature not cold, is very offensive, if not on account of the acid, still of its accompaniments.

Pettenkofer, after great attention to the subject, concludes that 1 per 1,000 marks the limit of bad and good air, and that those who can plead for more have lost the refined use of their senses. He then inquires into the cause of this feeling, as there is neither a want of oxygen nor a great amount of carbonic acid, attributing the feeling experienced to the prevention of a proper flow of heat, and in part, very ingeniously to the existence of such bodies as butyric and baldrianic acids, which saturate a large volume, and so prevent further evaporation. In other words, he attributes the depressing feeling to organic matter, as I have also done.

He finds also that a lowering of temperature ventilates a room more rapidly than opening a window.

In order to find the amount of fresh air which must be supplied to any dwelling, he explains that the carbonic acid of the expired air is about 4 per cent. or 40 per mille. The mean in the air is 0·5, and that of a good air for a room is 0·7. This gives a difference of 0·2. Then $\frac{40}{0·2} = 200$. If, we must keep up the freshness of the air, we must add 200 times the volume of the air that is expired. If, a man breathes out 300 litres in an hour, there must be added 60,000 litres of fresh air = 2118·96 cubic feet. At the same time it is shown how much more rapid the change of air is when out of doors, where the air is consequently pleasanter, proving that even the apparently excessive amount obtained indoors was not all that was desired.*

Pettenkofer mentions that it has been found necessary in some hospitals in Paris to use exactly this amount of 60,000 litres in order to prevent all smell.

If it were desired to keep the air at 0·6 per mille, the calculation would be $\frac{40}{0·1} = 400$ times. We cannot do better than adopt the figures for bad and good air given by Dr. Reid, or rather Professor Pettenkofer, as far as they will suit circumstances. Here we must put the amount of carbonic acid in the atmosphere here at 0·4 at the most, instead of 0·5; and it is exceedingly probable that in many parts of England it will be found constantly less, as it certainly is frequently. This would make it possible to have a dwelling room at 0·6 instead of 0·7. But practically we are not always favoured with such ventilation, even in England; and Germany seems to be much worse, judging from the analyses of Pettenkofer, &c. In some cases we may, with Dr. Reid, allow more carbonic acid. Dr. Reid was not exaggerating, although he was frequently blamed, when he insisted on supplying 600 cubic feet per hour for an individual; and we find that, in the Journal of the Chemical Society for 1858, Dr. Roscoe found that 1,200 was nearer the demand in a hospital. Dr. Arnott, a revered authority on ventilation, demands 1,200. I shall return to this question.

Carbonic Acid of the Air in England.

Dr. Roscoe has given what may be called a favourable view of the air of Manchester and London, as he seems not to have found places so bad as those found by me. I may be allowed to quote a calculation of mine in the Chem. Soc. Journal, 1859.

Allowing the air to go at the average rate of twelve miles an hour,* it will sweep over the three or four miles of Manchester three times an hour, or 36 times in 12 hours.

Taking the height of air affected to be 300 feet, as we must assume something, we have carbonic acid

from coals	0·0091 per cent.
expired air	0·0002
call the usual amount ·06	·06
	·0692

But call the usual amount 0·03 as it sometimes is, or even below it we have:—

from coals	0·0091
breathing	0·0002
usual air	0·0300
	·0393 or 0·393 per thousand.

We see then that the combustion of coal and the breathing will produce carbonic acid, amounting only to a third of that in the purest air generally found, or one fourth of that in air having 0·04. It is certainly remarkable that the amount which I calculated as that which ought to exist should be found, by experiment, to be correct to the third decimal place, according to Dr. Roscoe. At the same time my own numbers are a little higher, and in extreme cases much higher.

Dr. Roscoe has found the carbonic acid to be as low as 0·027 per cent. outside of Manchester in wet weather, and near the sea 0·043; rather more than in Manchester. This favours the idea of oxygen coming from vegetation, or rather of carbonic acid being absorbed to such an extent as to influence the experiments. Dr. Roscoe has put down for Manchester 0·0392 per cent.; the country 0·0402 „; Manchester district 0·0394 „

* Mr. Hartnup, F.R.A.S., finds it 12·62 at Liverpool.

That the amount should be less or even equal in Manchester is scarcely to be explained, especially as even in Geneva, Saussure found more than in the country. Had the country places been mountainous the observations would have been better understood.

At the same time I made some experiments which gave higher numbers, varying from 0·0409 per cent. to ·15 per cent. These, with the exclusion of four which are very high, give an average of 0·0544. The four were taken under circumstances which make me believe they are correct; some places are continually exposed to gusts from chimneys, which must contain a high amount of acid.

Lately I undertook a much larger number of experiments, using Pettenkofer's method of analysis. The bottle I used is of a different shape from Pettenkofer's, and the bellows are different, but the method is essentially the same. The bottle has a very wide mouth, so as to allow the hand to enter, and drying is performed by means of a pure linen cloth which has been washed in acid and distilled water. This saves a great deal of trouble, and repeated analyses have proved that neither from the hand nor the cloth does any hindrance to accuracy arise. The bellows pump is one that I have used for emptying bottles of air for the permanganate test. The bottle and pump are seen at fig. (1). When the bottle is cleaned and dried, the baryta is added, and the elastic cover, as seen in the same figure, is put on.

The following results were obtained after nearly 200 experiments were made in Manchester and London.

Carbonic Acid in the Air just outside of Manchester.

Place.	Per Cent.	Wind.	Date.	Time.	Temp. Cels.	Bar.	Remarks.
Fields in Greenheys -	0·0383	—	Feb. 22	—	—	—	
Higher Broughton - -	0·0350	E.S.E.	„ 24	—	0·6	29·9	
Old Trafford - -	0·0432	—	„ 25	—	3·0	29·98	
Buxton - - - - -	0·0431	E.	—	11.0	—	—	Fine day.
„ - - -	0·0459	„	Mar. 19	—	—	—	
„ - - -	0·0467	„	„	—	—	—	
„ - - -	0·0443	„	„	1.0	—	—	
City Road, Hulme - -	0·0367	„	Mar. 8	3.0	4	29·2	Strong wind. Little snow.
Rusholme - - -	0·0295	—	„ 11	—	5	29·2	Very windy. Hail storm.
Queen's Park - -	0·0308	—	„ 14	—	10	—	
Old Trafford - -	0·0340	W.	April 1	—	—	—	
„ over canal -	0·0313	„	„	—	—	—	
Old Trafford - -	0·0293	„	„ 2	—	—	—	
„ - - -	0·0291	„	„ 11	5.50	—	—	
(14)	0·5172						
Mean -	0·0369						

Close Places.

Place.	Per Cent.	Wind.	Date.	Time during Day.	Temp.	Bar.	Remarks.
Theatre Royal, pit -	·2734	—	Feb. 13	—	22	29·3	
„ gallery -	·1358	—	„ 15	10.50	29	29·7	
„ „ -	·1238	—	„	„	„	„	
Queen's Theatre, pit -	·1026	—	„ 16	—	26	29·7	
„ - -	·1019	—	„	—	„	„	
Stables - - -	·0833	—	—	—	8·2	30·	4 horses had been there during the night, and 3 were still there.
„ - - -	·0875	—	—	—	„	„	
Cellar of Laboratory -	·0572	—	„ 17	—	6·2	30·1	
Study, at table - -	·1177	—	„ 25	—	16	29·98	4 persons were in the room, with 3 gas lights and large fire.
„ ceiling -	·1561	—	—	—	22	„	
Schoolroom - - -	·0970	—	Mar. 15	—	12	—	
„ - -	·0886	—	„	—	—	—	
Brewery - - - -	·1214	—	„ 16	—	—	—	
„ - - -	·180	—	„	—	—	—	Near fermenting vat.
Mills - - -	·286	—	„ 10	4·0	20	—	Taken in weaving shed which contained 400 people.
„ - - -	·283	—	„	5·30	21	—	
„ - - - -	·293	—	„	5·30	21	—	
„ - - -	·300	—	„	„	„	—	
(18)	2·8883						
Mean -	·1604						

CARBONIC ACID in the AIR of MANCHESTER.

Place.	Per Cent.	Wind.	Date.	Time during Day.	Temp.	Bar.	Remarks.
Churchyard, All Saints	0·0323	N.E.	Feb. 22	—	1	29·8	
Smithfield Market	0·0446	„	„ 20	11·0	1·3	29·95	
„ „	0·0464	„	„ 20	„	1·3	„	
Churchyard, All Saints	0·0437	„	„ 18	—	5·2	30·18	
„ „	0·0521	„	„ 18	—	„	„	
Back yard of laboratory	0·0539	—	„ 6	—	1·4	30·8	
„ „	0·0383	—	„ 6	11·15	„	„	
„ „	0·0473	—	„ 6	3·15	„	„	
„ „	0·0515	—	„ 6	3·35	„	„	
Philosophical Society	0·0677	—	„ 9	11·20	1	29·55	Fog, but not very dense.
„	0·0683	—	„ 9	5·15	„	„	„ „
Bishopsgate	0·0734	—	„ 9	4·30	„	„	Fog, very dense.
„	0·0727	—	„ 9	„	„	„	„ „
Back yard of laboratory	0·0523	—	„ 10	10·30	8	29·4	Little fog.
„ „	0·0541	—	„ 10	11·30	„	„	
Deansgate	0·0578	—	„ 10	2·30	—	—	Fog.
Small court off Berry Street	0·0604	—	„ 11	—	4	29·6	
Midden	0·0724	—	„ 12	5·5	5·4	29·38	
„	0·0732	—	„ 12	„	„	„	
„	0·0805	—	„ 13	11·50	7·2	29·3	
„	0·0837	—	„ 13	12·25	„	„	
Churchyard, All Saints	0·067	—	„ 19	—	1	30·18	
„ „	0·0447	—	„ 19	—	„	„	
„ „	0·0518	—	„ 19	—	„	„	
End of Market Street	0·0374	—	„ 23	—	2·8	29·85	
„ „	0·0321	—	„ 23	—	„	„	
Blackfriars Bridge	0·0495	—	—	—	—	—	Taken immediately over the water. Very bad smell. Fine day.
Near Printing Lane	0·0351	—	—	—	—	—	
Back yard of laboratory	0·0327	—	Mar. 4	4·0	5·6	29·5	Rain.
„ „	0·0319	—	„ 4	5·30	—	„	
„ „	0·0391	S.W.	„ 7	10·15	9·5	29·	Very fine.
„ „	0·0358	„	„ 7	11·15	—	„	These experiments, Mar. 7, after 3 days rain.
„ „	0·0343	„	„ 7	12·15	10	„	
„ „	0.0311	„	„ 7	2·15	7·8	„	After more rain.
„ „	0·0311	„	„ 7	2·50	7·4	„	Rain.
„ „	0·0335	„	„ 7	3·15	7·2	„	
„ „	0·0367	„	„ 7	4·15	6·4	„	Fine.
„ „	0·0333	„	„ 7	5·15	—	—	
All Saints Churchyard	0·0319	E.	„ 8	4·45	4	—	A little snow; strong wind.
Stockport, back street off Heaton Street.	0·0415	N.E.	„ 9	2·30	4	—	Snowing fast.
„ Chester Gate	0·0351	„	„ 9	3·30	4	—	„ „
„ near Grammar School.	0·0355	„	„ 9	4·30	„	—	„ „
Back yard of laboratory	0·0311	—	„ 11	4·50	5	—	Very stormy.
River Medlock, a little above Brook Street.	0·0351	—	„ 17	11·30	—	—	
Back street off Gray Street, Ox. Street.	0·0383	—	„ 17	2·30	—	—	Rather windy.
River Medlock, where the water runs into a basin.	0·0367	—	„ 17	4·15	—	—	
Canal bank, Canal Street	0·0375	—	„ 18	11·0	—	—	
Old Garratt, river bank	0·0608	—	„ 22	11·40	—	—	
Granby Row, Crown St.	0·0520	N.E.	„ 22	4·0	—	—	
„ „	0·0544	„	„ 22	„	—	—	
Scholes Street, London Road	0·0408	„	„ 22	4·50	—	—	
Devonshire Street, All Saints.	0·0343	E.	„ 23	—	—	—	
St. Mary's Gate, Exchange	0·044	W.	„ 24	—	—	—	
„ „	0·0375	„	Apr. 1	11·0	—	—	
„ „	0·0344	„	„ 1	5·0	—	—	
„	0·0333	„	„ 2	11·0	—	—	
„ „	0·0346	„	„ 2	„	—	—	
„ „	0·0364	S.E.	„ 5	12·10	—	—	
„ „	0·0365	„	„ 5	„	—	—	
„ „	0·0389	„	„ 5	5·0	—	—	

Place.	Per Cent.	Wind.	Date.	Time during Day.	Temp.	Bar.	Remarks.
St. Mary's Gate, Exchange	0·0398	S.E.	Apr. 5	5·0	—	—	
„ „	0·0317	N.W.	„ 11	—	—	—	
„ „	0·0329	„	„ 11	—	—	—	
Back yard of laboratory	0·0399	S.E.	„ 5	2·30	—	—	
„ „	0·0352	—	—	—	—	—	
„ „	0·0312	—	„ 6	—	—	—	
Ditto, over some mud	0·0358	—	„ 6	3·0	—	—	
„ „	0·0415	—	„ 6	„	—	—	
Ditto, over jar of mud	0·0433	—	„ 7	—	—	—	
„ „	0·0404	—	„ 7	—	—	—	
„ „	0·0501	—	„ 7	3·0	—	—	
„ „	0·0343	—	„ 7	—	—	—	
Yard	0·0353	—	„ 7	5·0	—	—	
„	0·0387	—	„ 7	„	—	—	

The following summary may be made of the Manchester results:—

	Average of Carbonic Acid per cent
In Manchester streets in usual weather.	0·0403
During fogs	0·0679
About middens, of which there are thousands	0·0774
Average of all the town specimens	0·0442
Fogs excepted	0·0424
Fogs and middens excepted	0·0403
Where the fields begin	0·0369
In close buildings	0·1604
Minimum of suburbs	0·0291

There may be noticed also a tendency towards increase of carbonic acid as the day advances, as if at times the ventilation could not keep down the increase of acid. This is contrary to the results in a country place. There is less after rain, and less during high winds.

Carbonic Acid on the River Thames April 1864.

Locality.	Wind.	1st Deter.	—
		Carbonic acid per cent.	
London Bridge:—			
City side	S.W.	·0354	
Middle	„	·0383	
Surrey side	„	·0383	
Westminster Bridge:—			
City side	„	·0313	
Middle	„	·0344	
Surrey side	„	·0298	
Before the Houses of Parliament.	„	·0329	
Lambeth Bridge:—			
City side	„	·0329	
Mean of 10 experiments		·0343	

Carbonic Acid in the Open Places of London.

Locality.	Wind.	1st Deter.	2nd Deter.
Hyde Park	S.W.	·0334	·0334
The same	S.E. from City.	·0306	·0299
Regent's Park	N.E.	·0304	·0304
St. James's Park	„	·0285	
Duke of York's Column	„	·0285	·0280
Highbury			
Mean of 5 experiments		·0301	

Carbonic Acid in the Streets of London.

Locality.	Wind	1st Deter.	2nd. Deter.
		Carb. acid present.	
Cheapside, Post Office end.	S.W.	·0352	·0337
Outside the Exchange	„	·0398	
Newgate Street.	„	·0413	
Oxford Street, above Regent's Circus	E.	·0344	·0344
Lower Thames Street	„	·0428	
Small Alley, Smithfield.	„	·0337	
Small Court, Smithfield.		·0398	
Small Court, Upper Marsh, Lambeth.	„	·0382	
New Cut, Lower Marsh, Lambeth.		·0413	
Top of the Monument (215 feet high.)	„	·0398	·0405
Mean of 10 experiments		·0380	
Mean of 25 experiments in London		·0341	

With the aid of Dr. Bernays, of St. Thomas' Hospital, I have also obtained the amount of carbonic acid in close places in London.

CARBONIC ACID in CLOSE PLACES in LONDON.

	Per-centage by Volume.
Chancery Court, closed doors, 7 feet from ground, March 3	0·193
Same, 3 feet from ground	0·203
Strand Theatre, gallery, 10 P.M.	0·101
Chancery Court, door wide open, 4 feet from ground, 11.40 A.M., March 5	0·0507
Same, 12.40 P.M. 5 feet from ground	0·045
Surrey Theatre, boxes, March 7, 10.3 P.M.	0·111
Same, 12 P.M.	0·218
Olympic, 11.30 P.M.	0·0817
Same, 55.11 P.M.	0·1014
Victoria Theatre, boxes, 24 March, 10 P.M.	0·126
Haymarket Theatre, dress circle, 18 March, 11.30 P.M.	0·0757
Queen's ward, St. Thomas's Hospital, 3.25	0·040
Edward's ward, St. Thomas's Hospital, 3.30	0·052
Victoria Theatre, boxes, April 4	0·076
Effingham, 10.30 P.M., April 9, Whitechapel	0·126
Pavilion, 10.11 P.M., April 9 (Whitechapel)	0·152
City of London Theatre, pit, 11.15 P.M. April 16	0·252
Standard Theatre, pit, 11 P.M., April 16 (Strand)	0·320

Pettenkofer informs us that the air of Munich may be taken as containing about 0·05 per cent. of carbonic acid; with us it is certainly below this amount, and if raised to 0·05 by breathing, one would perceive it. May we conclude that such a small amount is imperceptible without organic emanations? Munich is very high; the air must sweep over the whole continent to come to it; it may wash up the carbonic acid, and, perhaps, oxidize the organic matter.

Air with even a smaller loss of oxygen is found deteriorated, if its place is occupied with carbonic acid and exhalations from the person, although we are not able to say how far this is the case when small quantities of pure carbonic acid are substituted for this small amount of oxygen.

On the Thames it is clearly seen that the open river is purer than the streets when the water is not putrid. London is freer from this acid than Manchester, although not equal to the parks in March and April, when the experiments were made. When the new sewers are complete the difference will be interesting.

These analyses indicate that a very minute amount of carbonic acid shows deterioration of air sufficient for the senses to observe. The senses observe a difference between Manchester and the outskirts. The difference is 0·0034 per cent. The senses observe it in London, where the difference between the streets and parks is 0·0040 per cent. They observe it also on the Thames and in wet weather. But they do not observe that in Munich, which has more carbonic acid than even these towns, and more than the New Cut or Lower Thames Street. The conclusion is that carbonic acid in these small amounts is not that which annoys us. In some towns it is no doubt sulphurous acid, in others organic matter and gases from putrefaction.

It does not follow that we must neglect this carbonic acid; on the contrary, it ought to be examined minutely, so that not the smallest increase be allowed if possible; not that we know certainly of any positive evil which it can do of itself in these small quantities, but because it almost always comes in bad company.

In the above analyses the air containing ·0774 is really worse than that containing ·1604, and even 0·3, because over the middens there is a little sulphuretted hydrogen. It is well then in such cases to use a double test. Indeed it is probable enough that other gases besides sulphuretted hydrogen, such as marsh gas and hydrogen products of decomposition, are issuing from cesspools and middens. I should not say probable; it is really certain. These gases, including the carbonic acid, show the reason why less oxygen should be found in such places.

I believe these analyses are of importance in the inquiry into the state of the air of mines, as they teach us the meaning of a deviation from the normal amount of carbonic acid as well as of oxygen in the air. A deviation of 0·2 is painful to us when it is caused by simple want of ventilation. If it is accompanied with gases of putrefaction it is much more hurtful, as some of these are very deadly.

These analyses teach us to be very careful not to allow the air to become deteriorated even to a very minute extent, and that a figure in the third decimal place is not to be despised; but they teach us more, namely, that in some places, such as high mountains, a slight increase of carbonic acid, such as is found in the third or even to the length of 2 in the second place, is rather a proof that the oxygen of the air has done its work well and purified the atmosphere, and that this increase is probably owing to pure carbonic acid. We have no proof of this occurring to a greater amount than 0·02. This number is taken from those observed at Munich and other places. It would be well to have those experiments of Schlagintweit confirmed, where 0·07 and 0·09 are found on high mountains. To conclude, we all avoid an atmosphere containing 0·1 of carbonic acid in crowded rooms, and the universal belief of civilized men is that it is not only odious but unwholesome. When men speak of good ventilation in dwelling houses they mean, without knowing it, air with less than 0·07 of carbonic acid.

ANALYSES OF THE AIR OF MINES.

Gases.

Before giving analyses of the air in mines, it is well to inquire into the work of our predecessors; and this, it must be confessed, is a laborious undertaking, daily becoming more oppressive for scientific men because of the want of any full arrangement of scientific facts. As time presses, and the report must be ready, it may be sufficient to mention the reasons for believing that the analyses quoted are the principal ones made public. Gätzschmann in Freiberg and Combes in France, are men who of all others may be expected to know the subject; and I feel inclined to throw on them the blame if any important collection of the analyses of air from metalliferous mines has ever been made and neglected. On the first especially I have learnt to depend, not merely on account of the greatness of his own knowledge as evinced in his writings, but also from the experience of that knowledge in conversation and by correspondence. I know he was desirous of giving all aid, from the impulses of his own nature, as well as on account of the introduction to him from Baron F. C. von Beust, who is the first officer over the Saxon

mines. To add to these, I might mention many of the most distinguished professors of Germany who would certainly have known inquiries of this kind had they existed. And no one will doubt the extensive knowledge of such men as Bischoff of Bonn.

Without going into details, it may be said that modern writers speak of bad air very much as the mining writers for three centuries have done; but where very late times are arrived at, we have the analyses of Moyle of Cornwall, and of Mr. Hunt, and to these must be added the still more recent inquiries of Dr. Brockmann of Clausthal, which seem less known, although most searching and valuable.

The only separate volume on mining air which has come before me, after advertising and inquiring, is that of Dr. Alois Wehrle, of Schemnitz, published in Vienna, in 1835. But analyses are few. When speaking of the candle, there may be more occasion to quote from him. These are some of his opinions on the air :—

"That air in which the mining candle burns dull and dark, but in which the workman feels no oppression, is called (*matte luft*) dull, flat, or stale air. But when the workman cannot keep his candle burning, it is called bad air (*schlechte lüfte* or *wetter*). A man may live in this bad air, and an Argand lamp may burn in it; but when this also goes out, and the workman feels confined (*beengt*), or when he is suffocated, then it is bad or poisonous air (*bad weather or schwaden*)."

"When the quantity of oxygen falls under 13 per cent., and is too small for the process of respiration, or when the carbonic acid amounts to 7 per cent. with several per cent. of sulphuretted hydrogen and miasmas of a peculiar kind, they communicate to the atmospheric air a property which is often very dangerous."—(Wehrle ueber die Grubenwetter, p. 6.)

Wehrle says, "the first consequence of a disturbed relation of the oxygen is that the mine candle burns darkly, and will only burn by enlarging the wick, until it at last goes out." (By enlarging the wick is meant putting the candle to the side and melting more grease, when more of the wick is laid bare. An actually larger wick does not seem essential.)

"As oxygen has a greater affinity to the ingredients of the burning material according as they are more decomposable, it follows that this phenomenon occurs sooner or later according to the quality of the substances burnt; and it is well known that tallow goes out when oil burns well, and that the common mine lamp goes out when the Argand lamp with the same oil burns clear."

"The venous blood also possesses a greater affinity for the oxygen than the carbon of the combustible substance, and a man can replace the loss of oxygen by frequent breathing, and therefore can live where candles and mine lamps go out."

p. 10. "As neither the combustible material nor the venous blood can remove all the oxygen from the air, but rather diminish it to 18 and at most to 12 per per cent., it follows that atmospheric air, the oxygen of which is to a certain degree diminished, acts towards men and candles like pure nitrogen."

p. 12. "In an atmosphere poor in oxygen, there is felt, not so much as a consequence of the presence of nitrogen, as of the absence of oxygen, contraction of the chest, tickling of the eyes, fatigue, weakness, and anxiety; we breathe more heavily and frequently, and are compelled to make more exertion at work, whilst perspiration and thirst ensue. With continued breathing, Humboldt observed paleness, hardening of the glands, herpetic eruptions, laming of the extremities, and early asthma."

Mr. P. Moyle examined the air of the Cornish mines. His results were published in the report of the Royal Cornwall Polytechnic Society in 1839, and the Annales de Ch. & de Ph. Vol. 3d, 1841. The following is the list of mines from which air was taken, and the analyses of the specimens, taken from the Annales de Chimie, and afterwards supplemented from the original.

		Oxygen.
1.	Wheal Vor.—250 fathoms from the surface, and 15 from the shaft, two men working in the cavity; air taken a few minutes after explosion	18·416
2.	Do.—16 fathoms from the shaft, 10 minutes after explosion	16·69
3.	Do.—24 fathoms from shaft, 30 minutes after firing	18·95
4.	Do.—22 fms., 30 m. after firing	17·282
5.	Do.—21 fms.	16·762
6.	Do.—Four men at dead end	14·76
7.	Do.—After firing	17·01
8.	Great Work Mine.—30 fathoms from a shaft, 15 minutes after firing	15·15
9.	Do.—20 fms., directly after firing	16·45
10.	Do.—23 fms. from shaft, half an hour after firing	17·544
11.	Binner Downs, 18 fms. from shaft, 2 men	16·764
12.	Carn Brea, 25 fms., 2 men	15·693
13	Do.—45 minutes after firing	14·51
14.	Tresavean, after firing, 65 fms. from shaft	16·35
15.	Wheal Ann, 16 fms., 2 men, no gunpowder	16·72
16.	Do. end of a level, powder not employed for some time, 45 fms., 2 men	18·22
17.	Consols Mine	17·78
18.	Do.	18·425

These figures are all the averages of several analyses. The specimens were collected by emptying a bottle of water or mercury at the spot. Water would appear to have been used in all cases, as there is a disproportionately small amount of carbonic acid, from 0·06 to 0·15. Supposing we recalculate, and give to each specimen an amount of carbonic acid equal to the oxygen removed, we should have different numbers. This amount would not be quite correct, but very nearly. Allowing the amount of nitrogen to be 79 pes cent., a number which must be within a small fraction of the truth, we may find the following change in Mr. Moyle's results :—

	Oxygen per cent.
No. 1	18·80
2	17·44
3	19·34
4	17·95
6	15·74
7	17·71
8	16·09
9	17·23
10	17·86
11	17·55
12	16·57
13	15·51
14	17·14
15	17·46
16	18·74
17	18·37
18	18·91
Mean	17·55

Mr. Moyle says that the lights burned with difficulty in No. 6 specimen; I have not found that candles could burn in such air.

These analyses are the only series made in this country, and the largest hitherto made anywhere, on the air of mines. Hausmann found in one of the Harz mines 13 per cent. of oxygen. It is, however, an extremely laborious operation to seek out the literature of any scientific subject, and I doubt if I shall have time to exhaust this branch before the date when this report must be written. It certainly will be no pleasure to me to neglect the labours of any man. I believe we must come to very late years, viz. 1851, to find another inquiry of equal authority with that of Moyle's, although not of equal extent. This was made by Dr. Brockmann, with the aid of a young chemist deceased, named Bodemann. Brockmann, who lives at Clausthal, in the Hanoverian Harz, will be quoted largely elsewhere as well as here, being especially a student of and an authority on the condition of mines and the diseases of miners.

These analyses, by "Bodemann, assayist," were published in the *Bergwerk's Freund* (*Miners' Friend*), vol. 8. No. 11,* and by Dr. Brockmann in his work on the diseases of the Upper Harz.

1st Analysis.

Air from Eleonora Mine. Place, 6th level, 220 fathoms deep, 1 fathom high, and 1 broad; 120 from shaft, 80 from the nearest winze; the rock not a very hard clay slate. Two men had worked from 4 to 9 in the morning, and at 6 o'clock 3 holes were bored; at 9 o'clock, 2.

The air was taken about 3–4 minutes after firing the last of the holes, and at the spot. There were 6 men with 6 candles present at the time. There was a west-north-west wind, a favourable one for the ventilation of the Upper Harz mines. The average of four analyses is—

1·86 less oxygen than normal air.
1·8042 carbonic acid converted into volume, or
2·7496 by weight per cent.

2d Analysis.

Air from pit Queen Charlotte, 80 fathoms from the nearest inside shaft or winze, 500 fathoms from the nearest shaft; 60 fathoms from a draught of air; The place was 200 deep; very moist, and with water on the ground. No ventilators used. Tallow candles were not extinguished, but oil lamps burned badly.

Two men had worked since 4 in the morning, At 7.30 o'clock two holes were fired, then two more; and half an hour after, that is 8.15 o'clock, the air was taken.

1·94 per cent. less than normal oxygen.
1·7781 carbonic acid by vol.
2·6975 by weight.

3d Analysis.

From Queen Charlotte Pit, 135 fathoms deep, 40 from draught; wet ground; may be taken as the representative of an ordinarily well-ventilated place.

0·73 less than normal oxygen.
1·0418 carb. ac. by vol.
1·5874 „ „ weight.

4th Analysis.

Duke William Mine, 289 fathoms down, 100 from draught; wet ground, 3–4 inches water. The ventilator was removed for 4½ days.

Air taken at 10 o'clock after 4 holes had been fired, two men having worked since 4 o'clock. On the previous day two men had worked from 4 to 12, and fired six holes. The day before that two men had worked from 6 to 12, and fired four holes, having 2 ounces of powder.

2·29 per cent. less than normal oxygen.
2·3794 carb. ac. by vol.
3·6262 „ „ weight.

5th Analysis.

Air from Wilhelm's Shaft, 5 fathoms from bottom, or 310 deep; active circulation of air.

0·45 less than normal oxygen; carbonic acid wanting.

6th Analysis.

Air from Caroline Shaft, 157 fathoms deep, before beginning the week's work:

0·29 less than normal oxygen.
0·64748 carb. ac. by vol.
0·9867 „ „ weight.

7th Analysis.

After the week's work:

0·21 less than normal oxygen.
0·7241 carb. ac. by vol.
1·1035 „ „ weight.

8th Analysis.

From the same after a week's work:

0·51 less than normal oxygen, wanting carbonic acid.

From these results Dr. Brockmann says we have—

Carbonic acid, by volume, 1·1964 per cent.
„ 1·8214 „ „

The mean of oxygen is 19·785, and taking the amount in the atmosphere at 20·815 we have a diminution of 1·030 per cent.; this is where ventilators have been used. Averaging these analyses in the manner adopted with the former we have:—

	Oxygen.	Carbonic acid.
No. 1. - -	18·955	1·8042
2. - -	18·96	1·7781
3. - -	20·085	1·0418
4. - -	18·525	2·3794
5. - -	20·365	?
6. - -	20·525	0·6474
7. - -	20·605	0·7241
8. - -	20·305	?
Mean -	19·790	1·396

Each line gives the mean of from two to six analyses, making the whole number 29.

Moyle's figures are also means of several trials. It would have been better in both cases to have had the separate items.

These analyses show a very bad condition of the atmosphere in the Harz mines, but a still worse in the mines of Cornwall. I confess myself inclined to think that the figures given by Mr. Moyle for oxygen are rather too low; but the reasons,

* Die Krankheiten des Oberharzes, von Dr. Karl Heinrich Brockmann, p. 30.

founded on the numerous results obtained by myself, must not be taken as conclusive that Mr. Moyle has made any error; it may be that he has been more choice in his spots. One circumstance, however, speaks strongly against his analyses: A candle will not burn in air with less than 18 per cent. of oxygen, when there is 3 per cent. of carbonic acid. Twenty-five years have greatly changed our ideas of the purity of air, and I was informed by Cornish miners that they have worked in spots where it was impossible to remain above ten minutes at a time, and when nearly every man fell down overcome, and the candles went out. Nevertheless, they went to their work and took their turns. This occurred when working upwards to meet a winze which was also being worked downwards. Mr. Moyle has, no doubt, sought such extreme cases, not to be obtained at will, and he had a right to choose such places because the men were at any time liable to be exposed to their influence. Such, at least, would explain a considerable depression of the oxygen. At the same time we must not forget that the habits of men have changed much in many places; and when I saw the holes through which some of the older miners occasionally burrowed in the Harz I was prepared for a worse state of things at a previous period. Looking now at Mr. Moyle's results, from the experience gained in the lead chamber to be afterwards mentioned, there is no difficulty in concluding that they represent very rare conditions of the atmosphere even in mines. A man may live awhile in most of the air, as thus represented, but long I believe he cannot live. I feel strongly inclined to doubt if he can exist in air, such as No. 6, 12, and 13. But with great lungs and great strength perhaps it may be possible. Healthy men and women, of various ages, were found in the lead chamber unable to bear such a loss of oxygen. I read in a lecture by W. Mackworth, Esq., R.E., that Mr. Robert Hunt, F.R.S., found 17·6 of oxygen in the average air of the Consolidated Mines, whilst the average of eighteen samples of air from different Cornish mines yielded 17 per cent. and of six others 19 per cent. of oxygen. I fear I have not seen all the labours of Mr. Hunt on this subject.

Method of Analysis.

It has already been shown why especial importance was attached to the oxygen and carbonic acid of the air, although it was not believed that their presence or absence to the extent of a half per cent. or even one per cent. would have a direct action which could be at once perceived by the senses.

To obtain specimens for analysis tubes of about $\frac{3}{4}$ of an inch (nearly 2 centimetres) in diameter were used, the length being six inches. They are drawn out at each end, and a fine tube $1\frac{1}{2}$ inch in length is left attached. Near the junction of the fine and the wide tube is a very narrow neck. They are in fact made after Professor Bunsen's model. The air is drawn through the tube until it is filled; and by the use of a candle and blowpipe the neck is melted and the specimen of air hermetically sealed up, so that it may be preserved for ages unaltered, as far as we know. Fig. 2 shows the tube with the pump attached, ready to be filled, and the tube before sealing. Beside it is the tube sealed. Fig. 3 shows another method with an elastic ball pump. The candles in many instances burned very badly and gave little heat

Fig. 2.

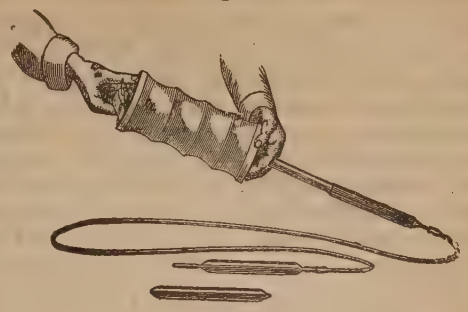
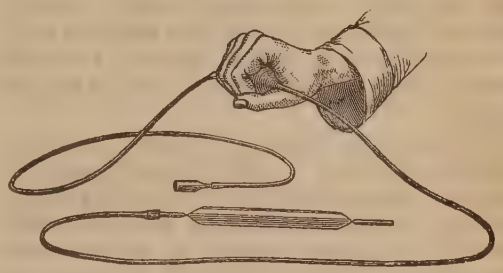


Fig. 3.



so that the act of sealing was difficult, and sometimes a failure. For this reason it will be seen that there are many numbers which have not the analyses attached, as it was found that the tubes leaked. In these cases the air may have been equal to that mentioned by Mr. Moyle, so that the worst are left out of my list. It may even happen that this is the reason for some specimens receiving a better character than they deserve, as the leak may not have been discovered. Most of the specimens were kept a few weeks before examination, some a few months; and minute leaks would be effective in that time in rendering the inside air equal to that outside, although that small leak might not be discovered during the short continuance of an experiment. At first the tubes were examined simply with the eye or a lens to see that the points were melted, afterwards they were dipt into mercury; if any leak existed, it was betrayed by the existence of a drop or more of the mercury entering the tube. If the tube is well handled in sealing, the lens is the best test. The tube was broken at one end under the mercury, and the air transferred to an absorption tube. In this graduated tube the amount of carbonic acid was taken, by absorption with moist balls of caustic potash. When the balls were moist it did not require quite an hour to complete the absorption in wide tubes; an hour and a half, however, was always the least given, whilst one set of tubes stood all night. There was no difference found between those which were done in the middle of the day and those which were begun on leaving the laboratory and kept to stand a night. As the number of analyses was very great, it became important to ascertain the readiest mode of going rapidly over them with accuracy. I had never been called on to prepare an amount of analyses at all approaching to the number now before me, and was a little alarmed. I began with the method of my master, Liebig, and obtained in many cases good results; but I confess to being very much annoyed with the endless washings required in order to remove the caustic solution of pyrogallic acid, a strongly-coloured liquid, from the tubes and from the mercury. Besides these

troubles there was observed occasionally an unaccountable obstinacy in the solution, as it appeared extremely unwilling to rise, and wearied the hand by constant shaking and watching ; nor was there any distinct mark to show the limit of the absorption or end of the experiments, except the exhaustion of the patience. I had therefore for some time given up the plan as a rule. Dr. Calvert objects to the method on account of an error of 0·4 per cent. caused by the formation of carbonic oxide. I may say, however, that I have sometimes and frequently obtained results far more accurate than the formation of 0·4 per cent. of carbonic oxide (See Dr. Calvert's paper, Proceedings of the Lit. and Phil. Soc. of Manchester), would indicate, so that the amount formed must be variable. However, I need not mention these results of mine, as Liebig himself and Bunsen, I believe, have both performed with pyrogallic acid very accurate analyses of air.

I preferred the method of explosion, and used Bunsen's eudiometer. I might have used Frankland's apparatus if any one could have been found to mend it in time. It would be interesting to know by which method the greatest number of analyses could be produced. With Frankland's apparatus one gas only is analysed at a time, but it is done very rapidly. I used five or six eudiometers at once. For obtaining a spark various methods had been frequently tried. At one time for a while I was satisfied with the rosin electrophorus, but from the moisture of the climate it frequently became extremely difficult to carry to another room as much electricity as would cause an explosion, and no spark could be had except before a fire. Bunsen's tube was greedily sought, as a very simple method, and in dry weather acted well, but became at times quite useless, so that whole days were spent in obtaining a spark. A small electric apparatus was got, and then a large one was used, but both required peculiarly warm rooms, and sometimes in wet weather the mere opening of a door would render useless the machine for a considerable time, although one had a plate of about 18 inches diameter. It was then clear to me that to work with any comfort a battery and a Ruhmkorff's coil were necessary. With this apparatus the amount of work was multiplied by five at least, and made into a pleasure instead of a pain. The battery used was made of cast iron and zinc. It was, perhaps, unnecessarily large; there were 12 plates of cast iron, and 24 of amalgamated zinc of 6 inches square. This battery has been some years in my possession ; the plates have never been renewed, and they are as smooth as at the beginning, although now becoming thin. It is lifted up and down into the cells by a pulley, so that the plates are only a few seconds at a time in the acid when a gas is to be exploded. After doing the usual experiments of a laboratory for a few years, it was set down to the induction coil about three years ago, and in that period, without special cleaning, and merely by a change of acid once in six months, it has exploded perhaps two to three thousand gas mixtures, besides being used occasionally for decomposing water. It makes us independent of weather.

My assistant at the time, being little accustomed to the use of this apparatus, preferred pyrogallic acid, and I was willing that he should take his experience, which ended in results similar to my own ; at the same time I am bound to confess that quietness and patience produced better results. Still that quiet and that patience could not be found with 500 analyses waiting before us. It was in fact necessary to work on a scale and by a method where the feelings would be completely excluded, and the mechanism of the operation be responsible for the exactness. This point, I believe, was attained, with gain in time, in comfort and in accuracy ; when I say in accuracy, I do not mean that there is an actual increase of accuracy, but in the number of experiments which were not failures. The analyses that are spoilt by the explosion method are very few, and were in reality at the latter part of the enquiry reduced to almost nothing.

Measure of the Accuracy of the Analyses.

At this stage it is necessary to enquire into the character of the results from which the conclusions are drawn.

I shall cite all the duplicate analyses from one volume of notes, containing the analyses of air from Welsh mines, and a few others, taking them exactly as they come, leaving none out.

Mark.	Oxygen, 1st.	Oxygen, duplicate.
W 53	18·60	18·74
25	20·89	20·96
77	20·82	20·79
64	20·52	20·61
76	20·96	20·85
16	20·49	20·48
60	20·73	20·67
52	19·58	19·60
43	20·25	20·17
37	20·64	20·76
39	19·96	19·86
W 55	20·47	20·52
W 58	20·36	20·29
121	20·79	20·90
116	19·70	19·54
W 16	20·44	20·34
W 17	20·42	20·38
D	20·73	20·56
D 10 top	20·09	20·50
D 47	19·09	19·00
D 8	20·55	20.55
	22) 446·50	22) 446·54
	20·29	20·29

Here we have the average of both columns, absolutely the same to the 2d decimal place, the farthest distance to which it is attempted to go, and farther after all than with absolute certainty we can at all times pretend to go. Of course it is clear that in individual analyses some errors must occur, as in D 10 top ; but these errors equalize themselves, and unless they were small and very regular they would not do so. That the two sets of analyses should be so near as in the columns above, is the utmost that can be desired, especially as it is after all true that we are apt to be more careless about a duplicate, although it is far from wise to be so ; the first may be considered as the real analysis, and the second merely to show that no gross error has been made.

Pursuing further the enquiry into the accuracy of the numbers, we may put the question in this form. How great is the departure from 21 per cent. shown in specimens of good air, and inferior air such as is found at ash-pits? 21 is used here simply as a convenient whole number, without any theory to exalt it.

Departure from the number 21.

Good Air.		Impure Air.	
0·10	0·02+	0·20	0·44
0·04	0·12	0·15	0·21
0·02	0·09	0·21	0·36
0·10	0·08+	0·28	0·06
0·10	0·04	0·13	0·33
0·02+	0·08	0·24	0·47
0·04	01	0·41	0·29
0·22	05	0·15	——
0·17	02	0·10	7·34 Total.
0·09	01	0·79	——
0·08	01	0·42	·293 Average.
0·13	06	0·26	
0·02+	——	0·60	
0·00	2·25 Total	0·27	
0·17	——	0·01	
0·02	·065 Average	0·30	
0·12	Subtracting	0·12	
0·01+	those with	0·54	
0·13	a sign of +		
0·08			

This is the same result as given before, but the numbers in this form, when bared of all their superfluous bulk, show more strikingly the change from pure to impure air. It must, however, be remembered that this is such air as all persons are at times compelled to breathe. The impure air, such as is found about middens, and in waterclosets, actually contains less oxygen than the pure air. The pure air deviates from 21 per cent. by 0·065; the air of these places spoken of, by 0·295. This illustrates further my reason for using the oxygen as an indication of pure air, although not the only one.

In all analyses, and in all work generally, tendency to error is in one particular direction more than in any other; this tendency may depend on peculiarities of the individual or of the conditions of the work. The tendency in these is towards an increase of the oxygen. If the hydrogen which is mixed with the air is not free from oxygen, the air has the benefit of the mistake.

Some of the analyses, about 80, beginning from about No. 60, were made with hydrogen obtained by throwing sodium amalgam into dilute sulphuric acid.

This gas was very pure. The amalgam was made so as to be a pretty firm paste, and sulphuric acid with about three times its bulk of water was heated and cooled. The first bubbles were allowed to pass away, after throwing the amalgam into the water lest some air might be taken. 76·22 of this gas exploded with water-gas still gave on calculation 76·22, and with time the manipulation becomes pleasant. The gas stood in a tube ready for use. It was not found practicable to prepare by galvanic methods so much hydrogen as was required. Afterwards, more for the convenience of others than myself, zinc was used, a quantity of unusual purity having accidentally been found some time ago. And whilst I place the fullest confidence in the oxygen as being correct to a small fraction, the same minute accuracy cannot be expected of the carbonic acid, although on taking the average the amount of the gas agrees so well with the amount + the carbonic acid from the powder smoke, that the error must be trifling. The estimations of carbonic acid made elsewhere than in mines are not subject to any error except that of the operator; and this has been reduced to an amount that may be called nothing. The reason that the carbonic acid in these tables is in some cases not so minutely ascertained as the oxygen is this: the amount being extremely small and the total amount of air being extremely small, there was more risk of error. In other cases where the carbonic acid can be estimated at the spot in large bottles, any extent of accuracy may be attained.

The Air of Mines. Analyses.

The numbers indicating the amount of crystalline matter are arbitrary, 10 meaning that the whole tube was dusted with crystals; 0·1 meaning that it was just possible to find a small one with a magnifying power of 60 diameters. When no mark is made the tube was not examined.

Air normal or nearly so, represented by Italic figures, *e. g.*, *20·9*
Air less pure or decidedly impure, „ Clarendon „ **20·6**
Air extremely impure or dangerous, „ Antique „ **20·5**
Italics in the "Carbonic Acid" column mean probable amount, not actual analysis *0·6*

Carbonic acid of pure air not above 0·04 per cent.

No. or Mark on Sample.	Name of Mine.	Depth from Surface in fms.	Distance from Current.	Description of Place where taken.	Time when taken.	Therm. Fahr.	No. of Men working in it.	Oxygen per cent.	Carbonic Acid per cent.	Oxygen less than 21 per cent.	Crystals observed in the tubes.	Remarks.
1	Rampgill	—	300 ft.	End, 6½ ft. wide, 4½ ft. high	2 hours after shot	68°	2	**20·4**	*0·6*	0·6	—	Ventilated by fan blast.
2	„	—	—	Large cavity, 18 ft. high and 22 ft. wide.		60	8	**20·60**	0·73	0·4	0	
3	Long Clough	—	—	Large cavity, 20 ft. high		60	5	**20·84**	*0·16*	0·16	—	
4	„	—	42 ft.	In vein, 6 ft. wide, 20 ft. high		61	4	**20·62**	0·27	0·38	1	
5	„	—	—	In driving at an end, 16 ft. high.	15 minutes after shot	61	5	**19·94**	0·76	1·06	—	About 4lbs. of powder had been fired that morning.
6	Rodderup Fell	—	—	Sinking shaft 10 fms. deep from level, 9½ ft. diam., bratticed.		58	4	*21·04*	0·48	0·04+	0	Here were men working in water; temperature of water 54°.
7	„	—	24 ft.	End, 9 ft. high, 6 ft. wide	15 minutes after shot	57	4	*20·9*	*0·1*	0·1	4	Branching crystals.
7a	„	—	—			—	—	**20·66**	*0·34*	0·34	0	
9	„	—	—	End of level	2 hours after shot	62	4	**18·80**	2·06	2·20	1	Faggots of little prisms.
10	„	—	—	In draught, stope above level		64	4	**20·28**	*0·72*	0·72	—	
11	„	—	—	Ditto, in level 6 ft. wide		59	—	**20·66**	0·19	0·34	—	
12	„	—	—	Top of rise, level above not communicated.		60	6	**20·76**	*0·24*	0·24	0·5	
13	Cashwell	—	—	42 ft. from end, level 4½ ft. wide, 5 ft. to 9 ft. high.		61	4	**20·19**	0·70	0·81	—	Heaps of mineral in level.
14	„	—	In current			57	4	**20·34**	*0·66*	0·66	0	
15	„	—	78 ft.			61	4	*20·95*	0·05	0·05	?	
16	„	—	In current	In current		55	2	**20·64**	0·25	0·36	—	
17	Garrigill	—	In current	End		54	4	**20·79**	0·21	0·21	—	

18	Allenhead's Mine, West Henry's Vein.	—	—	120 ft. from rise	—	·66	6	Broken	—	—	0	
19	„	—	—	30 do.	—	66	—	19·01	2·35	1·99	0	
20	„	—	—	In direct current	—	63	—	20·20	0·80	0·8	—	Furnace ventilation.
21	„	—	—	In a rise 30 fms. high, bratticed: top 6 ft. above brattice.	—	66	2	19·09	*1·91*	1·91	—	Do. do.
22	„	—	72 ft. from winze.	—	—	66	—	Broken	—	—	0	
23	„	—	90 ft. from winze.	—	—	78	—	20·22	*0·78*	0·78	0	
24	East part Henry's Vein.	—	72 ft. from rise.	End in large cavern, 18 fms. wide and 8 ft. high.	—	66	—	20·292	*0·708*	0·708	numerous.	
25	„	—	—	Ditto	—	69	—	20·8	*0·2*	0·2	0	No shots for several days.
26	„	—	—	Ditto	—	67	—	20·87	0·747	0·13	?	Do. do.
27	„	—	—	Rise 18 ft. high	1 hour after shot	70	2	18·27	*2·73*	2·73	?	
28	„	—	—	In level	—	67	—	19·3	*1·7*	*1·7*	?	
29	Greenlaws	—	—	240 ft. from rise, 6½ ft. high, 4½ ft. wide.	—	57	4	*21·*	0·0	0·0	0	Air must have been blowing here.
30	Settlingstone	—	—	End of level, 36 ft. from rise, 6½ ft. high, 4½ wide.	—	59	6	20·47	*0·53*	0·53	0	Very dry.
31	„	—	—	End of level, 150 ft. from rise, 6 ft. high, 4 wide.	—	58	—	Broken	—	—	0·1	
32	Grinton Moor	—	—	End, 150 ft. from shaft	—	51	3	*21·*	0·0	0·0	0·2	
33	„	—	—	Opening at bottom of sump, 3 fms. below level.	—	53	7	20·85	*0·15*	0·15	0·1	Two samples from this end.
33a	„	—	—	—	—	—	—	20·23	0·75	0·77	—	
34	Surrender	—	—	In a sinking stope below level, 30 ft. long, 18 ft. wide.	—	51	—	20·79	0·	0·21	3	
34a	„	—	—	Do. do.	—	—	—	20·23	0·64	0·77	—	
35	„	—	—	End, 240 ft. from rise	—	57	—	20·17	1·04	0·83	4	Air machine.
36	„	—	—	Just under shaft in adit level	—	48	—	*20·89*	0·13	0·11		
36a	„	—	—	End of level, 72 ft. from shaft.	—	—	—	20·36	0·6	0·64	—	
*37	Botallack Crowns Lode.	190	—	In direct current	—	75	—	20·84	0·53	0·16	0	Smells of tallow.
*37a	„	—	—	Do.	—	—	—	20·64	0·22	0·36	—	Two samples taken.
*38	„	190	—	End, 60 ft. from rise	—	78	2	20·88	0·11	0·12	0	
*39	„	190	—	End, 84 ft. from rise	—	87½	2	19·96	*1·04*	1·04	0·5	Smells of perspiration.

* These samples, 37 to 39, show the difference of the air when a long distance from current.

Analyses of the AIR of MINES—*continued.*

No. or Mark on Sample.	Name of Mine.	Depth from Surface in fms.	Distance from Current.	Description of Place where taken.	Time when taken.	Therm. Fahr.	No. of Men working in it.	Oxygen per cent.	Carbonic Acid per cent.	Oxygen less than 21 per cent.	Crysals observed in the tubes.	Remarks.
40	Botallack Crowns Lode.	166	—	Stoping in level	-	° 77	2	**20·82**	*0·18*	0·18	1·	
41	Huel Cock	125	—	Stoping, back of level, good current.	-	65	2	Leaking tube.	—	—	0·1	
42	„	142	—	Do. do.	-	71	6	**20·83**	*0·17*	0·17	0·5	
43	„	180	—	In current	-	—	—	Broken or lost.	—	—	0·5	
44	„	180	—	End 180 ft. from rise.	-	76	2	**20·40**	0·90	0·6	0.1	
45	Huel Hazard	85	—	In current.	-	62		*21·*		0·0	0	
46	„	85	—	120 ft. from rise, dry.	-	67		**20·11**	0·50	0·89	1·5	
47	„	85	—	360 ft. from rise, wet.	-	—	1	**20·84**	0·31	0·16	0·1	
48	Huel Call	30	—	End 42 ft. from rise, 6 ft. high by $2\frac{1}{2}$ wide, hard granite, wet.	-	62	1	**20·73**	0·42	0·27	0·2	
49	„	85	—	End of level, 42 ft. from rise. granite, dry.	-	67	2	*20·96*	*0·04*	0 04	0·5	
50	Wheal Owles Buzza Mine	50	—	End of adit, 480 ft. from rise, wet	-	63	2	**20·04**	1·24	·96	1·0	Level nearly choked with deads, only 2 ft. clear.
51	,,	50	—	End of cross cut, 420 ft. from rise, wet.	-	63	1	**19·93**	1·43	1·07	0·1	
52	„	50	—	End 96 ft. from rise, dry	-	60	2	**20·47**	0·92	0·53	0·0	
53	Levant	150	—	End 690 ft. from current, 7 ft. high, 3 ft. wide, hard ground, killas.	1 hour after shot	75	2	**20·75**	0·42	0·25	4·0	
54	„	150	—	End 660 ft. from current, 7 by 3 ft.	-	73	2	**20·11**	1·25	0·89	—	
55	„	150	—	End 1080 ft. from current, 8 by $3\frac{1}{2}$ ft.	-	78	2	*21·0*	*0·0*	0·0	—	
56	„	170	—	Stopes, 180 feet from winze	-	82	8	**20·53**	1·05	0·47	0·1	
57	„	170	—	End 540 ft. from winze, 9 by 5 ft.	-	83	2	Broken.	—	—	—	
58	„	170	—	Stopes 48 ft. from current	-	73	2	*21.00*	*0·0*	0·0	Large but few	
59	Balleswidden	130	—	Stopes	-	72	2	**20·14**	1·59	0·86	4	
60	„	140	—	End 7 ft. by 4 ft., smoky	-	73	2	**19·83**	1·03	1·17	—	Smoky.

61	Balleswidden -	—	140	Rise, 6 ft. high - - -	- - -	73	2	*20·93*	0·06	0·7	—	
62	Wire Gill -	—	—	Stopes - - -	- - -	—	—	**20·40**	0·64	0·6	4	
63	„ -	—	—	End - - -	- - -	55	2	*20·96*	0·017	0·04	0·5	
64	„ -	—	—	End of level, 780 ft. from current. In shale - -	20 minutes after shot	60	2	**20·82**	0·59	0·18	0	Ventilated by water blast.
65	Hurst - -	—	—	End 300 ft. beyond a rise, 9 ft. high, 7 ft. wide.	- - -	—	2	—	1·99	—	0	
68	Old Gang -	—	—	End of level - - -	- - -	—	2	**20·58**	0·48	0·42	3	
69	„ -	—	—	End of level - - -	- - -	—	2	—	0·28	—	0	
70	„ -	—	—	Rise 7 ft. high, 132 ft. from current.	- - -	—	2	**20·25**	0·39	0·75	0·1	Air machine. Hand fan, 4 in. pipes.
71	Grassington -	60	—	End of cross cut, 480 ft. from rise.	- - -	—	2	*20·94*	*0·06*	0·06	—	Unusual amount of dust.
72	„ -	—	—	End, 480 ft. from rise - -	- - -	—	2	**19·53**	1·59	1·47	3	
73	„ -	—	—	Rise, 60 ft. high: in shale -	- - -	—	2	**19·52**	1·72	1·48	0·1	
74	„ -	—	—	End, 60 ft. from rise - -	- - -	—	2	**20·47**	1·06	0·53	0·1	
75	„ -	—	—	End, 840 ft. from rise - -	- - -	—	2	**20·08**	0·94	0·92	5	These were chiefly hexagons.
76	Habden Moor -	—	—	End, 150 ft. from rise - -	- - -	—	2	**20·79**	*0·21*	0·21	0·1	
77	Cononley - -	—	—	Pitch in back of level, 7 ft. high, 15 wide.	15 minutes after shot	—	3	**20·84**	0·59	0·16	2·	
78	„ -	—	—	Winze, 15 ft. below level -	40 minutes after shot	—	2	**20·54**	0·37	0·46	1·	
79	„ -	—	—	Pitch in back of level, 18 ft. high, 18 ft. wide.	- - -	—	4	**20·05**	0·66	0·95	3·	
80	„ -	—	—	Rise, 42 ft. high - -	- - -	—	2	**19·27**	1·84	1·73	3·	
99	- - -	—	—	- - - -	- - -	—	—	Not come to hand		—	—	
100	- - -	—	—	- - - -	- - -	—	—			—	--	
101	South Frances -	104	—	End, 90 ft. beyond winze -	- - -	—	2	*20·95*	*0·05*	0·05	1	
102	„ -	—	—	Pitch, 12 ft. high, 3 ft. wide -	- - -	—	2	**20·12**	0·99	0·88	--	
103	„ -	114	—	End, 180 ft. from shaft, 7 ft. by 4 ft.	- - -	—	2	**19·96**	0·75	1·04	2	
104	„ -	124	—	End, 120 ft. from winze, wet -	- - -	—	2	**20·05**	0·95	0·95	--	
105	„ -	50	—	End, 180 ft. from shaft, choked	- - -	—	2	**20·48**	0·42	0·52	3	
106	„ -	60	—	End, 90 ft. beyond rise, 7 ft. by $3\frac{1}{2}$ ft.	- - -	—	2	**20·54**	0·45	0·46	—	

Analyses of the AIR of MINES—*continued.*

No. or Mark on Sample.	Name of Mine.	Depth from Surface in fms.	Distance from Current.	Description of Place where taken.	Time when taken.	Therm. Fahr.	No. of Men working in it.	Oxygen per cent.	Carbonic Acid per cent.	Ozygen less than 21 per cent.	Crystals observed in the tubes.	Remarks.
107	South Frances	70	—	End, 12 ft. from current	1½ hours after shot	° —	2	**20·37**	0·72	0·63	8	
108	„	80	—	End, 120 ft. from winze		—	2	*21·06*	*0·0*	0·06+	—	Ventilated by double duck machine.
109	„	94	—	End, 42 ft. from air		—	2	**20·36**	0·84	0·64	2	The men had left work.
110	„	94	—	End of cross cut, 300 ft. from rise.	1½ hours after shot	—	2	**20·65**	0·46	0·35	5	Double duck machine.
111	Dolcoath	314	—	Bottom of shaft		—	—	*20·99*	0·05	0·01	3	
112	Huel Harriet	130	—	End, 36 ft. from shaft, 7 ft. by 4 ft.		—	3	**20·75**	0·21	0·25	—	Hard granite.
113	„	—	—	End of cross cut 18 ft., beyond winze.		—	2	**20·00**	0·97	1·0	2	Winze choked.
113a		—	—			—	—	—	—	—	5	
114		—	—	Stopes above 100 fm. level		—	16	*21·00*	0·10	0·0	—	
115	„	—	—	End cross cut 240 ft. in		—	2	broken or leaking.	—	—	—	
116	Carn Camborne	13	—	End, 150 ft. from winze		—	2	**19·70**	1·37	1·3	0	
„								**19·54**	1·37	1·46	0	
117	„	13	—	End, 36 ft. from rise, 7 by 4 ft.		—	—	**20·72**	0·29	0·28		
117(2)		—	—			—	—	—	—	—	—	
118		—	—			—	—	broken or leaking.	—	—	—	
119		—	—			—	—	broken or leaking.	—	—	6	

120	Tolcarne	—	—		—	—	—	—	**19·81**	0·91	1·19	1	
121	„	40	—	End, 78 ft. from shaft	—	—	—	2	**20·79**	0·21	0·21	1	
121(2)		—	—		—	—	—	—	*20·90*	*0·1*	0·1		
122	„	40	—	End, 240 ft. from winze	—	—	—	2	**20·49**	0·69	0·51	0·1	
123	„	—	—		—	—	—	—	broken or leaking.	—	—	2	
124	„	—	—		—	—	—	—	broken or leaking.	—	—	0.5	
125		30	—	End, 126 ft. in	—	—	—	2	**20·04**	0·97	0·96	—	
126	„	—	—		—	—	—	—	broken or leaking.	—	—	0	
127	„	20	—	End, 120 ft. from winze	—	—	—	2	**20·88**	0·06	0·12	2	
128	Wheal Friendship	—	—		—	—	—	—	**19·32**	1·15	1·68	—	
128(2)	Tolcarne	20	—	End, 36 ft. in	—	—	—	—	**20·29**	0·51	0·71	—	
129		—	—		—	—	—	—	—	—	—	—	
130		—	—		—	—	—	—	*20·90*	0·03	0·10	—	
D 1		—	—		—	—	—	—	broken or leaking.	—	—	—	
D 2		—	—		—	—	—	—	**20·60**	0·38	0·4	—	Has a smell of mouldiness.
D 3		—	—		—	—	—	—	broken or leaking.	—	—	—	
D 4	Crelake	52	—	End, 144 ft. from rise	—	—	—	2	**19·82**	1·05	1·18	2	
D 5	„	52	—	Rise, in current	—	—	—	68	*20·96*	*0·04*	·04	—	
D 6	„	40	—	End, 576 ft. from shaft	—	—	—	66	broken or leaking.	—	—	—	Ventilated by waterfall.
D 7		—	—		—	—	—	—	no account of it.	—	—	—	
D 8	„	24	—	End, 96 ft. from winze	—	—	—	2	**20·55**	0·23	0·45	—	
D 9	„	12	—	Rise, 24 ft. high, no current	—	—	—	2	**19·98**	0·97	1·02	1	
D 10	„	12	—	End, 24 ft. from shaft	—	—	—	—	**20·09**	0·60	0·91	0	Top.
D 11	Sortridge Consols	30	—	End of level	—	—	—	2	**19·86**	0·92	1·14	some	
D 12	„	40	—	End, 240 ft. from shaft	—	—	—	4	**19·54**	1·26	1·46	—	
D 13	„	40	—	End	—	—	—	—	**20·82**	0·86	0·18	—	

Analyses of the Air of Mines—*continued.*

No. or Mark on Sample.	Name of Mine.	Depth from Surface in fms.	Distance from Current.	Description of Place where taken.	Time when taken.	Therm. Fahr.	No. of Men working in it.	Oxygen per cent.	Carbonic Acid per cent.	Oxygen less than 21 per cent.	Crystals observed in the tubes.	Remarks.
D 14	Sortridge Consols	40	—	End, 660 ft. from air	—	° —	4	broken or leaking.	—	—	1	
D 15	„	50	—	Cross cut	—	—	4	**20·72**	0·13	0·28	0·5	
D 16	„	50	—	End 660 ft. from air	—	—	—	**20·70**	0·10	0·30	?	Top.
Do.	„	—	—	—	—	—	—	**20·87**	0·14	0·13	—	Bottom.
D 17	„	50	—	End 420 ft. from current	—	—	4	**19·43**	1·30	1·57	—	Bottom.
Do.	„	—	—	—	—	—	—	**20·27**	0·80	·73	—	Top.
D 18	„	—	—	—	—	—	—	No tube corresponds to this number it is believed.			—	
D 19	„	—	—	—	—	—	—	Do.	do.		—	
D 20	„	—	—	—	—	—	—	Do.	do.		—	
D 21	„	—	—	—	—	—	—	Do.	do.		—	
D 22	Wheal Friendship	—	—	Cross cut, 300 ft. from current	—	66	6	**20·67**	0·22	0·33	—	
D 23	„ 100 East	100	—	End, 240 ft. from draught	—	60	6	**19·99**	0·95	1.01	—	Ventilated by door and pipes.
D 24	„	70	—	End, 120 ft. from winze	—	61	4	Cannot find it.		—	—	
D 25	„ 80 East	80	—	End, 240 ft. from winze, 180 ft. from trapdoor.	—	65	6	**19·40**	1·50	1·60	0·1	
D 26	„	80	—	Cross cut, 72 ft. from current	—	65	2	**19·55**	1·39	1·45	—	
D 27	„	100	—	End, 60 ft. from winze	—	66	6	**18·80**	1·37	2·20	—	
D 28	„	100	—	End, 57 ft. from winze	—	66	6	**20·80**	0·27	0·20	3	
D 29	East Gunnislake	36	—	End, 468 ft. from winze	—	—	—	**19·57**	1·33	1·43	4	Air pump worked by engine rod.
D 30	„	12	—	Bottom of shaft	—	—	—	**20·08**	0·89	0·92	—	
D 31	„	12	—	End, 42 ft. from shaft	—	—	—	**20·30**	0·80	0·70	—	
D 32	„	—	—	Adit end, 96 ft. from shaft	—	—	—	**20·76**	0·34	0·24	—	
D 33 See at end of D.	Okel Tor	80	—	End, 300 ft. from winze	—	—	2	**19·22**	1·79	1·78	8	
D 34	„	65	—	End, 24ft. from winze	—	—	2	**20·76**	0·74	0.24	—	

D 35	„	-	—	—	- - - - - - - -	—	—	**20·51**	0·31	0·49	—			
D 36	Huel Edward	-	98	—	Bottom of shaft - - - - -	—	3	**20·73**	0·34	0·27	0			
D 37	„	-	91	—	End, 240 ft. from shaft - - - -	—	2	**20·45**	0·42	0·55	—	Smell of mouldiness.		
D 38	„	-	81	—	End, 372 ft. from shaft - - - -	—	—	**20·17**	0·72	0·83	—	Waterfall and pipes.		
D 38a	„	-	—	—	- - - - - - -	—	—	**20·30**	0·63	0·70	—			
D 39	„	-	71	—	End - - - - - - -	—	—	**20·66**	0·29	0·34	—			
D 40	„	-	—	—	- - - - - - -	—	—	**20·00**	1·31	1·00	0			
D 41		-	45	—	Tribute pitch - - - - -	—	—	**19·91**	1·01	1·09	—			
D 42	„	-	—	—	End. Side level 180 ft. from main level. - - -	—	—	**20·37**	0·68	0·63	—			
D 43	Frank Mills	-	60	—	End, 252 ft. from winze - - - -	—	—	**20·44**	0·43	0·56	—			
D 44	„	-	60	—	Stopes, 30 ft. long, 15 ft. wide, 12 ft. high. - - -	—	—	**20·55**	0·28	0·45	—			
D 45	„	-	70	—	End, 210 ft. beyond winze - - - -	—	—	**20·68**	0·31	0·32	—	Trap door and pipes.		
D 46	„	-	—	—	Bottom of shaft - - - - -	—	—	**20·82**	0·06	0·18	2			
D 47	South Exmouth	-	30	—	End, 150 ft from current - - - -	—	2	**18·87**	1·88	2·13	4			
„	„	-	—	—	- - - - - - -	—	—	**18·80**	1·37	2·20	—			
D 48	„	-	—	—	Rise 24 fms. from air - - - -	—	2	**19·46**	1·15	1·54	—	Air pipes.		
D 49	„	-	45	—	End, 120 ft. from rise - - - -	—	—	Broken, it is supposed.			—			
D 50	„	-	—	—	Bottom of shaft - - - - -	—	—	**19·34**	1·75	1·66	—			
D 51	- - -		—	—	- - - - - - -	—	—	Not known if sent.		—	—			
D 52	- - -		—	—	- - - - - - -	—	—	Do.	Do.	—	—			
D 53	„	-	45	—	End, 330 ft. from winze - - - -	—	—	**18·67**	2·26	2·33	—			
D 57	- - -		—	—	- - - - - - -	—	—	No such number sent it is believed.						
D 58	- - -		—	—	- - - - - - -	—	—	Do.		Do.				
D 59	- - -		—	—	- - - - - - -	—	—	Do.		Do.				
D 60	- - -		—	—	- - - - - - -	—	—	**18·87**	1·97	2·13	—	Peculiar organic smell.		
D 61	- - -		—	—	- - - - - - -	—	—	No such numbers known to be on the tubes.	—	—	—			
D 62	- - -		—	—	- - - - - - -	—	—		—	—	—			
D 63	- - -		—	—	- - - - - - -	—	—		—	—	—			

Analyses of the AIR of MINES—*continued.*

No. or Mark on Sample.	Name of Mine.	Depth from Surface in fms.	Distance from Current.	Description of Place where taken.	Time when taken.	Therm. Fahr.	No. of Men working in it.	Oxygen per cent.	Carbonic Acid per cent.	Oxygen less than 21 per cent.	Crystals observed in the tubes.	Remarks.
D 64	- - -	—	—	- - - -	- - -	° —	—	No such numbers known to be on the tubes.	—	—	—	
D 65	- - -	—	—	- - - -	- - -	—	—		—	—	—	
D 66	- - -	—	—	- - - -	- - -	—	—		—	—	—	
D 67	- - -	—	—	- - - -	- - -	—	—		—	—	—	
D 68	- - -	—	—	- - - -	- - -	—	—		—	—	—	
D 69	- - -	—	—	- - - -	- - -	—	—		—	—	—	
D 70 East.	- - -	—	—	- - - -	- - -	—	—	**19·86**	1·12	1·14	—	
47 D	- - -	—	—	- - - -	- - -	—	—	**19·07**	1·90	1·93	—	Smells of tobacco.
30 S	- - -	—	—	- - - -	- - -	—	—	—	—	—	—	
35 D35	„ - -	50	—	End 360 ft. from winze -	- - -	—	—	**20·10**	0·75	0·90	—	
E 1	Dolcoath - -	314	—	End, 30 ft. from winze - -	- - -	82	12	*20·94*	0·06	0·06	0·5	
E 2	„ -	268	—	Winze, 24 ft. deep - -	- - -	—	2	*20·92*	0·08	0·08	0·5	
E 3	„ -	268	—	Level at mouth of winze -	- - -	—	—	**19·77**	1·17	1·23	1	
E 4	„ -	266	—	End, 150 ft. from sump -	- - -	84	3	**20·41**	0·4	0·59	—	
E 5	„ -	—	—	Stopes between 242 and 256 fm. levels.	- - -	—	—	**20·50**	0·28	0·50	—	
E 6	Huel Ruth - -	130	—	End, 150 ft. from rise, 7ft. by 3 ft.	- - -	72	2	**19·33**	1·70	1·67	—	
E 7	„ -	180	—	End - - - -	- - -	75	2	**20.56**	0·43	0·44	—	Peculiar specks, very numerous, apparently crystalline, or at least transparent.
E 8	„ -	190	—	End, 120 ft. from rise -	- - -	76	2	**20·13**	0·93	0·87	0	
E 9	„ -	190	—	End - - - -	- - -	77	3	**19·96**	0·98	1·04	—	
E 10	St. Ives Consols -	160	—	End, 90 ft. from rise - -	- - -	80	2	**20·70**	0·39	0·30	0	
E 11	„ -	177	—	End - - -	- - -	77	2	**20·81**	0·02	0·19	11	
E 12	„ -	147	—	End, 120 ft. from winze -	- - -	75	2	**20·50**	0·39	0·50	0	
E 13	„ -	—	—	Carbons, 70 ft. by 20 ft. to 40 ft.	- - -	72	—	**20·49**	0·63	0·51	1	
E 14	„ -	87	—	End close to winze - -	- - -	65	—	**20·48**	0·36	0·52	—	

E 15	Carn Brea -	155	—	Stopes close to shaft - -	- - -	64	2	**20·60**	0·43	0·40	—	
E 16	„ -	175	—	End, 36 ft. from winze -	- - -	70	2	**20·28**	0·51	0·72	4	
E 17	„ -	197	—	End, 102 ft. from winze -	- - -	77	2	**20·20**	0·70	0·80	0	Wet.
E 18	Condurrow -	140	—	End, 108 ft. from shaft -	- - -	68	2	**20·71**	0·29	0·29	—	
E 19	„ -	155	—	End, 120 ft. from winze -	- - -	71	2	**20·27**	0·72	0·73	—	Dry.
E 20	„ -	166	—	Stopes - - -	- - -	66	5	**20·47**	0·43	0·53	0·1	
E 21	„ -	165	—	End, 168 ft. from winze -	- - -	—	2	**20·52**	0·43	0·48	—	
E 22	„ -	177	—	End, 132 ft. from shaft -	- - -	73	2	**20·29**	0·62	0·71	0	
E 23	„ -	180	—	Bottom of shaft - -	- - -	—	3	*20·93*	0·08	0·07	—	
E 24	„ -	188	—	End - - -	- - -	70	2	**20·63**	0·27	0·37	3	
E 25	East Pool -	150	—	End, 60 ft. from winze -	- - -	75	2	**20·27**	0·79	0·73	2	
E 26	„ -	—	—	Under a rise - -	- - -	68	—	**20·41**	0·51	0·59	2	Smell of mouldy substances.
E 27	„ -	140	—	Stopes - - -	- - -	66	—	*20·95*	0·08	0·05	—	
E 28	West Cheverton -	—	—	Stope close to shaft - -	- - -	64	2	*20·90*	0·03	0·10	—	
E 29	„ -	70	—	End, 120 ft. from air - -	- - -	68	2	**19·56**	1·43	1·44	—	
E 30	St. Day United -	154	—	End, killas, 7 ft. by 4 ft. Dry	- - -	77	2	**20·45**	0·51	0·55	—	
E 31	„ -	174	—	End, 12 ft. from winze - -	- - -	82	2	**19·42**	1·37	1·58	—	Choked.
E 32	„ -	174	—	Bottom of winze, 30 ft. deep -	- - -	88	2	**20·72**	0·15	0·28	—	
E 33	„ -	—	—	Stopes - - -	- - -	80	—	**19·31**	1·73	1·69	—	
E 34	West Basset -	75	—	Cross cut end, 6.30 ft. in. 7 ft. by 4 ft. Dry. Granite.	- - -	—	2	**19·55**	1·46	1·45	—	An aromatic smell, such as we may read of chiefly in German writers as existing in mines.
E 35	„ -	—	—	Mouth of cross cut - -	- - -	—	—	**20·70**	0·19	0·30	—	Do.
E 36	„ -	85	—	End, 120 ft. from winze -	- - -	—	2	**19·63**	1·4	1·37	—	
E 37	„ -	94	—	End, 90 ft. in, dry - -	- - -	—	—	**20·37**	0·48	0·63	—	
	Botallack -	160	—	¼ a mile from shaft, under sea	- - -	—	3	**20·63**	0·68	0·37	some	These four specimens were taken by myself, and the crystals first seen on them. The relative amount therefore not attempted to guess at.
	South Francis -	—	—	Air at surface coming from shaft.	- - -	—	—	**20·54**	0·82	0·46	numerous	
	South Francis -	29	—	24 fathoms from a winze, 90 from shaft.	- - -	—	—	**18·69**	2·22	2·31	do.	
	Dolcoath Mine -	233	—	80fms. from shaft -	- - -	—	—	**20·77**	0·74	0·23	do.	

Analyses of the Air of Mines—*continued.*

No. or Mark on Sample.	Name of Mine.	Depth from Surface in fms.	Distance from Current.	Description of Place where taken.	Time when taken.	Therm. Fahr.	No. of Men working in it.	Oxygen per cent.	Carbonic Acid per cent.	Oxygen less than 21 per cent.	Crystals observed in the tubes.	Remarks.
W 1	Minera	60	—	End, 105 ft. from sump, 6½ ft. by 4½ ft.	-	° —	2	**19·91**	1·16	1·09	—	Hard dry siliceous with shale.
W 2	„	—	—	End adit, 210 ft. from sump	-	—	2	**20·50**	0·29	·50	—	Level choked.
W 3	„	—	—	Level in current	-	—	—	broken or	leaking	—	—	
W 4	South Minera	54	—	End 90 ft. from shaft, 7 ft. by 5 ft.	Several hours after shot.	—	2	**19·73**	0·92	1·27	0·1	Ground hard. Wet.
W 5	Park	125	—	Level, 150 ft. beyond winze, 6½ ft. by 5 ft.	-	—	2	**19·72**	1·32	1·28	0·1	Ventilated by hand fan.
W 6	„	—	—	From air pipe	-	—	—	**20·32**	0·82	0·68	longer than usual	
W 7	Maes-y-safn	125	—	End, 90 ft. from vent	-	—	—	**19·40**	1·51	1·60	—	Smell of tallow and perspiration.
W 8	„	155	—	End, 90 ft. from shaft	-	—	6	**19·26**	1·86	1·74	1	Roof of level.
„	„	—	—	Do. do.	-	—	—	**20·47**	0·49	0·53	—	Floor of level.
W 9	„	—	—	Bottom of shaft	-	—	—	**20·69**	0·27	0·31	2	
W 10	Rhoses Mawr	—	—	Winze, 15 ft. deep	-	—	2	**20·00**	0·89	1·00	0.1	
W 11	„	60	—	Level between shafts	-	—	—	**20·67**	0·38	0·33	—	
W 12	„	70	—	End, 45 ft. from shaft	-	—	—	**19·54**	1·26	1·46	0	
W 13	„	70	—	End, 75 ft. from shaft	-	—	2	**20·35**	0·40	0·65	—	
W 14	Talargoch	90	—	End, 72 ft. from shaft, 6 ft. by 4 ft.	1½ hours after two shots.	—	2	**20·11**	0·81	0·89	0·1	Limestone.
W 15	„	—	—	-	-	—	—	broken	—	—	—	
W 16	„	90	—	End of Great Cross Cut, 600 ft. from level.	-	—	—	**20·44**	0·57	0·56	—	Ventilated by door and air pipes.
2d	„	—	—	-	-	—	—	**20·48**	0·36	0·52	—	
3d	„	—	—	-	-	—	—	**20·49**	0·36	0·51	—	
W 17	„	—	—	From mouth of pipes	-	—	—	**20·44**	0·46	0·56	—	

W 18	„ -	90	In current	evel - - -	„ - -	—	—	20·76	0·24	0·24	0·1	
W 19	„ -	110	In current	Level - - -	„ - -	—	—	20·58	0·39	0·42	—	
W 20	„ -	110	—	End, 90 ft. from rise -	- - -	—	—	—	—	—	—	
W 20a	Coed Mawr Pool -	15	—	End, 72 ft. from air - -	- - -	—	2	20·25	0·46	0·75	—	
W 21	„ -	10	—	End, 102 ft. from shaft -	- - -	—	2	20·27	0·56	0·73	0·5	
W 22	Symmdde Dylluam	40	—	End, 60 ft. ,rom shaft -	20 minutes after 2 shots.	—	2	19·90	1·10	1·10	—	Aromatic smell, formerly alluded to.
W 23	„ -	—	—	Winze, 18 ft. deep - -	- - -	—	2	20·87	0·26	0·13	—	
W 24	„ -	—	—	Rise, 30 ft. high - -	- - -	—	2	20·77	0·09	0·23	—	
W 25	„ -	35	—	End - - -	- - -	—	2	*20·92*	0·04	0·08	0	
W 26	„ -	70	—	End - - -	- - -	—	—	20·47	0·55	0·53	—	
W 27	„ -	—	—	Winze, 12 ft. deep - -	- - -	—	3	20·42	0·49	0·58	—	
W 28	Pary's Mine -	100	—	Stopes from winze - -	- - -	—	—	20·72	0·10	0·28	—	
W 29	„ -	112	—	End, 210 ft. from shaft -	- - -	—	2	19·81	1·18	1·19	—	
W 30	„ -	—	—	Winze, 24 ft. deep, 8 ft. by 4 ft.	- - -	—	—	19·16	1·80	1·84	—	
W 31	„ -	—	—	- - - - -	- - -	—	—	—	—	—	—	
W 32	„ -	90	—	End - - - -	- - -	—	—	20·34	0·49	0·66	—	
W 33	Lisburn - -	—	—	- - - - -	- - -	—	—	—	—		—	Cannot find these.
W 34	„ -	—	—	- - - - -	- - -	—	—	—	—	—	—	
W 35	„ -	—	—	- - - - -	- - -	—	—	—	—	—	—	
W 36	„ -	—	—	- - - - -	- - -	—	—	—	—	—	—	
W 37	„ -	—	—	- - - - -	- - -	—	—	20·76	0·22	0·24	—	
W 38	Loggy Lass -	—	—	- - - - -	- - -	—	—	20·30	0·63	0·7	2	
W 39	„ -	—	—	- - - - -	- - -	—	—	—	—	—	—	
W 40	Cwm Erfin -	30	—	End of cross cut, 300 ft. from shaft.	- - -	—	—	20·35	0·61	0·65	—	
W 41	„ -	32	—	End, 150 ft. from winze, 7 ft. by 5 ft.	- - -	—	2	20·12	0·79	0·88	—	
W 42	„ -	—	—	Rise, 12 ft. high, 102 ft. from winze.	- - -	—	2	20·04	1·74	0·96	—	
W 43	„ -	20	—	End, 312 ft. from winze - -	Soon after shot -	—	2	20·25	0·72	0·75	—	
W 44	„ -	20	—	Stope - - -	- - -	—	4	—	—	—	—	
W 45	East Darren -	104	—	End, 270 ft. from air, 7 ft. by 5 ft.	- - -	—	2	20·12	0·66	0·88	—	

Analyses of the AIR of MINES—*continued.*

No. or Mark on Sample.	Name of Mine.	Depth from Surface in fms.	Distance from Current.	Description of Place where taken.	Time when taken.	Therm. Fahr.	No. of Men working in it.	Oxygen per cent.	Carbonic Acid per cent.	Oxygen less than 21 per cent.	Crystals observed in the tubes.	Remarks.
W 46	East Darren	80	—	End, 180 . rrom winze	- - -	—	—	**19·72**	1·24	1·28	—	
W 47	Bryn Gwiog	75	—	End, 120 ft. from rise, 6½ by 5 ft.	- - -	—	2	**19·75**	1·22	1·25	—	All taken before any shots had been fired. A good deal of dust, scarcely crystalline in any part.
W 48	„	—	—	Pitch 12 ft. up	- - -	—	—	**20·11**	0·9	0·89	—	
W 49	„	—	—	Under a winze. Supply air	- - -	—	—	*20·92*	0·02	0·08	—	
W 50	„	—	—	Bottom of shaft	- - -	—	—	**20·76**	0·12	0·24	—	
W 51	- - -	—	—	- - - -	- - -	—	—	**20·04**	0·83	0·96	—	
W 52	Mona	60	—	End, cross-cut, 240 ft. from current.	- - -	—	2	**19·58**	1·32	1·42	—	Air pipes not much use.
W 53	„	—	—	Pitch, 150 ft. from current	- - -	—	2	**18·60**	2·26	2·40	0·1	
W 54	„	—	—	End	- - -	—	2	**20·20**	0·76	0·80	0	Candles scarcely burn.
W 55	„	—	—	Do. do. after blower had been worked.	- - -	—	—	**20·52**	0·41	0·48	—	
W 56	„	—	—	Supply air to blower	- - -	—	—	*20·90*	0·07	0·10	—	
W 57	„	—	—	End of cross-cut, 360 ft. deep, 120 ft. from shaft.	- - -	—	2	**20·37**	0·87	0·63	—	Aromatic smell, very distinctly that of apples; German miners frequently speak of this.
W 58	Snailbeach	171	—	End, 450 ft. from sump	½ hour after shot -	—	2	**20·36**	0·61	0·64	—	
W 59	„	171	—	Under sump	- - -	—	—	**20·07**	0·83	0·93	2	
W 60	„	186	—	End, 270 ft. from sump	- - -	—	2	**20·73**	0·26	0·27	—	
W 61	„	—	—	In voog	- - -	—	—	—	—	—	—	
W 62	„	201	—	Bottom of shaft	- - -	—	2	**20·72**	0·14	0·28	—	
W 63	„	171	—	End, 132 ft. from sump	- - -	—	—	**20·74**	0·12	0·26	—	
W 64	„	156	—	End, 315 ft. from sump	- - -	64	—	**20·56**	0·31	0·44	0	
W 65	„	126	In current	Level	- - -	—	—	**19·44**	1·45	1·56	—	
W 66	„	126	—	End, 300 ft. from sump	- - -	—	2	**20 29**	0·57	0·71	0	Peculiar organic odour.
W 67	„	—	—	Tribute pitch between two shafts.	- - -	—	—	**19·61**	1·33	1·39	0·1	

W 68	Roman Gravels	6	—	End, 120 ft. from winze	—	2	20·81	0·26	0·19	—	Fatty smell; butyric acid very clearly amongst others.
W 69	„	20	—	End, 290 ft. from winze	—	4	19·58	1·42	1·42	—	Air pipes, level choked.
W 70	„	—	—	Sump, 36 ft. deep	—	3	19·90	0·92	1·10	—	
W 71	Dyliffe	25	—	Cross cut, 360 ft. from air	—	—	19·70	1·20	1·30	—	Ventilated by duck machine attached to engine rods.
W 72	„	75	—	End 480 ft. from winze	60	2	19·45	1·70	1·55	—	Blower idle.
W 73	„	—	—	Do.	—	—	20·07	0·88	0·93	—	After machine at work.
W 74	„	85	—	End, 210 ft. from shaft	—	2	18·88	2·21	2·12	—	
W 75	Foxdale	72	—	End, 150 ft. from shaft	—	—	20·73	0·12	0·27	4	
W 76	„	—	—	Stopes between 72 and 86 fm. levels.	—	6	*20·90*	0·05	0·10	1	
W 77	„	86	—	End of cross cut	—	2	20·80	0·18	0·20	—	
W 78	„	100	—	End, 210 ft. from shaft	—	2	19·79	1·3	1·21	3	
W 79	„	86	—	End, 180 ft. from rise	—	2	—	—	—	2	
W 80	„	72	—	End 90 ft. from rise	—	2	19·00	1·00	2·00	4	
W 81	Laxey	—	—	Stopes	—	4	20·84	0·05	0·16	—	
W 82	„	165	—	End	—	4	20·72	0·16	0·28	—	Air pipes.
W 83	„	212	—	End	—	2	19·92	1·16	1·08	3	
W 84	„	—	—	Bottom of shaft	—	—	—	—	—	2	
W 85	„	110	—	End	—	2	19·62	1·53	1·38	2	Air pipes.
W 86	Coniston	—	—	End, 900 ft. from draught	55	2	20·26	0·88	0·74	—	Door and pipes.
W 87	„	—	—	Sump 84 ft. deep	64	3	19·58	1·40	1·42	—	
W 87b	Silberthwaite	—	—	End 3,300 ft. in,	—	2	—	—	—	2	Air pipes.
W 88	Goldscope	—	—	Stopes in 60 fm. level	—	2	20·07	0·91	0·93	—	
W 89	„	90	—	End 36 ft. in, $6\frac{1}{2}$ ft. by $4\frac{1}{4}$	—	2	20·55	0·3	0·45	0·1	
W 90	„	—	—	Bottom of shaft	—	3	20·42	0·6	0·58	—	Black dust chiefly; not unusually in less quantity.
W 91	„	60	—	End 132 ft. from winze	—	2	19·77	1·05	1·23	—	Men just going to fire.
W 92	Castlenook	28	—	Bottom of shaft	—	3	19·62	1·13	1·38	0·5	
W 93	„	10	—	End, 54 ft. from rise, $6\frac{1}{2}$ ft. by 4 ft.	—	2	20·46	0·54	0·54	—	Level choked.
W 94	Greenside	—	—	Engine sump 23 ft. wide	—	2	20·62	0·47	0·38	0·5	

Analyses of the AIR of MINES—*continued.*

No. or Mark on Sample.	Name of Mine.	Depth from Surface in fms.	Distance from Current.	Description of Place where taken.	Time when taken.	Therm. Fahr.	No. of Men working in it.	Baro-metrical Readings.	Oxygen per cent.	Carbonic Acid per cent.	Oxygen less than 21 per cent.	Crystals observed in the tubes.	Remarks.
W 95	Greenside -	—	—	Rise 18 ft. high - -	- - -	° —	2	—	—	—	—	0·5	
W 96	„ -	—	—	End 30 ft. from air - -	- - -	—	2	—	**20·84**	0·08	0·16	1	
W 97	„ -	—	—	Sump - - - -	- - -	—	4	—	**19·55**	1·39	1·45	—	
W 98	Hutton - -	—	—	- - - - -	- - -	—	—	—	*20·90*	0·06	0·10	—	
W 99	Upleatham -	—	—	- - - - -	- - -	—	—	—	**20·22**	0·80	0·78	—	
W 100	„ -	—	—	- - - - -	- - -	—	—	—	*20·91*	0·1	0·09	—	
	Northumberland:												
K	Derwent -	120	220 ft.	95 fms. level, forehead west -	- - -	66	2	27·98	—	—	—	—	
L	„ -	91	120 ft.	50 „ do. east.	- -	64	2	29·12	—	—	—	—	
	Cumberland:											—	
M	Stow Craig -	7	24 ft.	7 fms. level, forehead north -	- -	48	4 2 per shift.	28·84	*21·00*	*0·0*	0·0	2	
N	„ -	12	180 ft.	12 fms. level end, north -	- - -	56	2	28·84	**20·03**	1·53	0·97	1	
O	Lady Vein -	30	240 ft.	Rise in forehead of adit, east -	- - -	53	2	28·42	—	—	—	2	
P	Guttergill -	12	60 ft.	High level, east driving -	- - -	54	2	28·9	**20·44**	0·72	0·56	1	
Q	Dowpot Syke -	15	66 ft.	South cross-cut end - -	- - -	55	2	28·82	**20·19**	1·02	0·81	2	
R	„ -	10	42 ft.	Top level end - - -	- - -	56	2	28·78	**20·56**	0·29	0·44	1	
S	Brownley Hill -	90	12 ft.	South driving on "jug" vein	- - -	56	2	28·64	**20·77**	0·99	0·23	1·5	
T	„ -	93	72 ft.	Sump below adit - -	- - -	62	2	28·72	**20·69**	0·41	0·31	3·0	
U	„ -	83	50 ft.	Ore workings above adit -	- - -	63	4	28·68	*20·98*	*0·02*	0·02	3	
V	„ -	108	100 ft.	South driving, "4 fms. lime-stone."	- - -	56	4 2 per shift.	28·84	**20·33**	1·49	0·67	0	
W	Nenthead -	About 58	150 ft.	Small cleugh level, end going east.	- - -	62	6 2 per shift.	28·50	—	—	—	—	
X	„ -	About 58	150 ft.	Ditto, end going west -	- - -	66	6 2 per shift.	28·56	—	—	—	—	

Y	" -	About 58	In current	Ore workings, roof of level - - -	66	18 6 per shift.	28·58	—	—	—	—	
Z	Nattrass -	—	600 ft.	End driving south - - - -	62	2	28·84	Cannot find them.	—	—	—	
A A	Honey Bee -	7	420 ft.	End driving east - - - - -	60	2	28·70		—	—	—	
B B	White Bee -	25	24 ft.	Ditto - - - - - -	56	2	28·78		—	—	—	
C C	Clargill Burn -	40	160 ft.	Bottom of sump in low drift - - - -	59	2	28·78		—	—	—	
D D	Fullgrove -	10	42 ft.	Adit level end, west - - - -	51	2 per shift.	—		—	—	—	
E E	Crossgillhead -	25	700 ft.	Adit level end going south - - - -	52	2 per shift.	—		—	—	—	
F F	Dosey -	25	In current	Slopes in sole of adit - - - - -	46	2	27·86	**20·62**	0·48	0·38	6	
G G	Calvert -	60	120 ft.	Clearing adit, south west - - - -	50	2	27·78	**20·79**	0·20	0·21	1	
H H	Dougang - -	90	720 ft.	Fourbreast of adit level, going west. - - -	60	6	28·24	**20·68**	0·38	0·32	0·2	
I I	" -	60	60 ft.	End of driving going east - - - -	58	4 2 per shift.	28·24	**19·09**	1·84	1·91	3	
J J	Yorkshire: Stang, Arkendale	20	About 1,000 ft.	South cross cut forehead - - - - -	55	4 2 per shift.	27·3	**19·63**	1·11	1·37	2	
J J	Cumberland: Birchy Bank -	—	80 ft.	End of east drift - - - - - -	52	2	28·22	**20·37**	0·77	0·63	3	
J J 2d	- - -	—	—	- - - - - - -	—	—	—	—	—	—	—	A slight but disagreeable smell. A friend considered it putrescent. I could not decide. Found no sulphuretted hydrogen.
K K	Yorkshire: Stang Arkendale -	15	About 400 ft.	Rise in north driving - - - - -	58	2 per shift.	27·26	**18·77**	2·38	2·23	2	
L L	Foregill, Arkendale	30	90 ft.	End south ; bottom of sump - - - -	55	3 per shift.	28·16	**19·04**	2·51	1·96	0·1	
L L 2	- - -	—	—	- - - - - - -	—	—	—	—	—	—	—	Fatty matter and perspiration.
M M	" "	30	50 ft.	Drift end going towards sump - - - -	55	4 per shift.	28·16	**19·00**	2·40	2·00	4	
M M 2	- - -	—	—	- - - - - - -	—	—	—	—	—	—	3	
N N	" "	20	500 ft.	"Slack," cross cut end - - - - -	58	2 per shift.	28·40	**20·13**	0·96	0·87	6	After first explosion n level forehead.
N N 2	- - -	—	—	- - - - - - -	—	—	—	**19·62**	1·39	1·38	6	After second explosion.
O O	Fellend "	40	In current	Gutter's level, drift end east - - - -	56	3 per shift.	—	—	—	—	—	

E E

Analyses of the AIR of MINES—*continued.*

No. or Mark on Sample.	Name of Mine.	Depth from Surface in fms.	Distance from Current.	Description of Place where taken.	Time when taken.	Therm. Fahr.	No. of Men working in it.	Barometrical Readings.	Oxygen per cent.	Carbonic Acid per cent.	Oxygen less than 21 per cent.	Crystals observed in the tubes.	Remarks.
	Yorkshire :												
P P	Hurst	about 30	180 ft.	Pryes level, low drift end		58°	2 per shift.	28·40	*20·92*	—	0·08	0·5	
P P 2		—	—			—	—	—	**20·37**	0·58	0·63	0·5	
Q Q	Copperthwaite	45	About 200 ft.	Low drift forehead, east		54	2 per shift.	28·10	**20·81**	—	0·19	2	
Q Q 2		—	—			—	—	—	**20·56**	0·25	0·44	0·1	
R R	Grinton	6	300 ft.	Low level end		52	2	28·24	**20·52**	0·43	0·48	4	
S S	Old Gang	90	210 ft.	Bunting, south cross cut end		63	2 per shift.	28·14	**19·72**	1·28	1·44	1	
T T	„	60	300 ft.	Bunting, top drift end, west		58	4 2 per shift.	28·	**19·82**	1·17	1.18	2·5	
U U	„	about 50	About 300 feet.	Barberry main level, forehead		55	4 2 per shift.	28·1	**20·55**	0·22	0·45	0	
V V	„	about 50	About 200 feet.	„ cross cut, no. „	Immediately after a shot.	57	4 2 per shift.	28·6	**19·60**	1·11	1·40	2	
W W	Hurst	—	In current	Queen's level, drift 12 fms. above it.		55	6 2 per shift.	—	—	—	—	—	
X X	Arkendale	70	In current	Faggergill, forehead of adit level.		56	4 2 per shift.	28·54	**20·78**	—	0·22	0	
X X 2		—	—			—	—	—	20·59	0·40	0·41	0	
Y Y	Keldheads	65	210 ft.	Main level forehead		51	8 2 per shift.	28·74	**19·77**	1·41	1·23	5	
Y Y 2		—	—			—	—	—	—	—	—	0	A strong smell as of cinders burning, sulphurous evidently.
Z Z	„	81	54 ft.	Low „ „		59	8 2 per shift.	28·76	**19·55**	1·64	1·45	0	

AAA	West Burton -	20	180 ft.	Stopes over main level forehead - - -	59	10 5 per shift.	28·58	*20·90*	—	0·10	4	
2d	- - -	—	—	- - - - - - - - -	—	—	—	—	—	—	4	
BBB	„ -	18	20 ft.	West stopes above level - - - -	58	6	28·58	*20·91*	*0·09*	0·09	0·1	
CCC	Keldheads -	35	120 ft.	Ash bank, main forehead - - - -	58	6 2 per shift.	28·94	**19.24**	2·08	1·76	0·1	
2d	- - -	—	—	- - - - - - - - -	—	—	—	**20·26**	0·76	0·74	—	
DDD	„ -	31	About 90 ft.	Ditto, rise - - - - -	58	4 2 per shift.	28·92	**20·29**	1·21	0·71	0·1	
2d	- - -	—	—	- - - - - - - - -	—	—	—	—	—	—	—	Aromatic and also fatty.
EEE	Westmoreland: Dupton Fell -	50	Ventilated by fissures in limestone.	"North Dobron's" forehead - - - -	53	6 3 per shift.	27·58	**20·13**	0·78	0·87	4	
FFF	„ -	50	Do. -	"South Dobron's" forehead - - - -	55	8 4 per shift.	27·58	**20·21**	1·03	0·79	—	
GGG	„ -	100	Do. -	Threalkeld or deep level forehead. - - -	53	4 2 per shift.	28·	**19·84**	1·37	1·16	—	
HHH	Silverband -	80	Do. -	Stope vein forehead - - - - -	49	4 2 per shift.	26·94	**20·82**	0·23	0·18	4	
HHH2	- - -	—	—	- - - - - - - - -	—	—	—	**20·47**	0·63	0·53	—	
III a	„ -	80	Do. -	Remington - - - - - -	53	4 2 per shift.	26·90	**20·79**	0·33	0·21	6	
2d	- - -	—	—	- - - - - - - - -	—	—	—	—	—	—	—	A smell somewhat like candles burning—far from pure air.
JJJ	„ -	—	Do. -	Silverband forehead - - - - -	50	4 2 per shift.	26·98	**20·44**	1·02	0·56	—	
SSS	- - -	—	—	- - - - - - - - -	—	—	—	—	—	—	—	A smell as of burning oils.

Analyses of the AIR of MINES—*continued.*

No. or Mark on Sample.	Name of Mine.	Depth from Surface in fms.	Distance from Current.	Description of Place where taken.	Time when taken.	Therm. Fahr.	No. of Men working in it.	Baro-metrical Readings.	Oxygen per cent.	Carbonic Acid per cent.	Oxygen less than 21 per cent.	Crystals observed in the tubes.	Remarks.
No. 1.	Clifford Mine, the hot mine.	—	—	120 feet from shaft, 2 from winze.	- - -	105°	—	—	**20·87**	*0·13*	0·13	—	A smell as of burning oil; water running at the rate of two gallons per minute, 120° F.
No. 2.	- - -	220	—	From stopes at eastern end of 220.	- - -	95	—	—	**20·30**	0·68	0·70	—	
No. 3.	- - -	220	—	From stopes - - -	- - -	98	—	—	**20·80**	*0·2*	0·20	—	
No. 4.	- - -	—	—	From a cross-cut; men resting themselves.	- - -	—	—	—	**20·62**	0·25	0·38	—	Men resting; 17 men in a high state of perspiration, and seven candles burning.
No. 1.	- - -	40	—	- - - - -	- - -	—	2	—	—	—	—	—	
No. 2.	- - -	—	—	- - - - -	- - -	—	—	—	—	—	—	—	
				*Analyses not included in the average.**									
1	Parr Consols -	80	—	- - - - -	- - -	70	—	—	**20·44**	0·42	—	—	
2	„ -	100	—	Cross-cut - - -	- - -	74	—	—	**19·90**	1·18	—	—	
3	„ -	150	—	Stopes - - - -	- - -	77	—	—	**20·60**	0·27	—	—	
4	„ -	180	—	End - - - -	- - -	84	—	—	**20·75**	0·17	—	—	
5	Fowey Consols -	180	—	N. of union shaft - -	- - -	72	—	—	**19·71**	1·23	—	—	
6	„ -	200	—	Stopes - - - -	- - -	74	—	—	*20·96*	0·04	—	—	
7	„ -	220	—	End - - - -	- - -	84	—	—	**20·22**	0·67	—	—	
8	„ -	270	—	Stopes - - - -	- - -	81	—	—	**19·82**	1·09	—	—	
9	„ -	270	—	Stopes on south lode -	- - -	82	—	—	**20·24**	0·69	—	—	
10	„ -	280	—	End - - - -	- - -	86	—	—	**19·70**	1·19	—	—	

G 1	Der alte Elizabeth, Freiberg.	—	—	End	—	—	—	—	—	**19·80**	1·08	1·20	3	
2	„	—	—	Ditto, another end	—	—	—	—	—	**20·48**	0·39	0·52	2	
3	Mordgrube, near Freiberg.	—	—		—	—	—	—	—	**18·93**	2·03	2·07	0	
4	„	—	—	A stope	—	—	—	—	—	**18·52**	2·42	2·48	1	
5	Samson Mine, Andreasberg.	—	—	End of long level	—	—	—	—	—	**20·39**	0·49	0·61	3	
6	„	—	—	Stope	—	—	—	—	—	**20·51**	0·45	0·49	4	
7	Elizabeth Mine, Clausthal.	—	—	Top of a rise	—	—	—	—	—	**20·65**	0·23	0·35	2	A blowing machine in this mine
8	Samson, Andreasberg.	—	—	End of a long level	—	—	—	—	—	*20·90*	0·15	0·10	4	
9	„	—	—	Ditto, farther from shaft	—	—	—	—	—	**20·25**	0·73	0·75	4	
10	„	—	—	Large wide space	—	—	—	—	—	**20·78**	0·10	0·22	4	

E 3

Coal Mines.

No. or Mark on Sample.	Name of Coal Mine.	Depth from Surface in yds.	Amount of Air.	Place where taken.	Therm. Fahr.	No. of Men working in it.	Barometrical Readings.	Oxygen per cent.	Carbonic Acid per cent.	Remarks.
1	Cowper Colliery	200	65,000 cubic feet per minute, workings 12 feet by 7.	100 yards from the downcast shaft.	52°	100	30·55	**20·85**	0·06	Current very strong.
2		—		1000 yards ditto	—	—	—	**20·71**	0·44	Half way between downcast shaft and end of workings.
3		—	A side working	2000 yards ditto	65	1 and 1 candle.	—	**20·87**	*0·13*	
4		—	End of workings connected with upcast shaft.		—	—	—	**20·57**	0·39	
5		—	Air after passing through the whole mine, about 5 miles.		—	—	—	—	—	
6	North Seaton Colliery	248	40,000 to 45,000 cubic feet per minute of air		65	—	30·5	—	—	250 men and 58 horses.
1		—		100 yards from the downcast shaft.	—	—	—	*20·97*	*0·03*	
2		—	Average air of mine to all appearance		—	—	—	**20·71**	*0·29*	After passing over 40 men.
3		—	Air from workings after passing over 53 horses and 88 men and boys.		—	—	—	**20·80**	0·16	
4		—	Air after passing over 250 men and 58 horses, and through 2 miles of workings.		—	—	—	**20·44**	0·42	

*The carbonic acid is given in italics in a few cases. These numbers were got merely by subtracting the oxygen from 21. They are, therefore, only approximative; but, as a rule, they are a trifle too small. Those, for example, with 21 of oxygen are put as having no carbonic acid, whereas they have from 0·03 to 0·04 per cent.

Summary of the Analyses.

Oxygen, average of 339 specimens	20·26
of ends - -	20·18
of other parts -	20·32
in currents - -	20·65
in large cavities - -	20·77
just under shafts - -	20·424
in sumps - - -	20·14
Carbonic acid - -	0·785

35 or 10·67 per cent., normal or nearly so.
81 or 24·69 per cent., decidedly impure,
212 or 64·63 per cent., exceedingly bad.

Here the division into three classes is made as before explained. Other analyses made after the above 399 give similar proportions.

It is remarkable that the carbonic acid found by the method explained should so nearly approach the amount of oxygen deficient, and also that the difference should be in excess of the oxygen as was anticipated on account of the use of gunpowder, bringing in a disturbing quantity. It turns out as we might expect, that the sumps are the very worst and the ends nearly as bad, and that currents and large cavities have an amount of oxygen equal to that found in a well ventilated coal mine. The value of the oxygen test is perceived here, and the accuracy of the method of taking the carbonic acid is also confirmed.

I need only observe that if 0·1 or 0·2 deficiency of oxygen indicate bad ventilation in houses, the state of these mines must exceed all that we who live above ground can comprehend. We enter gradually, and cannot well judge; if we leapt from the pure air into a close end in an instant, we should recoil with horror.

GENERAL IMPURITIES OF THE AIR OF MINES, AND CALCULATION OF EXTENT.

When a mine opens out into the free air, and when there is sufficient light at the entrance, we are apt to suppose, in many cases, that fires are burning within it, because a constant flow of dusty and smoke-like vapour issues in an endless stream. This is the impure air of the mine, which escapes with whatever solid matter it can support, the powder and candle smoke mixed with the exhalations of the workmen. When you enter that smoke yourself you are not aware of any impurity—at least, after a few minutes are gone; and as the stream is pretty rapid, it leaves even a somewhat cooling and refreshing sensation, if we come from a less pure part of the mine where the air has been warm; this we frequently do when we have gone some distance from the shaft or draught of air.

If we pass from the air of the shafts to the sidings, galleries, or long levels where the air is stagnant, the change is very striking; and when we return to the shaft we are again comparatively refreshed. That this is really a comparative feeling, and to some extent therefore a delusion of the senses, may be proved, because we experience the same feeling of pleasure in breathing as soon as we leave the shaft itself and enter the pure air; and this is found even on escaping from the largest and best ventilated shafts. Our senses adapt themselves with marvellous rapidity to changes. True, when passing rapidly from one atmosphere to another, they give correct notice of the change, but discrimination appears to them much less useful where there is no choice.

In passing through the long levels, between air currents, or removed from close ends, my small experience did not show that anything occurs to render the air oppressive; the impression given is that of want of freshness. As a rule, the long passages appeared so ventilated that although the air is inferior to that above-ground, it is still such as does not strike us with alarm. But it is when we come to the end of the levels that the trial of the air begins, that is, when we leave the direct influence of draughts. It may be, perhaps, looked on as a matter of necessity that most of the borers should work at such ends.

The first mine in which I made experiments was that of Dolcoath. The air which was analysed was taken at 1,320 feet from the surface, at a place half a mile from the main shaft at which we entered, but, contrary to anticipation, only 80 fathoms from another shaft, and one by which the air entered as being the lower; the distance from the nearest winze was 40 fathoms. The height of the level was 7 feet 5 in., the broadest part being below, but narrowing above. The air was taken an hour and a half after an explosion for blasting, in which five ounces of gunpowder were used. A blast such as this was made every $2\frac{1}{4}$ hours. The men informed me that after a blast they stay away for about half an hour to let the air clear, but they sometimes, in their anxiety to know the result, run in, after five minutes, just for a moment, to see if anything remarkable has happened; especially if they have taken the spot for themselves, when they have hopes of a load of treasure. They generally retire to some nook, somewhere about 20 fathoms from the *blast*. The temperature was 70° Fahrenheit (21·1° cent.) and in cooler corners 65° (18·3 cent.)

In South Francis Mine the depth entered was 1,056 feet, at about 100 fathoms from the direct air shaft, and 24 from a winze; this winze, however, giving only air which had previously passed through other levels, where the height was $6\frac{1}{2}$—7 feet, and the breadth about 3. Five blastings were made in 8 hours, which is a shift, each blast consuming on an average $3\frac{1}{4}$ ounces of gunpowder. Two men worked together with two candles.

At Bottallack Mine the air was taken at about a quarter of a mile out from the shore and the same distance from the shaft. This mine was remarkably dry, whilst the previously-mentioned were remarkably wet. Mr. Couch considered this mine as very well ventilated, but I was not made aware of its peculiarities.

It was after viewing the condition in which the men in these mines worked that the following calculations were made. After seeing other mines I am still inclined to look on these figures as fair approaches to an average state of things, or, in other words, a statement of the influences at work in the air at an average of these "ends," whilst the analyses show that the calculations represent fairly the state of the worst parts.

The actual condition of the air must of course be obtained from the analyses; there the result is found after all the influences at work have performed their part. The calculations are made for a space represented by 50 feet in length from a close end; if a larger space were assumed the results would correspond to a greater number of cases, but the close

ends are the most important, and for the theoretical part I am not inclined to make a change. We must not forget that explosion, diffusion, and inequalities of temperature and moisture are continually at work to cause variations, and that air which would have had the calculated composition may on account of these influences be found to have fewer impurities. Small as the value of these calculations might be alone, they throw a great light on the condition of the mine, when taken in conjunction with the analyses, to which they are intended specially to act as introductions.

Amount of Carbonic Acid from breathing.

Let us take as the amount of carbon given out in a day by the lungs at 7·55 ounces :—

This will be equal to carbonic acid—

15·6 cubic feet at 70° F.
Or 844·59 grammes
441714·6 cub. c.

Let us consider this given out in a space equal to 50 feet in length, 5 feet in height, and 4 feet in breadth : 50 × 6 × 4 = 1,200 cubic feet, calling this a close end.

It is equal to 35·3166 cub. metres.

Let us double the amount of carbon, as there are always at least two men working, and let us divide it by 3, giving them 8 hours per day :—

15·6 cub. feet × 2 = 31·2 ÷ 3 = 10·4.

This is 0·86 per cent. of the 1,200 cub. feet.

Amount of Carbonic Acid from Candles.

During this time there is burnt about half a lb. of candles. These may differ, and do differ, in quality, some having more and some less rosin. But we may suppose them formed of stearine, and if they are not entirely so we shall at least be near enough for the present purpose by supposing it. It is impossible to work out the numberless suppositions that might be made ; I must be content with one. Let us suppose the candle grease to contain 114 atoms of carbon, 110 of hydrogen, and 12 of oxygen :—

½ lb. of stearine will contain 2689·89 grains carbon.

„ „ 432·58 „ hydrogen.
„ „ 377·53 „ oxygen.
3500·00

These 2689·89 grains of carbon will make an amount of carbonic acid equal to 9862·92 grains. Taking the weight of 100 cubic inches at 100 to be 47·339 grains, we have a volume of carbonic acid at 60 F. of 12·044 cubic feet, or at 70 F. of 12·2765 cubic feet.

This, in French measure, is—

Carbon - - 174·18 grammes.
Carbonic acid - 638·69 „
Or 347596 cub.-centimeters.

The amount on the 1,200 cubic feet is 1·023 per cent. of carbonic acid. Add this to the amount by breathing, and we have carbonic acid by breathing :— 0·86 per cent.

From candles - 1·023 „
1·883 carbonic acid introduced

into the space of 1,200 cubic feet in eight hours by two men and two candles.

During the same period of time there are used 12 ounces of gunpowder = 340 grammes. The composition of gunpowder varies, but one not unusual contains :

Nitre - - - 74·8 per cent.
Sulphur - - 13·3 „
Charcoal - - 11·9 „
100 „

Or, in equivalent parts—

Nitre - - - 101
Sulphur - - - 16
Carbon - - - 18
135

These are converted by explosion into—

Carbonic acid - - 66
Nitrogen - - - 14
Sulphide of kalium - - 55
135

The weight, therefore, remains the same after explosion, or in other words the smoke weighs exactly the same as the gunpowder. This is not so with smoke generally, which weighs much more than the wood or coal consumed : but powder burns without air ; it supplies its own air in the nitre employed. This powder gives another increase of carbonic acid equal to 2·803 cubic feet, or 0·233 per cent.—

making by breathing - 0·86
candles - 1·023
gunpowder - 0·233
per cent. - 2·116

Besides this amount of carbonic acid there are 2,139 grains of sulphide of kalium or potassium, or an equivalent in sulphate of potash, floating in the atmosphere—a portion of the smoke. This is not constant, but exists in great amounts for a short space of time, and in small amounts for a longer time. It is, however, seldom entirely absent. It exists for a while after the explosion in great excess, so that sight and breathing become nearly impossible for ⅕ or 20 per cent. of the time; that is, above three half hours out of the eight hours. During that time the men are not present above a few minutes, but they breathe the less dense smoke much longer, perhaps some of them constantly.

About one-third of the powder is fired off at a time. There are 713 grains of sulphide of potassium, or its equivalent in sulphate of potash, sent into the air at once, leaving 0·59 grains in a cubic foot, or still more of the oxidized salts and other substances, as will be seen in the last table of this chapter. This amount, small as it seems, is intolerable, and the men can neither work nor live in it. They wait till it diminishes. But it is important to remember this amount to be able to understand the enormous influences which are to be ascribed to substances existing in quantities which by our modes of description appear to be extremely minute.

The decomposition attributed in the above calculation to gunpowder is theoretically correct in this sense, that the arrangement of the elements is fitted to bring about such a result as nearly as we can reckon, but the actual result is very complicated. It is extremely probable that no mixture could be made sufficiently intimate to produce this purely theoretical result. We find that on coming from a mine our mouths and nostrils are extremely black ; this blackness is much greater in those organs than over the face. The reason is that the current of air entering by the mouth or by the nostrils, is strained and purified to a great extent, and charcoal from the powder is one of the substances strained out. The charcoal is not wholly burnt during the explosion of the powder ; the sulphur is not wholly as a sulphide of kalium, and the nitre is not wholly robbed of its

oxygen. The sulphide of potassium is believed to be converted rapidly into sulphate of potash. Professor Bunsen seems to think that the conversion of part is instantaneous; and as he has examined the combustion of gunpowder so carefully it will be needful to consider what would be the composition of the air of the 1,200 cubic feet when we have decomposed the gunpowder according to his formula.

Besides these substances mentioned there are 544·4 grains of nitrogen, or 1,784 cub. in. at 70 F. set free from the saltpetre, being 0·86 per cent. increase on the nitrogen of the atmosphere in the space alluded to.

The changes in the 1,200 cubic feet will now be more fully understood.

The 1,200 cub. feet of air consisted of—

Oxygen	250·8 cub. feet.
Nitrogen	949·2 „

This will be increased by	10·32 carb. ac. from breath.
	12·276 „ candles.
	2·796 „ gunpowder.
	1·03 nitrogen from do.
Addition	26·422

Supposing the oxygen lost and the carbonic acid found in amount to be the same, which for the man is not exactly true, the volume will be diminished by an amount of oxygen equal to the carbonic acid from breath - - - 10·32

and that from candles 12·276

Oxygen united to the hydrogen of the candle - 4·929

Or - 27·525

We then have the new state of the air in the 1200 feet space—

Oxygen	250·8	—	27·525	= 223·275
Nitrogen	949·2+1·03 from gunpowder			950·302
Carbonic acid from breath			10·32	
„ „ candles			12·276	
„ „ gunpowder			2·796	
			25·392	25·392
The 1,200 cubic feet are now				1198·897

a little of the air from the level will now enter to fill up the space left.

I do not here calculate the amount of oxygen burnt by the hydrogen of fatty matters during respiration. Let us put the above into per-centage and total amounts :—

Original oxygen in 1,200 cubic feet	250·8	after work	223·48
Nitrogen	949·2	-	951·10
Carbonic acid	-	-	25·42
			1200·000

The same calculated in volumes per cent :—

Oxygen	20·9	after work	18·62
Nitrogen	79·1	-	79·26
Carbonic acid	-	-	2.12
			100·000

The carbonic acid before work is left out as being too small for the purpose of this calculation.

We here see a diminution of 2 per cent. of oxygen, and an increase of rather more than 2 per cent. of carbonic acid ; and this may be said to be the rough result, as far as these two gases are concerned with this calculation and sufficient for all who do not require to go far into details.

If we wish to know with still greater exactness the condition of the air as caused by gunpowder, we must take one of the following analyses. J. Linck gives gunpowder as*—

Saltpetre	-	0·7470
Sulphur	-	0·1245
Charcoal	Carbon -	0·0905
	Hydrogen -	0·0041
	Oxygen -	0·0279
Water	-	0·0060
		1·0000

From these result on explosion—

Solids.

	Grammes.	
Sulphate of potash -	0·2891	$K O S O_3$
Carbonate of potash -	0·1537	$K O C O_2$
Bisulphide of potassium	0·0959	$K S_2$
Hyposulphite of - -	0·0374	$K O S_2 O_2$
Sulphocyanide of - -	0·0116	$K Cy S_2$
Nitrate of - - -	0·0120	$K O N O_5$
Charcoal left - -	0·0183	
Sulphur - -	0·0031	S.
Sesquicarbonate of ammonium - - -	0·0204	$2 N H_4 O 3 C O_2$

Gases.

	Grammes.		Cubic C.
Carbonic acid - -	0·2239	$C O_2$ -	113·86
Nitrogen - - -	0·0952	N -	75·72
Sulphuretted hydrogen	0·0238	H S -	16·67
Carbonic oxide - -	0·0118	C O -	9·45
Hydrogen - -	0·0003	H -	3·56
Oxygen - - -	0·0001	O -	0·09
	0·3551		218·35

Messrs. Bunsen and Schischkoff, in the year 1857, Jahrbuch, p. 626, give—

Gunpowder.

Saltpetre	-	78·99
Sulphur	-	9·84
Charcoal	Carbon -	7·69
	Hydrogen -	0·41
	Oxygen -	3·07
		100·00

On explosion there result :

Solids.

Sulphate of potash -	62·10
Carbonate of -	18·58
Hyposulphite of -	4·80
Sulphide of kalium -	3·13
Sulphocyanide of -	0·45
Nitrate of - -	5·47
Carbon - -	1·07
Sulphur - -	0·20
3/2 Carbonate of ammonia -	4·20
	100·00

Gases in Volumes.

Carbonic acid - -	52·67
Nitrogen - -	41·12
Carbonic oxide - -	3·88
Hydrogen - -	1·21
Sulphuretted hydrogen -	0·60
Oxygen - -	0·52
Binoxide of nitrogen -	0·00
	100·00

* Jahrbuch der Chemie, 1858, p. 649.

Or in actual quantities :—

Solids.

Sulphate of potass.	0·4277
Carbonate of pot.	0·1264
Hyposulphite of pot.	0·0327
Sulphide of pot.	0·0213
Sulphocyanide of pot.	0·0030
Nitrate of pot.	0·0372
Carbon	0·0073
Sulphur	0·0014
Sesquicarbonate of ammonia	0·0287
	0·6856
Add gases	0·3138
	·9994 from 1 gramme of gunpowder.

Gases by weight.

	In grammes.	In C. C.
Carbonic acid	0·2012	101·71
Nitrogen	0·0998	79·40
Carbonic oxide	0·0094	7·49
Hydrogen	0·0002	2·34
Sulphuretted hydrogen	0·0018	1·16
Oxygen	0·0014	1·00
	0·3138	193·10

Although the result here is much more complicated than by the first calculation, and the proportions differ considerably, it also turns out that the resulting gases and solids which make up the smoke are equal to the weight of the original powder used. This simply means, that the amount of nitre has been very carefully calculated. No such accuracy is found in the powder of the miners, or in that which I used for experiments.

The 12 ounces used per day in a close end, or let us say 340 grammes, of gunpowder will give as gases—

	Litres.
Carbonic acid	34·5799
Nitrogen	26·9969
Carbonic oxide	2·5473
Hydrogen	0·7944
Sulph. h.	0·3939
Oxygen	0·3414
	65·6538

As solids.

	Grammes.
Sulphate of potash	144·710
Carbonate of potash	43·311
Hyposulphite of potash	11·189
Sulphide of potassium	7·296
Sulphocyanide of potassium	1·049
Nitrate of do.	12·751
Carbon, charcoal	2·494
Sulphur	0·466
3/2 Carbonate of ammonia	9·790
	233·106

Taking 1,200 cubic feet, or 33,978 litres, we have—

	Litres.
Carbonic acid from breathing	251·0592
„ from half a lb. of candles	324·7711
	575·8303
„ from the gunpowder	34·5799
	610·4102

The nitrogen from the gunpowder must also be added to the total nitrogen ; and when this and other operations are performed we have—

	Litres.
Oxygen	6,326·7036
Nitrogen	26,903·5949
Carbonic acid	610·4102
Carbonic oxide	2·5474
Hydrogen	0·7944
Sulphuretted hydrogen	0.3939
	33,844·4444

By weight in actual amounts—

	Grammes.
Oxygen	9,048·957
Nitrogen	33,726·7
Carbonic acid	1,200·44
Carbonic oxide	3·18800
Hydrogen	0·07186
Sulph. h.	0·59869
	43979·94855

By weight the numbers would be in per cents.—

For pure air.		For the enclosed air.	
Oxygen	23·1	Oxygen	20·575
Nitrogen	76·9	Nitrogen	76·686
		Carbonic acid	2·72958
	100·0	Carbonic oxide	0·00725
		Hydrogen	0·0001634
		Sulph. hydr.	0·0013613
			99·9993547

This will give a per-centage constitution of the atmosphere in the enclosure as follows :—

	By Volume.
Oxygen	18·6935
Nitrogen	79·4920
Carbonic acid	1·803607
Carbonic oxide	0·007529
Hydrogen	0·002347
Sulph.	0·001164
	100·000147

If we put together all the substances thrown into the air of the 1,200 cubic foot space, we have as air and impurities together—

	Grammes.	Grains.
Oxygen	9048·957	139737·7945
Nitrogen	33726·7	520470·4
Carbonic acid	1200·44	18525·2
Carbonic oxide	3·188	49·2
Hydrogen	0·07186	1·1088
Sulph. hydrogen	0·59869	9·23898
Sulphate of potash	144·760	2233·936
Carbonate of potash	43·311	668·375
Hyposulphite of potassium	11·189	172·668
Sulphide of potassium	7·296	112·592
Sulphocyanide of potass.	1·049	16·186
Nitrate of do.	12·751	196·773
Carbon	2·494	38·482
Sulphur	0·466	7·191
3/2 carbonate of ammonia	9·790	151·079
Organic matter		
Sand		
Sulphurous acid, or Sulphite of ammonia		
Arsenious acid		

All these substances actually are breathed by the miners. All except carbonic oxide, hydrogen, sulphocyanide, and arsenic have been actually found in the air. These four have been proved to enter it, and would be found if sought. We know assuredly that they exist, and search is therefore voluntary.

Every gas, with the exception of the first two, is injurious.

Every Cubic foot contains :—

	Grammes.	Grains.
O	7.540797	114·802599
N	28·105583	433·8182
CO_2	1·036666	16·0086
CO	0·002656	0·041015
H	0·000059	0·000911
HS	0·000498	0·007690
$KOSO_3$	0·120633	1·862865
$KOCO_2$	0·036092	0.557316
KOS_2O_2	0·009325	0·144000
KS	0·006080	0·093897
KCyS	0·000874	0·013476
$KONO_5$	0·010625	0·164075
C	0·002078	0·032089
S	0·000388	0·005989
$2NH_43CO_2$	0·008158	0·125779
Solids alone	0·194260	2·999486

It was on my first visit to the mines in Cornwall that it occurred to me that the probable condition of the air would be obtained by these calculations; and fatiguing as they may be to read, and still more so to make, they approach so nearly the exact truth in the case of those ingredients which can be ascertained by experiment that I believe they may be taken as actually representing the true condition of the air, with reference also to those substances which are not determined by analyses. Here are the impurities of the air; how far are they removed by the means already in use? The analyses show how far some of these impurities have been removed; and if the specimens have been taken from proper places they will show how much purification is due to such influences as position and natural changes or the use of mechanism.

There are some of the ingredients of the air at the end of the table not given in their quantity. The organic matter has been proved to exist, but its actual amount may be variously stated, and will be examined separately.

The sand is meant to include the fine particles of the rocks and the ores which are driven about as dust. The sulphurous acid and the arsenic are both in minute quantities, and both probably have little influence. The arsenic, however, cannot be considered as entirely without effect. The pyrites of Cornwall contain a large amount of arsenic, and when struck with a hammer or pick the smell is very strong. It is not a smell which a chemist only may trace, but one well known and used by the men as a test of the materials. This is a circumstance which may signify good or evil to the miners, most probably evil, but it cannot be entirely avoided, and is counteracted only by draughts of air. To this long list of impurities must now be added the products of distillation of tar and of canvas from the burning fuses. These are in amounts sufficient to affect the senses, and are of themselves extremely complex.

SOLID IMPURITIES IN THE AIR OF MINES.

It has already been said that the air issuing from a mine is not an invisible fluid, but contains solid material enough to make itself distinctly perceived, if not in all cases, still in cases of even well-ventilated mines; using the expression well ventilated in its ordinary acceptation, namely, compared with other mines. When I first observed this, it seemed to me that the sides of the shaft would be continually receiving accumulations of solid matter from these floating particles, and some of the surface of the wood was taken home for examination. But when it was considered how many solid particles in the form of stones and mud are continually moving up and down the shaft, it appeared on the other hand not at all probable that any conclusion could be drawn regarding those which were only to be caught by the sides out of the moving air. It was needful then to seek another method. In order to obtain floating particles in the air various methods have been used by Pasteur and others. Dr. R. D. Thomson used a screen, and others have used liquids. But an easier method, for a portion of this enquiry at least, presented itself, when Mr. P. H. Holland, on looking at one of the tubes which had been filled with air from an end in South Francis mine, asked why it glittered so much. A careful examination of every tube showed that the floating crystallized bodies of the mine air had deposited themselves on the glass.

The microscope showed that the solid products of the combustion of gunpowder are to be recognized in the specimens of air, and that there is a considerable variety in the form of crystal. In some cases, the crystals of saltpetre may be traced, in most a sulphate of potash. The internal space of the tubes is only from two to three cubic inches, and the substances occurring in smallest amounts will not be readily detected. The per-centage of sulphide of potassium in powder smoke is 3·13, of the solids, and of sulphide of hydrogen 0·6; whether from the quantity being so small or from the rapid oxidation of these sulphides, they have not yet been traced with any certainty in the air collected for analysis. In nearly all cases the tubes were examined by the microscope before they were broken open, and a note was made of the amount of crystals which were apparent. The amount is given in figures, which must not be considered as very definite, but as simple approaches such as the eye makes; in other words, they may be styled estimates. The eye can of course readily distinguish between amounts which differ as much as one and eighteen, and so widely the varieties did in reality differ.

The drawings of the substances speak for themselves; the power used for magnifying was 85 diameters, a higher power being found unmanageable on account of the thickness of the glass.

Besides the crystalline bodies there are substances transparent but shapeless, some looking like pieces of quartz, some perhaps looking more like glass.

There are also opaque substances, not very dense but shapeless and small, although at times one is found much larger than the others. I suppose these constitute the dust or broken-down portions of the rocks. Sometimes portions are blacker than others; these are the charcoal of the gunpowder.

Again there are occasionally filaments of evident organic origin; these also are to be counted amongst

the numerous substances that make up that complicated material so vaguely called dust. Portions of our own selves are to be found in it no doubt, and portions probably of everything existing around us.

Having found then that of a certainty numerous soluble and insoluble substances and bodies of various shape and texture are to be found in that air which the miners breathe, we naturally enquire what is the effect on the lungs. As this question belongs properly to a medical man only, I shall not presume to enter fully upon it, but it is certainly my part to prepare the evidence, and in fact to say as much as I have the power of learning.

One complaint I have made against the air, viz., that it is visible, when there is a layer of as little as one foot in thickness. The purest air is probably itself visible in the thickness of many miles. The atmosphere of all our towns is visible in the thickness of about half a mile, but there are portions of it readily seen in the small space of workshops, and even in those where there are employed numerous strong men who have not been found to suffer in an equal degree with the miners. In all these cases it may be said that there is a reservoir of purer air at the door, which may be considered equal to the existence of a shaft within a few feet. If such a convenience existed at every working spot of a mine, this enquiry would have been less necessary.

In those workshops in towns the most apparent impurity is that of smoke and the ashes of coals. It will be well to compare this with the substances found as solids in the air of mines.

Analyses of the Ashes of Coals. *Watts' Dictionary of Chemistry.*

	Newcastle Coal after deducting Sulphuric Acid.	Average of 5 Welsh Coals.	Average of 5 Scotch Coals.
Silica	62·44	42·67	49·63
Alumina	31·22	—	—
Sesquioxide of iron and alumina	—	43·56	38·21
Sesquioxide of iron	2·26	—	—
Lime	0·75	6·65	3·18
Magnesia	0·85	1·08	1·41
Potash	2·48	—	—
Soda	—	—	—
Sulphuric acid	—	4·46	6·26
Phosphoric acid	—	0·66	1·03
Per-centage of ash	1·36	8·15	—

Here the ashes are seen at once to differ very far from gunpowder ash, and the smoke, as is well known, differs far from gunpowder smoke. Let us pursue the differences.

The coal dust consists almost entirely of insoluble salts; the gunpowder entirely of soluble.

The coal dust is shapeless; the crystals of powder smoke and dust from explosions sharp.

The coal is oxidized by a great current of air and sulphides are therefore forbidden. The gunpowder smoke contains sulphides. If a few grains of gunpowder are exploded in a large vessel moistened on the side by acetate of lead, the whole vessel becomes black instantly. There is sulphuretted hydrogen in small quantities, but there is sulphide of potassium in comparatively large quantities, and that salt it is which gives the peculiar odour to powder smoke, in my opinion. I cannot but believe that the action on the lungs of this salt must be equal to that of sulphide of hydrogen, although from acting more slowly, perhaps the effect is more easily overcome. The slow action is a great advantage; the body has time to renew frequently the attack against its enemy; but although there may be power to resist actual death, the effect of slow action may be, and most probably is, to distribute over a long period of time that death which might ensue instantly, so that, if a chemist may be allowed to use the expression, the effect is dissolved in health and becomes disease. Probably the sulphide will deoxidize the blood and act in other ways not yet known. A powerful agent in the lungs it must be.

People who love the smell of gunpowder may be surprised at this, but we need not go to the soldier or the sportsman for examples either on one side or the other. The amount of gunpowder which they inhale is a mere trifle compared with that taken into the lungs of the miners. The soldier may have as much in battles, but these are the rare occasions of his life. So far as air forms the condition of existence a miner lives on a battle field his whole life; he has the smoke, the dust and the heat. Read the description of the air of a battle field and you have already that of a mine. The sportsman with the fine air around him has at the most only a short whiff of the powder smoke.

Let us endeavour to find how much really is inhaled. Let us say there are taken into the lungs in a minute 320 cubic inches of air, an amount considerably below Vierordt's estimate We have, then, in 10 hours, which is longer than the men must be in the mine air, 111 cubic feet. Let us say that 30 of these cubic feet contain the full amount of solid matter estimated, or, in other words, that the 111 feet breathed contain an amount equal to the full dose contained in 30 feet. We have then inhaled in one foot the amount of—

0·19426 grammes × 30 = 5·82780 in 30 feet.

Or in grains

89·914580 in 30 feet.

We cannot expect that a man will inhale so much, but it is at times possible, and to this fully he is at least liable to be exposed during a part of the day. A full dose of gunpowder smoke exists in the air only a portion of the time.

I here give careful drawings of the substances found in air, as they were found attached to the sides of the tubes. An investigation into the small bodies attached to surfaces offers to give much that is new. In this case it is not intended to go into details. The result of the general analysis of dust from the tubes has been given. The crystals on number five must, however, be mentioned separately. They were found even on tubes perfectly fresh from the glass-blowers, and always at the ends. The action of the heat on the glass has produced some changes, diminishing perhaps its soda; and at any rate either causing an efflorescence or a general deterioration. As a rule the greater number of all the crystals was found near the extremities of the tubes; I suppose these places were quieter

and less exposed to currents which would exist even in the small space contained in a tube.

Dust and Crystals collected from the Air of Mines.

No. 1.—Dust collected on the sides of a tube after gunpowder had been exploded in it.

No. 2.—Dust collected from the air of the lead chamber after explosion of gunpowder in it.

No. 3.—Specimen of an unusually large piece of saltpetre found in the air after explosion.

No. 4.—Dust collected on all objects in the chamber after an explosion of gunpowder.

No. 5.—Figures at the end of the glass tubes after much heating.

No. 6.—Figures on the tubes along with crystals from the air of a mine after an explosion of gunpowder. V V Barberry.

No. 7.—From H H H Dufton (Silverlead), Yorkshire.

No. 8.—N N Arkendale, Fregill, No. 2, immediately after an explosion.

No. 9.—V V Barberry, after an explosion.

No. 10.—V V Barberry, after explosion.

No. 11.—28 D 28.

No. 12.—South Francis Mine, 11th September 1862, 1140 feet.

No. 13.—South Francis Mine at surface, 9th September, 1862.

No. 14.—South Francis Mine, 1,140 feet, 10th September 1862.

No. 15.—T T Bunting.

No. 1. gunpowder specimen. This was taken by drawing the air as usual into a tube and sealing it. When examined by the microscope, and even by the naked eye, crystals of saltpetre were distinctly seen. There was clear matter like a crystallized salt, but with no regular form, and in conjunction with black spots. The tube, which before was clear, had a fine dust over it, distinctly showing that even the formless matter observed was brought into the tubes at the time of the explosion.

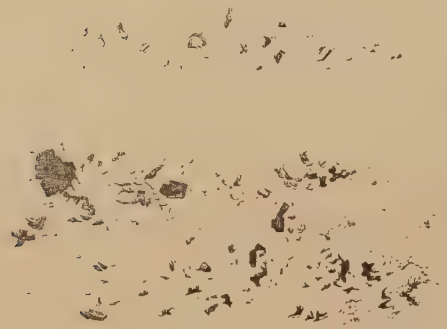
AMOUNT of CRYSTALS observed, compared with the OXYGEN or its Deficiency.

No. of Specimen.	Crystals.	Amount of Oxygen deficient, or the Amount less than 21 per Cent.
2	0	0·4
4	1	0·38
6	0	0·04+
7	4	0·1
8	0	0·36
9	1	2·20
12	0·5	0·24
14	0	0·66
19		1·99
20		0·8
21		1·91
23	0	0·78
24	Abundant	0·708
25	0	0·2
26	?	0·13
27	?	2·73
28	?	1·7
29	0	0·0
32	0·2	0·0
33	0·1	0·15
34	3	0·21
35	4	0·83
36	0	0·11
37	0	0·16
38	0	0·12
39	0·5	1·04
40	1	0·18
42	0·5	0·17
43	0·5	
44	0·1	0·6
45	0	0·0
46	1·5	0·89
47	0·1	0·16
48	0·2	0·27
49	0·5	0·04
50	1·0	0·96
51	0·1	1·07
52	0·0	0·53
53	4·0	0·25
56	0·1	0·47
58	Large, but few.	0·0
59	4	0·86
61	1	0·7
62	4	0·6
63	0·5	0·04
64	0	0·18
68	3	0·42
70	0·1	0·75
71	Dust	0·06
72	3	1·47
73	0·1	1·48
74	0·1	0·53
75	5·0	0·92
76	0·1	0·21
77	2	0·16
78	1	0·46
79	3	0·95
80	3	1·73
101	1	0·05
103	2	1·04
105	3	0·52
107	8	0·63
109	2	0·64
110	5	0·35
111	3	0·01
113	2	1·0
116	0	1·30
120	1	1·19
121	1	0·21
122	0·1	0·51
126	0	
127	2	0·12
128		1·68
129		
130		0·10
South Francis shaft		0·46
„ „ 90 fa.		2·31
Dolcoath mine, 1,400 feet deep.		0·23
D 4	2	1·18
D 8		0·45
D 9	1	1·02
D 10	0	0·91
D 11		1·14
D 14, top	1	
D 15	0·5	0·28
D 16	0	0·30
D 25	0·1	1·60
D 28	0·3	0·20

Gunpowder vapour after explosion in Lead chamber

February 17th 1864.

N° 1. Explosion of Gunpowder in the Lead chamber
Floating particles.

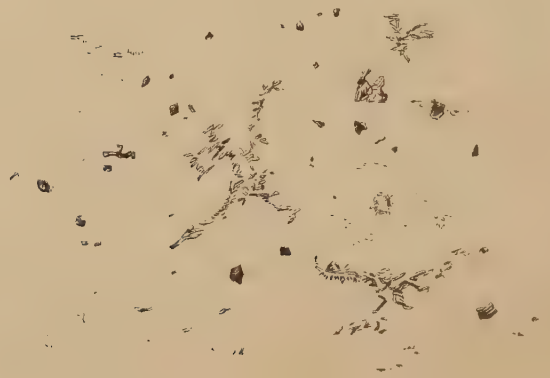


Dust collected in small chamber after an explosion
of Gunpowder

AAA
N° 2.

West Burton. Yorkshire

Thermometer 59. — Barometer 28. 58.



VV

Barberry

Thermometer 57. — Barometer 28 6

Immediately after an explosion of Gunpowder

PALL MALL

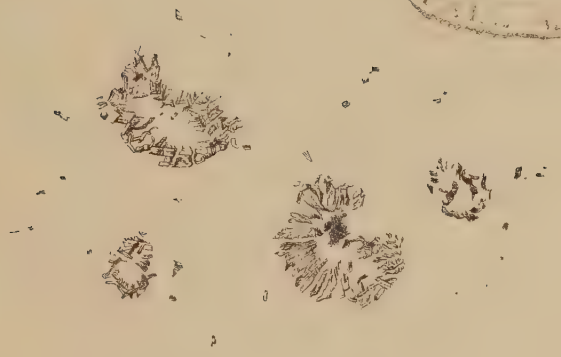
H H I Dufton (Silver lead) Yorkshire

Thermometer 49. — Barometer 26. 94.

N N Arkendale Foregill
N° 2

Thermometer 56. Barometer 27. 20

Immediately after second explosion in level forehead



VV Barberry.

Thermometer 57. . Barometer 28. 6.

Immediately after an explosion of Gunpowder

REFORM CLUB
PALL MALL

S Francis Mine. 190 Fathoms

Sept 11th 1862

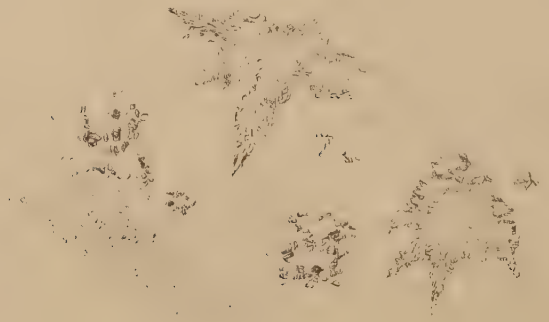
South Francis Mine Shaft at Surface.
Sept. 9th 1862.

REFORM CLUB MALL

Barberry.

Thermometer 57 — Barometer 28. 6
Immediately after an explosion of Gunpowder.

REFORM CLUB
PALL MALL



Bunting.

Thermometer 58.— Barometer 28

S. Francis Mine 190 Fathoms.

Sept 12th 1862.

No. of Specimen.	Crystals.	Amount of Oxygen deficient, or the Amount less than 21 per cent.
D 29	4	1·43
D 32		0·24
D 33	8	
D 35		0·49
D 36	0	0·27
D 40	0	1·00
D 40	0	
D W L 45		
D 41		1·09
D 45		0·32
D 46	2	0·18
D 47, 30 S		1·93
W 1		1·09
W 4	0·1	1·27
W 5	0·1	1·28
W 6	Longer	0·68
W 7	0	1·60
W 8	1	1·74
W 9	2	0·31
W 10	0·1	1·00
W 12	0	1·46
W 14	0·1	0·89
W 16		0·56
W 18	0·1	0·24
W 19		0·42
W 21	0·5	0·73
W 25	0	0·08
W 38	2	0·7
W 50	Dust chiefly	0·24
W 53	0·1	2·40
W 54	0	0·80
W 59	2	0·93
W 64	0	0·44
W 66	0	0·71
W 67	0·1	1·39
W 75	4	0·27
W 76	1	0·10
W 78	3	1·21
W 79	2	
W 80		2·00
W 83	3	
W 84	2	
W 85	2	1·38
W 87b	2	
W 89	0·1	0·45
W 90	Black dust	0,58
W 92	0·5	1·38
W 94	0·5	
W 95	0·5	
W 96	1	
A		0·16
M	2	0·0
N	1	0·97
O	2	
P	1	0·56
Q	2	0·81
R	1	0·44
S	1·5	0·23
T	3	0·31
U	3	0·02
V	0	0·67
F F	6	0·38
G G	1	0·21
H H	0·2	0·32
I I	3	1·91
J J	3	0·63
J Ja	2	1·37
K K	2	2·23
L L	0·1	1·96
M M 1	4	2·00
M M 2	3	
N N 1	6	0·87
N N 2	6	1·38

No. of Specimen.	Crystals.	Amount of Oxygen deficient, or the Amount less than 21 per Cent.
O O		
P P 1	0·5	0·08
P P 2	0·5	0·63
Q Q 1	2	0·19
Q Q 2	0·1	0·44
R R	4	0·48
S S 1	1	1·44
S S 2	1	
T T	2·5	1·18
U U 1	0	0·45
U U 2		
V V	2	1·40
X X 1	0	0·22
X X 2	0	0,41
Y Y 1	5	1·23
Y Y 2	0	
Z Z 1	0	1·45
A A A 1	4	0·10
B B B 1	0·1	0·09
C C C 1	0·1	1·76
C C C 2	0·1	0·74
D D D 1	0·1	0·71
E E E 1	4	0·87
F F F		0·79
G G G		1·16
H H H 1	4	0·18
H H H 2		0·53
I I Ia	6	0·21
J J J 1		0·56
German Specimens.		
G 1	3	1·20
G 2	2	0·52
G 3	0	2·07
G 4	1	2·48
G 5	3	0·61
G 6	4	0·49
G 7	2	0·35
G 8	4	0·10
G 9	4	0·75
G 10	4	0·22

The result of the comparison clearly is that the existence of solid matter and crystals in the tubes is not coincident with a corresponding deficiency of oxygen. I had, perhaps carelessly, expected the contrary, and hoped to find that one mode of examination would confirm the other. When examined more narrowly (and such results compel us to this fuller examination) we find that the diminution of oxygen in the air of a mine has no exact connexion with the solids contained in the air. Although both must frequently be found together, they are independent defects. For example, it happens that men work long in boring holes for blasts, but making no blast until several are ready. In this case the air deteriorates, but there can be no powder crystals. Next it happens that the powder smoke rolls out upon the purest air of the mine; it does not necessarily carry a diminished amount of oxygen along with it. The solid particles separate from the gaseous. In reality there must be cases where an explosion will purify a portion of the atmosphere, whilst it deteriorates another, and is the most violent agent for evil in the air of mines. For example, it will drive out air from a level at a long distance from the explosion, and other air will enter as the heated gas cools. To

some extent this will be of service, but it is one of those things which serve to complicate the conditions to be considered.

In a recess of small extent, an explosion will drive out all the existing air, substituting powder air. This, being very different from the atmosphere, will rapidly change by its own action, and fresh air will come in. This increased rate of change would go on no further than the point of impurity in the air before the explosion; but the organic matter and the excessive moisture would be removed. If the carbonic acid were washed out there would be a very fair purification, although not a perfect one. When the cavity is long the same result will not take place. The impure air of the end will be driven forward, it is true, but after the explosion most of it will come back mixed. There will be various modifications of the constitution of the air, and there will be a very gradual entrance of purer air. If in this case the carbonic acid and solid matter were washed out there might remain a deficiency of oxygen, an atmosphere not desirable to breathe. It would be interesting to know if this deficiency of oxygen with purity in other respects would be perceptible, allowing that it did not go beyond one per cent. or perhaps two. This is a point elsewhere to be examined. Meantime it may be said that the air will certainly be better without the carbonic acid and solid matter than with it, so that something at least would be gained. This leads to an enquiry as to the advantage of washing the air.

It is not my intention to say much on the effects of breathing so much solid matter. To judge from my own experience, it must be very hurtful. I must leave medical men to describe the effects, but will here remark that twelve hours after breathing powder smoke to an unpleasant amount, phlegm with taste of nitre appeared after a slight cough, entirely different from all previous experience. To assist in forming an opinion I have transcribed the following remarks which seem to me very just.

Effects produced upon the miners by the explosion of gunpowder.—By Dr. Josephson. (Annales d'Hygiène Publique, t. 19, 221.)

"We know that during sieges there passes underground a war of mines and of countermines, in order to hinder the assailants from penetrating near the fortifications by covert ways. The efforts of the besieged are especially directed to destroying and filling up the subterranean trenches of their enemies, by exploding powder in their works. Now, these explosions of powder in narrow spaces, where the air circulates with difficulty, occasion the evolution of gas; whence accidents well known to engineers, the nature of which is found in special works, and of which Dr. Josephson has given an account, when speaking of the demolition of the fortifications of Juliers.

"He has distinguished three particular forms:—

"*First Form.*—This is the mildest; the miners employed in the interior of the gallery experience in the middle of the forehead a piercing pain, so acute that they totter, sink down, and can speak only in a hesitating and imperfect manner. This stupor, the pain in the forehead and the tingling in the ears continue for some time, until exposed to the open air. The temperature and sensibility of the skin have undergone no change; the conjunctivæ are slightly injected; the other functions remain intact, except a little swelling of the stomach; and a slight headache remains for two or three days.

"*Second Form.*—The miner comes from the level apparently in health, then suddenly he falls without uttering a single cry; there is a loss of movement, a retardation of breathing; the eyes are half closed, replies are made in an excited manner; pulse large, full, showing 90 or 96 pulsations; colour and temperature of the skin normal. In about a minute breathing is resumed, the general condition remaining elsewhere the same; there is a want of power to swallow the liquids which are introduced into the mouth; very often hiccough comes on with attempts to vomit, rarely with vomitings which, when they do take place, always bring relief. After ten or fifteen minutes the recollection returns, the sick man complains of a keen feeling of cold and of headache in the forehead; and scarcely has a half hour passed until he can return to his work the headache only remaining and sometimes the oppression.

"*Third Form.*—Here the man falls while at work as if struck by lightning, and is seized with convulsions of an epileptic form; often there are spasmodic movements or actions, during which he stiffens with such violence that it is often very difficult to carry him along the straight galleries where he has been surprised by this attack. Brought to the air, he experiences a kind of tetanic convulsion, the teeth are pressed close, and breathing becomes loud and heavy; then follow foam at the mouth and complete loss of the senses; the eyes open, pupils dilate, the eye rolls in its orbit, conjunctivæ are injected, the pulse is full, moderately quick, unequal, and irregular. After some minutes of this condition there occurs a dilation of the muscular system. The patient is still insensible, presses convulsively his head between his hands, as if he feared that the violence of the pain would cause it to burst; sometimes he grinds his teeth; sometimes he utters hoarse cries; his pulse has become smaller and intermittent, the skin is livid, cold, and harsh. However, intelligence by degrees returns and the patient falls into a deep sleep during which he very often weeps and sobs; from his mouth there escapes a quantity of saliva, the pain in the head continues for a day after he awakes but his recovery is complete the day after."

"It must be admitted that the cause of these accidents is the gas evolved by the explosion of the gunpowder, and particularly the sulphuretted hydrogen; the sickness of the miners ought then to be regarded as a hydrothionic intoxication. Mr. Josephson has placed in the mouth of the sick a piece of paper saturated with a solution of lead, concentrated, and soon observed a grey colour."

Having had an opportunity of observing the instrument as proposed by Sales-Girons for the pulverization of liquids, or mixing them with the air in a condition so fine that they may be inhaled like very fine dust or like mist, it seemed as if the action of some of them would explain the effect of gunpowder smoke on the lungs. But looking at one of the latest papers

by Wedemann,* the only aid on the subject found is this, that the particles of so called powdered liquids are carried direct into the air tubes and that 30 inspirations are about sufficient for a dose, although sometimes very much more is given. The effects are evidently very great. Not to speak too much on a medical part of the subject, I observe that the author remarks the falling of the pulse during the breathing, and attributes this to the long inspirations that are taken. It may not be unwise to place the fact beside it, that as the air became worse in the close chamber during my experiments the pulse became weak and the inhalations long and numerous.

I have taken the liberty of making the allusion, as the instrument does not seem well known to medical men in this country.

ORGANIC MATTER OF THE AIR.

The organic matter has been a subject of great search, and it has escaped the observation generally. Vogel and Boussingault chiefly have laboured on the subject, and proved the existence of dissolved matter in crowded rooms and in unwholesome swamps. Some years ago I published some enquiries which excited great interest. It was desired that the process recommended at the same time should become so easy that every one could use it as easily as a thermometer. I have not been able to reduce it to that simplicity for all cases, but shall here endeavour to show exactly how far the plan is capable of popular use.

Forchammer first used permanganate of potash to test the organic matter in water. I had occasion to use this salt, or mineral chameleon, in the laboratory; and it struck me as very remarkable, that whilst the solution remained unchanged for a long time in a bottle, a thin stratum exposed to the air became brown in a few minutes. I breathed upon it, and it became brown more rapidly. This seemed to give the clue to the cause of the decomposition which the permanganate underwent in the atmosphere. The result was exactly that which occurs when we attempt to filter the salt through paper. The paper decomposes it instantly.

The next attempt was to obtain results from pure and impure air, and these were so decidedly different that a means of measurement seemed to be attained.

The apparatus used was very simple; it was merely a bottle of the capacity of 100 cubic inches. A very weak solution of permanganate was made; but even a very weak solution gives a very strong colour. A small burette holding 100 grains was filled with the solution of permanganate. The air was pumped out of the bottle, leaving the mouth open, so that the air of the place streamed in, and the stopper was put on. This stopper was of caoutchouc, perforated with two holes; one to allow a tube to enter through which the permanganate was poured into the bottle; another to allow, at the same time, a corresponding amount of air to pass out.

The liquid was poured into the bottle, and allowed to roll round the sides. It seemed to me that no improvement was obtained by allowing more than ten minutes for this. A small quantity was used at first, the colour was instantly removed, a small quantity more was added, and so on until the colour remained permanent, showing that the air contained no more of the material fit for decomposing permanganate.

Before making this public, I had made above 300 experiments. Of these, however, few only were published. They were given in a lecture at the Royal Institution. At that time I used oxalic acid to try the strength of the solutions; but oxalic acid is not a very sharp test, and I doubt if all the results are so definite as might be wished; but as a scientific fact, and a mode of showing the existence of organic matter in the air, the plan was sufficiently explained.

In trying the experiments in town and country, however, there was a difference given which could not easily be dealt with. The town air always required more permanganate: and no wonder; this was in reality due, to some extent, to sulphurous acid from the burning of coals. This might be mistaken for organic matter, and could this mode of testing show the difference? It could not readily show it, but when it is carefully observed, it is seen that the sulphurous acid of towns acts instantaneously. The sulphurettted hydrogen of putrid gases acts also instantaneously but the organic matter acts slowly. Still the organic matter does act.

The following table will give a fair specimen of the figures obtained; I need not here record them all. I certainly was not satisfied with the apparatus used, and endeavoured to obtain better results by means of an aspirator, that is by driving the air through a solution through which it might bubble. The experiments made in this way were satisfactory in a scientific point of view as may be seen below, proving the same points; but an aspirator is not generally applicable.

It was for the reasons found here that, in spite of many requests, I have never seen it proper to let it go forward as a popular apparatus. So far as putrefying matter and sewer matter is concerned as well as the sulphurous acid of coal smoke, the action is so rapid that any one may use the plan; but when organic matters purely are concerned, it frequently requires much patience, and some of that peculiar form of discretion which can only come with some knowledge of chemistry.

The following were made with the burette in a bottle of the capacity of 100 cubic inches. The number of grains of the solution of permanganate decolorized by 100 cubic inches of air is given in the last column, and the comparative amount of oxidizable matter is thereby seen. The bellows-pump used to remove the air from the bottle was that which is seen at figure 1.

* Würzburger Medicinische Zeitschrift, 1863, "Inhalation Medicamentöser Flüssigkeiten."

Grains of solution of permanganate of potash, decomposed by equal quantities of air. The last column gives the comparative amount of oxidizable matter in the air.

Place.	Date, 1858.	Temperature.	Grains of Permanganate of Solution used.
London :		Fahr.	
Wellington Street	July 13th	70°	45·
Do. higher up	,,	,,	25·
Waterloo Steps	,,	,,	42·
Blackfriars, in the street	,,	,,	25·
Southwark Bridge (at river)	,,	,,	55·
Street near the same bridge	,,	,,	22·
A little distance from river	,,	,,	22·
Street near Fetter Lane	,,	,,	30·
Fenchurch Street Station	,,	77°	18·
Loughton (in Epping Forest, on the hill)	,,	,,	16·
Loughton, at a goose pond	,,	71°	28·
Forest again	,,	,,	16·
Ditto, in the evening	,,	69°	16·
Inside a house	,,	,,	18·
Camden Square	,,	72°	26·
,, ,,	,,	,,	26·
,, ,, (after a thunderstorm and during rain)	,,	69°	10·
Kentish Town Road (close and warm)	,,	83°	37.
Highgate Road (where the houses form a single row)	,,	,,	27·
Do. at Swainson Lane	,,	,,	25·20
Ditto	,,	,,	24·25
Highgate, middle of village (an open wide road)	,,	,,	23·
Beyond Highgate, on the descent of hill	,,	,,	22·
Ditto	,,	,,	20·
Marylebone Cemetery	,,	,,	21
Finchley	,,	,,	15·
Near Euston Road	,,	,,	33·
Everitt Street	,,	,,	29·
Thames opposite Lambeth	,,	,,	35·
Ditto again	,,	,,	35·
,, Waterloo Bridge	,,	,,	35·
Poets' Corner	,,	,,	24·
Kew :			
Fern House, No. 12	,,	78°	20·
,, No. 10	,,	68°	14·
,, No. 15	,,	79°	18·
,, No. 15	,,	84°	32·
Victoria Regia House	,,	85°	14·
Palmhouse, at bottom	,,	73½°	18·
,, at top, painting going on	,,	,,	22·
Outside Palm House (evening set in)	,,	65°	10·
60 miles from Yarmouth, at sea	Aug. 1st	69·5°	3·5
Hospice St. Bernard in a mist	—	—	2·8
Hill in Lancashire	—	—	2·8
Lake Lucerne in middle–evening	—	—	1·4

Place.	Date, 1858.	Grains of Permanganate of Solution used.
All Saints, Manchester	June 22nd	40·
,, ,,	,,	40·
,, Inside laboratory	,,	48·
,, Outside ,,	,,	40·
,, ,, ,,	,,	37·
Air drawn foom a pigstye	,,	70·
All Saints, Manchester	June 21st, evening.	28·
,, ,,	June 22nd, morning.	36·
,, Inside laboratory	June 23rd, morning.	34·
,, Outside ,,	,,	30·
,, ,, ,,	,,	26·
,, ,, ,,	Evening	15·
Pigstye	,,	63·
All Saints'	June 24th	44.
Greenheys	,,	41·
Greenheys	,,	40·
Extreme of Greenheys fields, testing every ½ mile nearly, and leaving the town	,,	42·
,, ,, ,,	,,	40·
At a bridge (strong smell of putrefaction)	,,	73·
,, ,,	,,	38·
,, ,,	,,	36·
,, ,,	,,	30·
,, ,,	,,	30·
,, ,,	,,	27·
,, ,,	,,	15·
,, ,,	,,	19·
,, ,,	,,	16·
,, ,,	,,	12·

A very much larger vessel than here used would make the test sharper, but there is a great objection to bulky apparatus.

A better mode of conveying the test into the bottle was devised—a tube passing through the stopper was furnished with an elastic ball. The stopper and ball are taken out, the ball is pressed, and the point dipt into the permanganate. The ball is then allowed to expand, and the liquid rises. The taps are then closed, and the stopper put on. When the liquid is to be added to the bottle, the taps are opened and the ball pressed ; by this means any amount may be passed into the bottle without contact of air. If there is a graduated tube connected with the ball the amount may be read off there, and by having the stopcocks, none of the liquid is required to enter the hole.

In this way we may work with very small quantities of liquid and of air.

The method of preparing the liquid and testing it need not be given in detail, as I doubt if any but chemists could manage it.

From the late experiments one cub. centimeter of a solution of permanganate is made equal to 0·00225 grammes of metallic iron. A strong solution is prepared and tested, then diluted to the proper amount. The dilution must take place with very pure water. The best water is got by distilling deep well water, or else by allowing some to stand with a considerable amount of permanganate of potash for a night and then distilling it. The solution must remain clear with some purple in it, and must not become red.

REFORM CLUB
PALL MALL

Fig. 1.

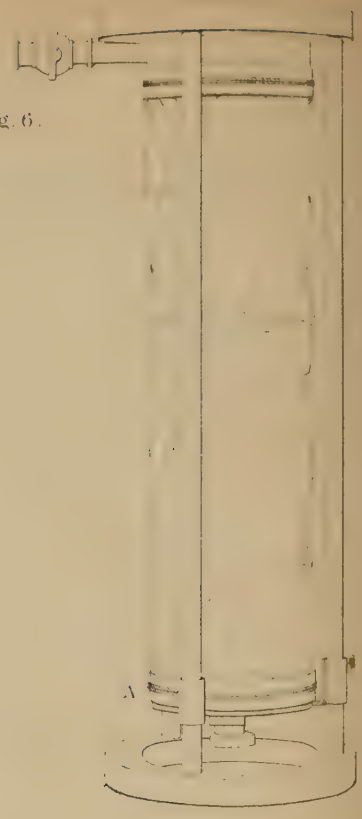


Fig. 6.

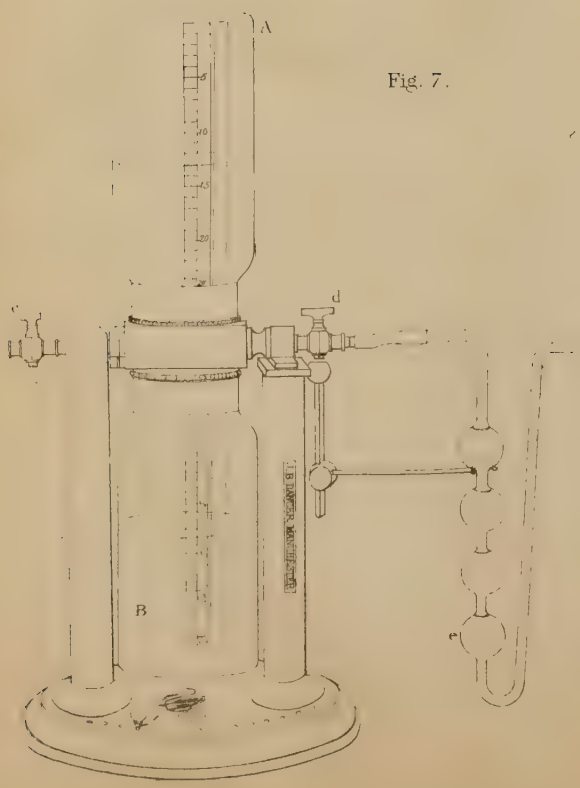


Fig. 7.

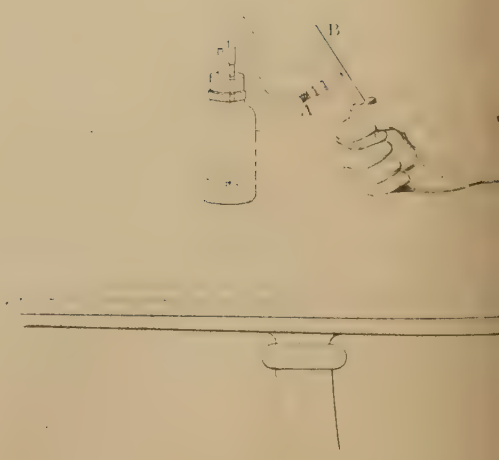


Fig. 8.

I have made some solution very pure by weighing out a crystal of permanganate and adding water to it, but, on the whole I prefer to begin with manganate, the green salt. By adding water to this, it becomes reddish or purple.

The solution of a crystal was used in the following experiments:—

Organic and other Oxidizable Matter in the Air.

5 cub. cent. (77·20 grains) of the permanganate were used, and air passed through it.

1 cub. cent., tested with protosalt of iron=0·00225 iron, or 0·00032 oxygen.

	Place.	Litres of air passed through.	Cubic feet passed through the Solution.
	Air on the hills near Buxton -	above 90	above $3\frac{1}{2}$
1	At the laboratory -	64·750	2·286
2	„	61·680	2·178
3	„	61·680	2·178
4	„	67·848	2·396
5	„	66·306	2·341
6	„	64·750	2·286
7	„	64·750	2·286
8	„	66·306	2·341
9	„	67·848	2·396
10	„	65·521	2·313
	Mean at Manchester	65·143	2·300
	In the lead chamber after three persons had remained about two hours - -		
1st		46·260	1·633
2nd	„	49·344	1·742
3rd	„	43·176	1·524
	Mean - -	46·260	1·633
	Human breath -	44·718	1·579
	„	47·802	1·688
	Mean - -	46·260	1·633
	Air from a midden	52·428	1·851
	„	57·054	2·014
	„	47·402	1·674
	Mean - -	52·294	1·846
	In lead chamber with vapour of gunpowder -	43·176	1·524

The amounts here are not exactly the same as in my former experiments, made six years ago. The earlier were made with an alkaline salt, the latter with a pure permanganate. It seems to me that the former is the most sensitive, and for the following reason :—

When acid, whether carbonic or any other acid, is added to the manganate, it becomes red, and the air which is passed through it, giving up its carbonic acid, causes this redness. When the change once begins it more readily goes forward. The solution is still more easily decomposed when sulphuric acid is added to it, although another cause seems then to act ; that is, the sulphuric acid assists in retaining and decomposing the organic substances.

There may also be some other causes which affect the decomposition of the manganate. Sometimes it is very easily reduced ; sometimes otherwise ; so that I fear we have to deal either with a variable substance, or with very variable conditions. The latter is the more probable, and, at any rate, the causes of a change are very numerous. As a rule, however, the amount of organic or other oxidizable matter in the air ought to be so small that with 5 cub. centimeters (77 grains) of the solution, it will require nearly four cubic feet to remove the colour when the air is caused to bubble through, and if less removes it the air is not the purest. Sometimes, as in the case of putrefactive matter, or of sulphuretted hydrogen, a few score cubic inches will be enough, in very bad air still less. In no case, however, will these experiments be complete, with such a small quantity of air as 100 cubic inches, unless the liquid is shaken in the bottle, or made to roll round its sides. In that case, as it will be seen, much less liquid was used, as well as much less air.

It is fatiguing to roll the bottle about in the hand, and I confess my patience was far too much tried to continue farther, and my assistants became tired also. I propose, therefore, the use of a flexible aspirator,—an instrument since found of the greatest value for many experiments. It stands at figure 6. It is composed of caoutchouc cloth. If standing with A downwards, it will draw air into itself, through a solution placed as at *e* on fig. 7, and with such regularity that even if allowed to go by itself for two hours it will be found not to have varied its pace. With water aspirators, as generally made, a variation is continually taking place. The amount which it has taken in or passed through the solution may be measured by the depth which A has fallen. My earlier experiments were more accurately measured, viz., by passing the air first through a Croll's or Glover's dry gas meter, in which it was easy to measure to a few cubic inches. Those made in a bottle of definite dimensions were not subject to any error of measurement. This flexible aspirator is also an apparatus which might be more employed in laboratories. If inverted, it may be used for pressing air through a solution. This too it performs with great regularity. The air or gas may be collected from any spot, and carried till it is required but extreme purity is not obtained in this way, on account of the sulphur from the vulcanized rubber cloth.

If people have much work to do, even the trouble of filling and emptying such a vessel may be too fatiguing ; and to avoid this evil Mr. J. B. Dancer, of Manchester, has made a very beautiful apparatus, adapted at first for this process only, but capable of being used for numberless purposes in a laboratory. The apparatus stands at figure 7. When the connections have been made as there shown, and the stoppers opened, the flow of water will commence from the upper bottle, drawing the air through the solution at *d*. When this is done, the bottle is reversed by a touch of the hand. It is moved with the greatest ease. The operation commences again. The bottles are measured in parts of a cubic foot, or in cubic centimeters, as required. This is a very elegant apparatus, a great improvement on that of Dr. Reid's, and ornamental either in a house or laboratory.

The 4-bulb glass is intended to allow of very rapid absorption. The first bulb is only half filled, and when the gas passes rapidly, the liquid is thrown up in spray, and thus better exposed.

When any caoutchouc is used it must be black; that is, either the common natural, or vulcanized rubber boiled with caustic soda. If ordinary vulcanized rubber is used in contact with permanganate, the solution is instantly decomposed. If the air from the inside of a bag of this rubber be used, it instantly destroys the permanganate. In fact that which we smell of vulcanized articles decomposes the salt.

It must be remarked that when putrid gases are passed through the solution of chameleon, the amount may be tested sharply, but when the exhalations of the skin or the lungs are passed through, this sharpness is not observed. For example, I have not observed a difference when two persons were in the lead chamber, and when there were three. The cause may be that only a limited quantity is kept in suspension in the air, the rest being deposited. The senses confirm this. If, however, actual putrefaction occurs, the amount is less limited. This leads us to think that the test may be of special advantage in tracing out the existence of putrid gases, either in houses, hospitals, or the human breath itself; but this subject requires labour, and that labour has not been bestowed. The amount of labour necessary to obtain such results as are here given has been more than can be imagined by those who have not been devoted to the search of such hidden and subtle existences and phenomena. I make this remark as I know that many persons seem to think that I have neglected the subject too much of late; but if I have, it has not been from idleness. Another energetic campaign might bring it forward an important step.

Since writing the above I am able to state that an atmosphere containing 0·19 of pure carbonic acid, feels very agreeable and cannot at least in half an hour be distinguished from pure air. To find such a condition Mr. P. W. Holland suggested a manufactory of soda water. This was found at Messrs. Hemsbury and Brown's in Manchester. The windows were wide open, and fresh air was coming in, but the amount of gas escaping was enough to keep the lowest amount of carbonic acid at 0·1 whilst the bottlers breathed at least 0·19 but generally much more. The place was fresh and agreeable. This fact I consider as sufficient to enable us to throw on the organic matter all the first blame of the discomfort in badly ventilated rooms. So pleasant was the air in the manufactory that very much more carbonic acid could have been borne. It was not apparent to the senses; indeed it will be seen that 4 per cent. was not very evident to the senses, although it affected the vitality; whilst we thus throw on the organic matter the sensible discomfort of the time, we are not yet able to say that 0·19 of carbonic acid caused no physiological effect. That point is for the present reserved. The absence of an effect which the sense of smell could detect did not hinder a very remarkable lowering of the pulse when air containing nearly 4 per cent. of carbonic acid was breathed.

Here however a step is distinctly gained. We owe our discomfort to organic matter; although this has been said for some years, it is not anywhere so fully proved as by the several facts now gained.

THE ORGANIC MATTER IN THE MINES.

It is not difficult to prove that organic matter exists in the air of mines. The assurance that human beings live there would of itself be sufficient to convince us of its existence. Organic matter flows into the air as a necessary result of the phenomena of life. If we did not know that human beings existed there, the proof would still be easy; as we find along the sides of the mine in places where the amount of water is neither too great nor small, and where other conditions do not prevent it, that a fine, soft, white covering is given to the rock like the nap of the finest white velvet, but much finer. When the water and light are favourable, it shines like the morning dew on spiders' webs, but I know no appearance above ground giving an idea of so much delicacy. It looks pure as it is white; and it is pure,—it purifies the air. When examined more nearly, it is found to resemble rather the mould which comes on preserves, but blanched thoroughly by its absence from light. It may readily be collected, but so wonderfully light is it that you may gather the crop from many square feet, and almost doubt at last that you have any harvest. It dries up at last into a very tough substance, which Professor Williamson, F.R.S., says is a mass of confervæ. I did not give him any in a fresh state, so that he had no opportunity of making any full examination.

When viewed under the microscope, it presents a mass of transparent fibres matted together and interwoven in a most complete manner. Its analysis is perhaps scarcely to be depended on as far as nitrogen is concerned, as the quantity used for combustion with oxide of copper was small, and the amount in possession insufficient for a second trial. Nearly two per cent. of nitrogen was found.

I sent for more of the substance, but my request was not clearly understood. There is an efflorescence of sulphate of lime, and also of other salts which very much resembles this fungous growth; but I have not found that it was noticed in the mines, whilst it is frequently taken for the inorganic salt. The specimen examined was obtained from the Botallack Mine, but the same kind was seen in other places.

When you enter a beer cellar, the fungous matters that grow around are proof of exhalations arising from the beer; and no cellar can show an analogous phenomenon better than mines. At the same time, these substances are not found in all parts of the mine, because the confervoids seek a suitable soil and climate, and these differ every few yards underground. Even in a cellar there is no fungous covering over the whole wall; it is confined to peculiar spots, which receive it sometimes in great excess. In a country there are little nooks of land, which are so favorably placed as to become natural hospitals; and in a garden there are little corners which have all the effects of hothouses. So one vineyard has the best wine in a country, and one plant in that vineyard is more remarkable than any other. For similar reasons, the confervoid spoken of does not grow on every spot in the mine, but it is common, and must feed only on the organic matter supplied by the miners. That which is found on decayed wood is much more abundant.

Decayed wood is much blamed for giving out bad air. In this country the amount of wood used is often so small that we may leave this source of evil out. When 4,000 fir trees are supplied yearly to a mine, as to the Dorothea Mine at Clausthal, and the Dolcoath Mine in Cornwall, this source of carbonic acid must not be overlooked.

As I had worked a good deal on the subject of or-

ganic matter in the air, it was natural that I should attend to it in the mines, and indeed my first visit was accompanied with an apparatus for testing it with permanganate, as explained when speaking of the organic matter of the air.

A solution of permanganate was used, 20 grains of which were decolorized by 100 cubic inches of air. In the mines 100 cubic inches removed the colour from 28, 30, 39, and 50 grains, and further on in the same level from 70 grains. In another mine 50, 48, 52.

It was clear that deoxidizing agents were abundant in the mine, at certain places. But it must not be supposed that this test fixes on organic matter only. It is affected by sulphides and sulphites instantaneously, and is therefore a test of the amount of these salts besides other substances as already explained.

The air from gunpowder contains sulphuretted hydrogen and sulphide of potassium. If a large jug, or even a basin or tumbler, be moistened on the sides with acetate of lead, whilst a few grains of gunpowder are laid on a dry spot below, and fired off by touching with a hot wire, the sugar of lead or acetate will become black instantly. A deep vessel is better for this purpose, in order to confine the smoke. No such large amount comes from cesspools on ordinary occasions. We see at once that such a gas must act so as to reduce the oxide of iron in the blood, and render much of the air which is taken into the lungs valueless.

For this reason it was found quite useless to apply in the mines the test which has been used for other places. It tells of substances in a group, a sufficient value at times, but not sufficient where a minute enquiry is wanted. I was driven, therefore, to other methods of examining the air for organic matter; numerous results were not sought. It was intended to spend some days on a second visit, in order to make some experiments which, from want of experience on the first visit, had not suggested themselves, but this seems now to be impossible. The following experiments, however, made for the purpose of discovering organic matter, if few, were remarkably satisfactory.

Seventy-six tubes in which gas had been collected were washed out with water. This solution contained chiefly sulphate of potash. I was scarcely sure of any soda without the spectrum test. It also contained a little chlorine, as we might expect, the gunpowder not being free from chlorides; there were also nitrates from undecomposed gunpowder, and partly, perhaps, from the explosions made when analysing.

The ammonia was equal to one grain in 250 cubic feet. This result is given as only approximate, still it looks probable. We do not know to what this ammonia is united; it would probably be to carbonic acid; and it may have come partly from the combustion of gunpowder. If it had come from organic matter only we should still have been in a difficulty, as we do not know how much nitrogen would be found with a given amount of animal exhalations. If the nitrogen came in a compound with the same percentage of nitrogen as fibrin, we should then have one grain of organic matter in 36 cubic feet.

Part of the material from the tubes was burnt, and the unmistakeable odour of nitrogenous substances was perceived; burnt feathers give it in its ideal purity. As a final proof that organic matter was operated on, carbon, black and combustible, remained behind.

True, the total amount obtained was small; and the actual estimation of quantity in such cases has a strong appearance of a guess; but in order to obtain proof of the existence of the organic matter, without regarding the quantity, a far smaller amount might be operated on with confidence. The inorganic salts are found as might be expected—the acids and the bases also.

This experiment is also a proof of the observations by the microscope being correct. The salts observed are proved and tested in a way that is more convincing to a chemist than the mere fact of seeing the undisturbed substances. Still the microscope was a valuable aid and showed the salts clearly to the most inexperienced. Indeed, the drawings were all made by one who knew nothing of chemistry.

Perhaps some persons may think that in washing out seventy-six tubes some impurity may have entered, vitiating the results. The same water was used to each, so as to avoid any accumulation of matter from the water. They were not thoroughly washed out, as this would have caused too much liquid to be used, and the water was not driven on them from a laboratory water bottle, but by pouring. Besides, experience in looking for organic matter has shown me that such noticeable quantities are not easily obtained; the difficulty is to obtain them at all from air.

However, for self-satisfaction, several fresh tubes were opened and treated with permanganate. That in tube marked "Dufton" decolorized 50 grains of the permanganate solution, acting at once; this tube must have contained sulphides, I suppose. It is the best proof of their existence which I obtained, but it is not complete. This is an amount which would not be decolorized by less than 250 cubic inches of common air; and here in the mine we find about 2 cubic inches enough. This specimen is one which had a very large amount of the crystals in it. The air in Z Z 2 acted similarly, to a less extent, and more slowly, which is still a better proof of organic matter, and to me a complete one. Sulphuretted hydrogen acts instantaneously. The slow action of the organic matter is very convincing when one becomes familiar with it. Of course the tubes that had no enclosed mine air were tried, and no such results were obtained from them. This mode of trial promised well, but it was not carried out far enough. For similar indications see table of analyses.

These proofs of organic matter were considered more than sufficient, and it was not deemed wise to destroy many specimens, as I was exceedingly anxious to obtain as much evidence as possible on the two gases, oxygen and carbonic acid. However, a few were broken to make experiments on

The Sense of Smell and Organic Matter.

Some substances are best known by the smell, and in reality only by the smell. Yet the sense of smell is not generally taken by chemists as a guide of the highest class. It is not easy to see why; a part of the reason may be that this sense leads us so accurately to such a great distance that we are apt to presume upon its power, and to judge of substances in amounts really too small even for it. We lead it to extremes more readily than we lead other faculties. In the mines the sense of

smell is not capable of exercising itself well. In order to give it a fair field, the organ must work in pure air, and the substance to be tested must be put to it for a short time only. Pure air must frequently be resorted to. If we act in this way we find that in the mine air there is the smell of tallow, perspiration, and tobacco. These smells were found, not in all specimens, but in some. The tubes containing the air were simply broken and brought near the nostrils. I have some tubes made in a form that will enable us to blow out a small quantity at a time rather than squander it away as hitherto obliged. Still, even by this squandering method, there was enough in two cubic inches of gas to prove it several times to the satisfaction of all the inmates of my laboratory. It required no more proof; it was clear to the observation. There was the close smell, simply like a school-room or church and the excessively disagreable smell such as I have met in the mine itself, of human perspiration.

But the most curious point is, that on several occasions I found the smell to be aromatic, and one gentleman who smelled it said at once that the smell was that of apples. I recognised apples in it also, but still was conscious of something besides, and simply called it aromatic. I was extremely surprised to find in several German books that the apple smell is an ancient attribute of badly ventilated places. The organic substances decompose, and compounds are formed after a time less disagreeable than at first. One tube had a smell of sulphurous ashes, another of burning oils, another of putrefactive matter,—according to a friend, Mr. Ed. Hunt, B.A., to whose capacity of recognising by smell I had often found advantage in appealing.

A bottle full of the air blown into the nostrils would be a very delicate test, and easily made. When I was shut up in the lead chamber, not imagining that the air was bad, those outside, who breathed from the chamber through a tube, found the atmosphere very unpleasing. Such an experiment is as good as the sense of sight can furnish. It is as good even as the sense of touch; nay, more, you may prove by the sense of sight and touch that a certain atmosphere is hurtful, but you will not prevent men from entering it, except after long and laborious processes of reasoning. But give that atmosphere a bad smell, and the argument is finished at once. This sense must not be despised by the intellect. If the intellect should venture to show such pride, it will be soon obliged to submit and confess itself beaten by the instincts. This unexpected incident, caused by the sense of smell, leads us to a new and very simple mode of testing air. We take it from its place, we stand in pure air, and blow the air to be tested into our nostrils.

TESTS FOR CARBONIC ACID AND OF VENTILATION.

Although the only impurity in air is not carbonic acid, as a rule the best chemical test for ventilation of rooms rendered impure by exhalations from the person is the presence and quantity of this gas. It has been seen in a former chapter that baryta and lime-water were tried for a long time in various ways, and after various stages became accurate in the able hands of H. Saussure; simple, and in theory completely accurate, in the hands of Mr. Hadfield; and at last, by the greatest refinement, were used as scientific instruments by Pettenkofer.

It is not pleasant to speak of the history of discoveries, as we so often find that much that is discovered is so for the second time and not for the first; but it is extremely improbable that Pettenkofer knew of Hadfield; and it is very probable that Hadfield, whom I long knew, could not have carried out the refined experiments of Pettenkofer. Besides, the use made of the instrument by the Munich professor is more important than the instrument itself.

It was one of my duties to examine into the subject of tests, in order to find a simple method of testing the value of the air in a mine. It was clear that my test for oxidizable matter was valueless in such places, and Pettenkofer's could not be used comfortably, or at least would not be used. More simplicity was required. There must be little to carry, little to do, and little to think of. Nothing better than baryta or lime suggested itself. The comparison of precipitates of lime, as Dr. Reid recommended, failed long ago because the precipitates changed in physical appearance; but his mode of keeping the extent of the precipitate in the memory did not exactly fail, and was to be considered correct or otherwise, according to the memory, and according to the frequency of the experiment.

Equal quantities of baryta water were poured into two bottles; air was blown into them from the lungs until a decided precipitate formed, equal in both cases. The amount of precipitate was estimated by testing the amount of baryta still in solution. When this was done several times by two persons, the results were almost absolutely the same. Next day, these same two performed the experiment, relying on the memory of the precipitate of the previous day; and the results were that the oxalic acid required was 23·7 cub. cent., 23·2, and 23·2. The difference in one case is 0·0005 gramme of carbonic acid, as every cub. cent. of the oxalic acid solution was equal to 0·001 gramme of carbonic acid. This was repeated times without number and served as a basis for a

New mode of using the Baryta and Lime Water test.—1st, for definite amounts of Carbonic Acid.

If we shake a bottle containing 644 cub. c. or 23 ounces of common air, we obtain a precipitate such as that described above. Now, if air containing twice as much carbonic acid were to be put into the bottle, the precipitate would be twice as great, but we could not ascertain its value by the eye. We cannot even make a probable approach to it. If, however, we used a bottle just half the size of the first, the air being still twice as bad as the first specimen, we should have a precipitate exactly the same, because in fact the amount of carbonic acid would be exactly the same. If the air were four times as bad, we should then use a bottle four times smaller, and obtain a precipitate also exactly the same as the first; and so on down to the smallest dimensions. I go here in the belief that although we cannot approach at all closely when endeavouring to obtain the comparative value of two precipitates, *we can retain in the memory with great exactness the character of one precipitate of a given density.*

If, then, we wish the air of a place to be kept at any one given state of purity, we should require only to have a bottle corresponding to the amount of carbonic acid, and the trial could be made at once. This plan would not suffice for estimating the amount in any given air; it would estimate only one amount;

but it would show clearly when there was more and when less.

When it was found so easy to remember a certain bulk of precipitate, it became important to know what bulk would be the most easily remembered. Must it be a minute quantity, such as a chemist would call a trace, or must it be a quantity such as we should call milky? Neither suffice. The first is too small for certainty; the second has no translucency, or so little that we cannot judge of the amount that lies behind. The quantity will be expressed most clearly by saying that the liquid is turbid and still translucent; but not so that you could read through it. Any one may obtain it exactly by shaking a clean 23-ounce bottle with half an ounce of baryta water in the air, and this may easily and frequently be done to aid the memory.

The size of bottle for various conditions of air was calculated; bottles of various sizes were made, and experiments were then performed in the close chamber. The time taken to produce a certain amount of carbonic acid when a man or candle, or both, were in the chamber, was known; and at these times the appropriate bottle was taken. It was then found that every precipitate was the same, from the 23 ounces of the open air containing 0·04 per cent. of carbonic acid down to the ounce bottle when the candles were fading, and to the half ounce bottle somewhere about the time of extinction of the light. To be more exact, it is a precipitate obtained by throwing down baryta with 0·2515 cubic cent. of carbonic acid, or 0·00224 grammes carbonate of baryta freshly precipitated, in half an ounce of liquid. In table I, all the information actually necessary is given. Column 2 is for fine measurements in cubic centimetres, indicating the amount of air which will contain the carbonic acid necessary for producing the precipitate of baryta when the proportion is according to any number of the first column. Column 3 is the same number, with the addition of 14·16 c. c. or half an ounce, which is the space occupied by the liquid. This then gives the size of the bottle to be used. The fourth column is the size of the bottle to be used, the numbers being avoirdupois ounces; fractions are not in all cases given, and not required so minutely as they are given.

TABLE I.

Half ounce of Baryta Water containing 0·082 grammes baryta.

Air at 0° C., and 760 m.m. Bar.

Carbonic Acid in the Air.	Volume of Air in Cub. Cent.	Size of Bottle in Cub. Cent.	Size of Bottle in Ounces Avoirdupois.
0·03	838 - 853		30·
0·04	629 - 644		23·
0·05	501 - 516		18·
0·06	419 - 434		16·
0·07	359 - 374		13·
0·08	314 - 329		12·
0·09	279 - 294		10·
0·10	251 - 266		9·
0·11	228 - 243		8·55
0·12	209 - 224		7·88
0·13	193 - 208		7·32
0·14	180 - 195		6·86
0·15	167 - 182		6·40
0·16	157 - 172		6·05
0·17	148 - 163		5·74
0·18	139 - 154		5·42*
0·19	132 - 147		5·17
0·20	125 - 140		4·92
0·21	119 - 134		4·71
0·22	114 - 129		4·54
0·23	109 - 124		4·36
0·24	104 - 119		4·19
0·25	100 - 115		4·04
0·26	96 - 111		3·90
0·27	93 - 108		3·80
0·28	90 - 105		3·70
0·29	87 - 102		3·59
0·30	84 - 99		3·48
0·40	63 - 78		2·74
0·50	50 - 65		2·28
0·60	42 - 57		2·00
0·70	36 - 51		1·79
0·80	31 - 46		1·61
0·90	28 - 43		1·51
1·00	25 - 40		1·40
2·00	12 - 27		0·95

* This size of bottle gives no precipitate in air with 0·04.

TABLE II.

Half-ounce of Lime-water containing 0·0195 grammes lime.

Carbonic Acid in the Air.	Volume of Air Cub. Cent.	Size of Bottles to be used. Cub. Cent.	Size of Bottle in Ounces Avoirdupois.
0·03	2,566 - 2,581		91·
0·04	1,925 - 1,940		68·
0·05	1,540 - 1,555		55·
0·06	1,283 - 1,298		46·
0·07	1,100 - 1,115		39·
0·08	963 - 978		34·
0·09	856 - 871		31·
0·10	770 - 785		28·
0·11	700 - 715		25·
0·12	642 - 657		23·
6·13	593 - 608		22·
0·14	550 - 565		20·
0·15	513 - 528		18·59
0·16	481 - 496		17·42
0·17	453 - 468		16·48
0·18	428 - 443		15·60†
0·19	405 - 420		14·78
0·20	385 - 400		14·08
0·21	367 - 382		13·45
0·22	350 - 365		12·85
0·23	335 - 350		12·32
0·24	321 - 336		11·83
0·25	308 - 323		11·37
0·26	296 - 311		10·95
0·27	285 - 300		10·56
0·28	275 - 290		10·21
0·29	266 - 281		9·89
0·30	257 - 272		9·58
0·40	193 - 208		7·32
0·50	154 - 169		5·95
0·60	128 - 143		5·03
0·70	110 - 125		4·40
0·80	96 - 111		3·90
0·90	85 - 100		3·50
1·00	77 - 92		3·22
2·00	38 - 53		1·86

† This size gives no precipitate in air with 0·04 carbonic acid.

In order to use this table, first in its application to ordinary circumstances in life, we may assume that a bottle holding 5·42 ounces will not give any precipitate in the air around houses if we live in a tolerably fair atmosphere. To try the experiment the bottle must be very wide-mouthed, so that we can put into it a rod covered with clean linen, and rub the sides dry and clean; we must then fill it with the air of the place, either by blowing in air with a bellows, or putting a glass or caoutchouc tube into the bottle, and inhaling the air out of the bottle, so that fresh may enter. No way is more exact than this, if care is taken not to breathe into the bottle. This care is not at all difficult to take, and no amount of apparatus can be more accurate than this method, if done intelligently. If the slightest amount of breath goes into the bottle, the process of rubbing clean and drying must be undertaken anew. Still the safest way is to use to use the caoutchouc pump at fig. 3.

When the bottle is filled with the air of the place to be examined, add the half ounce of baryta water, put on the stopper, and shake. If there is no precipitate, the air is not worse than 0·04 per cent. When it is desired to ascertain if it really contains as much as 0·04, then a 23-ounce bottle must be used.

Having ascertained that the air around contains no more than 0·04, it may be decided that a sitting room shall not be allowed to contain more than 0·06, 0·07, or 1 per thousand. If the first, then a bottle of 16 ounces is taken; if the air contains 0·06 the precipitate will be exactly like that in the 23-ounce bottle. If it is allowed to contain 1 per thousand, and on some evenings many houses will contain this, then a bottle of 9 ounces is enough; but if a very much denser precipitate is given it is easily observed.

For an amount of carbonic acid often found in workshops there is required a bottle of 4·04 ounces; we may neglect the decimal, and say 4 ounces.

In some mines the air contains 20 per thousand of the acid gas, and then less than an ounce bottle, such as one may put in the waistcoat pocket, will be a test more striking than the candle. In the worst case of air analysed, the bottle required for testing would only be 0·678 of an ounce; and in the air of the lead chamber, in one of the experiments 0·48,—less than half an ounce.

This plan does not enable us to make an analysis of air. The person to whom the care of the atmosphere would be committed would have only one bottle of the proper size; he would only have one precipitate to look for. The order would be that the air must never be worse than that size of bottle would indicate. The order might be given for any required purity, and by this test an uneducated man could tell when the amount of carbonic acid was too great.

For a private house the rule would be not to have the air above 0·07 at most. A 13-ounce bottle would be used, and in this bottle a precipitate must not be obtained denser than that obtained outside with a 23-ounce bottle. This is all the labour.

There are, of course, various ways of doing the same thing; some people might prefer that in every case a bottle should be used a few sizes less than the one corresponding to the carbonic acid, and that the proper way would be to find no precipitate at all. This can readily be done, but at present I have preferred the method given. The same tables apply to both.

The baryta water need not be of any particular strength; a weak solution is sufficient. The strength used is given; but the precipitate does not differ when the water is stronger. If, however, the water should be extremely weak, several times weaker than the above, there is a difference. The carbonate of baryta dissolves in the water to a very perceptible extent. The first precipitate made in baryta water by oxalic acid also, although very white at the surface where there is much acid and before mixing, disappears on shaking to a perfectly transparent and brilliant liquid. I speak, however, of very weak solutions; a solution five times weaker than the one given as an example, would be incorrect on account of its weakness.

Hitherto baryta has been spoken of, and it may well be asked why lime should not be preferred. The same precipitate to all appearance may be got with lime water. Table II is suited for lime water, and constructed on exactly the same principles as the former. It will be seen that lime is so soluble or so transparent that it requires three times more space or air from which to collect its equivalent of carbonic acid. This is, of course, an objection. Still, lime is to be had everywhere, and lime water has not the poisonous properties ascribed to baryta water.

It is worth observing that the proportion of lime and baryta are nearly as their atomic weights. Perhaps more minute observation would make it quite the same. It was supposed that lead might give a similar proportion, but the texture of the precipitate was entirely different, the particles much larger. This prevented it being used in a similar way, and obstructed the theory as well as the practice so far.

One of the main advantages of this process is that it requires no weighing and no measuring, and we may almost say no thinking; this idea is, perhaps, more fully carried out with the lime than with the baryta water. Lime water may be prepared of the same constant strength so closely that we may neglect the difference; with baryta we are apt to make the solution unnecessarily strong and so waste it, but the experiment will still be the same. Lime water is common but baryta water could also be prepared cheap if there were a demand for it.

The use of this method would enable us to distinguish air in this manner; we could say, this is 6-ounce air, that is 4-ounce air, that is 2-ounce air; and the miners would understand it, and prove it as easily as the scientific men, whilst vials so often seen in cottages might be converted into scientific instruments for sanitary purposes.

New mode of using the Baryta and Lime Water test.—2nd. For all amounts of carbonic acid.

If it be desired to ascertain the amount of carbonic acid in air which may be of any quality, and which does come under the class mentioned as suited for tables, I propose the following when a more elaborate and more accurate apparatus is wanting.

An elastic india-rubber ball may be made to contain any given amount; let us suppose two ounces. When we press it in the hand we can drive out the whole air, or at least nearly the whole; we let it go, and it fills again. If a tube be fitted to it we can drive the

air which has gone into the ball through a solution of baryta or lime water, and obtain the precipitate above spoken of. If the air be pure it will require so many more balls to be emptied; if impure, a smaller number.

If a ball with a simple tube is used for blowing into a liquid, that liquid is drawn up as soon as the ball expands, and many fillings cannot be made without inconvenience. If, however, a valve be placed between the liquid and the ball, there can be no return. This is the case in the tube A, figure 8; connected with the ball, there is a valve such as is used in air-pumps, preventing all entrance of air, but allowing it to pass out. Then again on tube B there is a valve of the same kind, preventing all egress of air, but allowing it to enter. The little instrument is therefore in reality an air-pump and a condenser. The air passes in at B, and goes out at A.

It is well to use always the same amount of solution, which may be, as in the previous method, half an ounce. If this liquid is put into an open vessel there is an escape of the carbonic acid, which ought to be retained, and also a collection of some from the atmosphere, which ought not to be absorbed. It is better, therefore, to use a bottle as at C, with a small tube of escape. The bottle with the liquid in it holds the same amount of air as the ball. It must be filled with the air of the place; this is done by one or two pressures of the pump. The liquid and cork are put in their places, and the whole shaken up. That counts for one ball. The ball being pressed and let go so as to be filled with the air of the place, is then used as seen in the fig., and pressed again, the air passing through the liquid into the bottle. The former air in the bottle is driven out, and the new air takes its place. This air gives up to the liquid the most of its acid, but as a little remains the bottle is well shaken, so that the liquid may absorb all the acid. This act is performed every time whenever a ball is emptied. The balls are counted, of course, and the following table will show the value of each.

No. of Strokes of the Finger Pump, or No. of Ballfulls of Air.	Per cent. of Carbonic Acid indicated in the Air.	Actual Amount of Carbonic Acid in the Air of the Ball.
		Cub. cent.
1	0·444	0·2515
2	0·222	0·1257
3	0·148	0·0838
4	0·111	0·0629
5	0·088	0·0503
6	0·074	0·0419
7	0·063	0·0359
8	0·055	0·0314
9	0·049	0·0279
10	0·044	0·0251
11	0·040	0·0229
12	0·037	0·0209
13	0·034	0·0193
14	0·032	0·0180
15	0·029	0·0167

We might call the apparatus a finger pump, if no better name is suggested.

In using this ball it is well to observe the method by which the points of the fingers press into the centre. If this is followed the whole of the air may practically be driven out. The ball is thus divided into two parts: one part is pressed between the palm of the hand and the fingers; the other is pressed between the surface of the nails and first joint of the thumb.

3rd. For all amounts of carbonic acid, the bulk of air fixed, the lime water varying.

There are many ways of ascertaining the amount of carbonic acid in the air with great precision. Any man may make any one of them perfect, if he will only continue to use it until familiarity ensues. Lime-water may be used according to table III.

Table III.

Neutralization with Lime-water.

12° C., and Bar 780 m. m.

Carbonic Acid in the Air.	Volume of Air in Cubic Centimeters.	Size of Bottles in Cub. Cent.	Size of Bottles in Ounces.
0·03	1,778 -	1,793	63·*
0·04	1,334 -	1,349	48·
0·05	1,067 -	1,082	38·
0·06	889 -	904	32·
0·07	762 -	777	27·
0·08	667 -	682	24·
0·09	593 -	608	21·
0·10	533 -	548	19·
0·11	485 -	500	18·
0·12	444 -	459	16·
0·13	410 -	425	15·
0·14	381 -	396	14·
0·15	356 -	371	13·
0·16	333 -	348	12·25
0·17	313 -	328	11·54
0·18	296 -	311	10·95
0·19	281 -	296	10·42
0·20	266 -	281	9·89
0·21	254 -	269	9·47
0·22	242 -	257	9·06
0·23	232 -	247	8·70
0·24	222 -	237	8·34
0·25	213 -	228	8·02
0·26	205 -	220	7·74
0·27	198 -	213	7·50
0·28	190 -	205	7·21
0·29	184 -	199	7·00
0·30	178 -	193	6·79
0·40	133 -	148	5·21
0·50	106 -	121	4·22
0.60	88 -	103	3·62
0·70	76· -	91	3·20
0·80	66 -	81	2·85
0·90	59 -	74	2·60
1·00	53 -	68	2·39
2·00	26 -	41	1·44

* Lime-water used is the usual lime-water. It generally contains 0·0195 grammes to half an ounce; this is diluted with 9 volumes of pure distilled and fresh boiled water.

Here it is proposed that a bottle, such as that at fig. 1, should have attached to it a flexible ball filled with a known quantity of lime-water. A little is squeezed into the bottle, and shaken about until it becomes neutral; again a little more; and when there is no more carbonic acid to render more lime neutral, the operation ceases. But how are we to know when the liquid is neutral? Of the many substances tried for this, perhaps turmeric was the best;—a little bit of paper floating on the liquid turmeric itself. One of my assistants, Mr. Clement Higgins, tried the turmeric in this way, and became very familiar with its use. The operation, however, was slow, and not satisfactory to me, although it can be made excellent with patience and attention.

The solution used by this method was lime-water ten times diluted. The manufacture of lime-water is a very good method of obtaining a pretty exact strength of a liquid without weighing. The lime-water, which has plenty of lime at the bottom, remains much the same. There is a little change occasionally; it would be well to determine the exact cause, and we might perhaps be able to start from the point of saturation, even for the most exact researches. The following results were obtained. Four bottles of lime-water took of oxalic acid—

	Cub. cent. solution.			
	1st.	2nd.	3rd.	4th.
April 7th, 12° C -	19·5	19·6	19·5	19·6
After two days 6° C	19·4	19·3	19·3	19·4
„ „ 8·4° C	20·0	19·8	20·1	19·9
„ „ 15° C	19·9	20·05	20·1	20·1
„ „ 13° C	19·9	19·9	19·9	19·9
	19·9	19·9	19·9	19·9

This shows that for the precipitate on the plan of tables I. and II., lime-water is more than necessarily constant, and even enough for Table III., and may be used in some cases to save the purchase of a balance.

Some years ago I proposed rosolic acid as an agent for ascertaining neutrality. It shows the neutral point with extreme sharpness when oxalic or any liquid acid is used, and we can tell to a small drop when to cease pouring. If all caustic solutions were coloured with it, it would help to point them out, as well as serve instead of litmus or turmeric. I did not obtain such successful experiments as I could have wished when trying it with carbonic acid lately. The last traces of colour are difficult to remove; I hope to bring it on further some day. It is curious that lime or baryta water take up carbonic acid much less readily when rosolic acid is present. It affects the latter portion of the experiment chiefly when the solutions become weak. It is as if the resinous consistence of the acid repelled the gas; when a liquid is used, such as oxalic acid in solution, the rapidity of action is very great, the same resinous quality causing the rosolic acid to shrink into its shapeless and colourless state with great suddenness.

It may, however, be remarked that weak solutions of baryta and lime take up carbonic acid very slowly of themselves, although rosolic acid renders the absorption still slower.

Manganates and Ferrates as tests for Carbonic Acid.

In a former paper I mentioned that the carbonic acid of the air was capable of being estimated by observing its action on manganates. The green manganate was prepared in the usual way, or by adding caustic alkali to the so-called permanganates, which, however, from this action appear rather as bi-manganates. The amount of acid required to convert the green to red may be found readily by a solution of test acid, and the equivalent for carbonic acid calculated. The plan already described, with a ball from which the manganate is pressed, suits the test very well when the ball contains nothing which affects the salt. If the ball is objected to, we may adopt another method. This plan consists simply of a graduated tube like a pipette fitted into the cork of the bottle; a small quantity is allowed to flow down when required, and when the liquid begins to become purple, there being no more carbonic acid to render it red, the experiment is finished; the amount used is read on the graduated tube.

At Mr. Hutchinson's alkali works I obtained from Mr. Powell a salt of ferric acid accidentally formed. It was analysed by Dr. Roscoe. This salt was expected to be still more sensitive to organic matter than chameleon. It was sensitive, certainly, but it decomposed rather rapidly in light. It can, however, be used both for carbonic acid and oxidizable matter, in the same manner as the manganate. The action on light is, however, not quite sufficient to make the salt a good photometer. The objection to it for carburic acid is that it does not keep well. The test requires a little more attention than I have given it; it promises in some cases to be more valuable than the manganates.

The aspirator may be used for drawing the air through any of these solutions, and either the ball apparatus or two small bottles. Even one bottle may be used with great safety, if it is covered from the air, and the speed not very great. To ascertain exactly the difference between the results from one and two bottles, the following experiments were made:—

Duration of Experiment.	Amount of Air.	Solution of Baryta in each Bottle.	Not absorbed in the first of the two Bottles.	10 cub. cent. of the Solution required of Ox. Acid before the Experiment.
	c. c.	c. c.	c. c.	c. c.
1 hour -	11,563	20	0.3	7·8
1 „ -	„	„	0·9	7·8
1 „ -	—	—	0·9	7·8
1 „ -	—	—	0·5	7·4
1¼ „ -	—	—	0·9	7·4
1¾ „ -	—	—	0·4	
			0·3	7·4
2 hours -	12,336	20	0·3	7·7
—	—	—	0·2	—
—	—	—	0·3	—
—	—	—	0·2	10·5
	With Rosolic Acid and Baryta.			
1½ „ -	11,565	20	1·2	3·9
2 „ -	13,107	—	1·5	3·8
2 „ -	13,107	—	0·8	3·8

PALL MALL

To face p. 241.

Fig. 4.

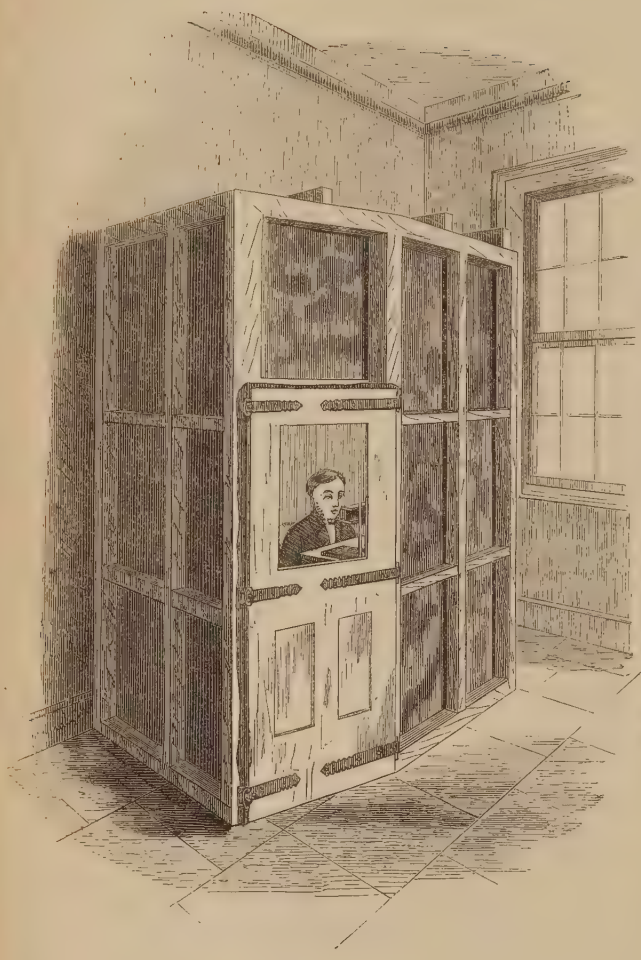


Fig. 5.

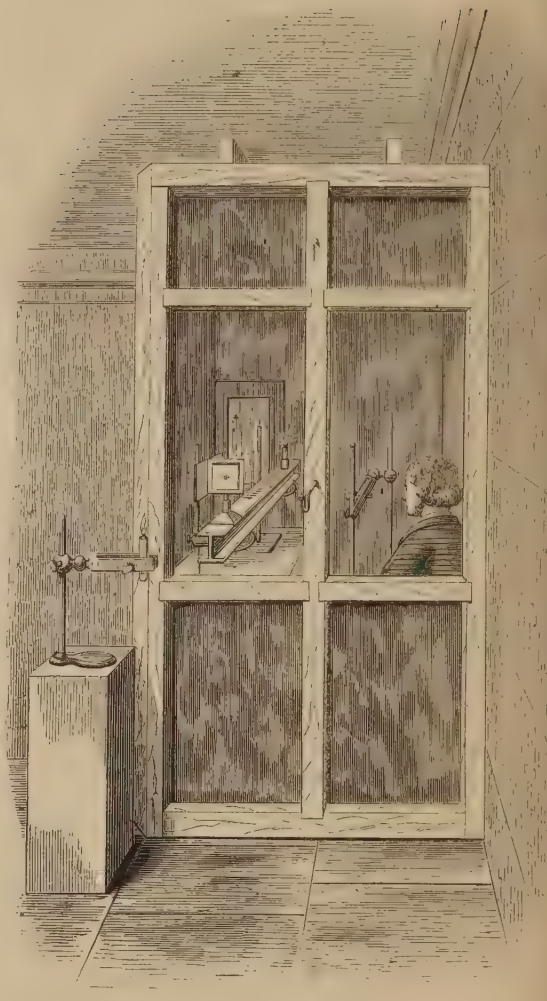
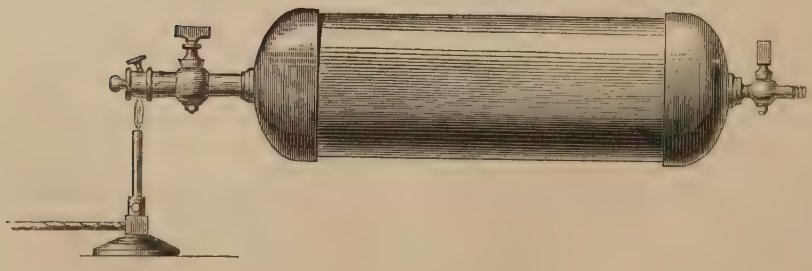


Fig. 9.



It will be seen from this that very exact experiments may be made with the aspirator and one bottle or bulb, and by using Mr. Dancer's apparatus the exact measurement of the air may be attained. This would be like a return to Dr. Reid's carbonometer, made somewhat more convenient and elegant, and made exactly quantitative.

There may be varieties of tastes, but I expect the first and second methods to be very much used; they are very simple. It is quite possible to add many other methods and modifications, but I know of none so simple as these.

PART II.

AIR OF CONFINED PLACES.

The Lead Chamber.

It was found necessary to inquire into the state of the air after it had been rendered impure by candles alone, as well as by breathing alone, and by gunpowder. Besides the bulky impurities, there were the small amounts of organic substances from tallow, from tobacco, from the human skin and from putrefaction; all these mingled in such a manner as to defy separation, but nevertheless were present, causing unmistakeable unpleasantness, and in some instances a positive feeling of disgust, even when a small portion only of a cubic inch of the air was inhaled.

In order to obtain some idea of the effect of the principal agents separately, it was necessary to make the experiments not in the mine but in the laboratory. When examined before the Commission I mentioned my intention of making experiments in a close chamber, of which I expected to have received the use for a short time, but when it was considered that experiments of the kind alluded to can never be performed by a stroke, that they are in reality never really finished, but at best are only made less and less unsatisfactory, according to the frequency of repetition, it seemed essential that a close room should be procured to be at hand for ready use. Accordingly a chamber was made of lead, six feet long, nearly four feet unequally broad, and eight high; the cubic contents were 170 feet—it is unnecessary to describe the irregularities of the shape partly caused by the door, the windows, and the position. The whole lead of this chamber was made into one piece by having the edges melted together by the hydrogen blowpipe, as is now done in making chambers for sulphuric acid. As it was important that no one should be left in the place without having the power of escape, it was determined that there should be sufficiently large windows which in any emergency could be broken through; were it otherwise, the mere idea of being confined and at the mercy of the treacherous memory of human beings would be enough to cause much discomfort and render the experiments void. The half of one end was made of glass, chiefly looking to the window, sufficiently large, of the apartment in which this chamber was placed. This apartment had been a scullery, and had a strong floor sufficient to bear the weight of the lead, which was considerable. The whole room was light, so that experiments could be made in it readily, and in addition to the windows at the end, another large pane of glass was put into the door, so that at each end any one could be seen, and his wants instantly attended to.

The door was of lead except where of glass, and was hung on heavy pivots; strong bars crossed it projecting over the sides. In these projections there were holes through which iron pins on the lintels passed when the door was shut. These pins had screws upon them, and large nuts were used to bolt them down. The door by itself did not fit very closely; it was made so in order to leave room for a tube of vulcanized caoutchouc, which surrounded the lintels; against this the door was pressed by the force of the screws, of which there were three. This arrangement suited exceeding well from beginning to end, and no change of the plan was necessary.

It was not needful that the chamber should be able to sustain a great pressure of air. All the experiments were to be made in a short time, and if minute crevices did exist through which a small amount of air might be pressed, it would not be of consequence, as that process would require much time to affect the air of the whole chamber. When the chamber air was analysed on Saturday, and again on Monday, the difference was not perceived. As there was nearly two per cent. of carbonic acid this will be considered proof of abundant accuracy in the workmanship. In some cases a specimen of air was drawn out for analysis. In order to obtain this from above and below holes were bored in the pillar between the two panes at the end; these holes went through the lead also, and generally contained glass tubes, which were stopped by having caoutchouc tubes fixed on them, which tubes again were closed by glass rods. These holes were the weak points of the chamber with respect to air-tightness; when powder was fired a slight whistling sound was heard which showed that the joinings would not stand pressure. It was not easy to keep the joining of the lead and wood complete, as the tubes on being moved caused a disturbance of the luting.

In this room was a small table and a chair, and when these and one person were present there were 170 cubic feet of air. Of course this cannot be given to a few inches, and even if it were a foot wrong, which is far from the case, the result would not change the analyses to any important extent. For example, when there are two per cent. of carbonic acid with 170 feet, there are altogether 3·4 cubic feet of carbonic acid, and if there are 171 feet there are 3·42 of carbonic acid; ½ a per cent. will be 0·850 in one case and 0·855 in the other. Sometimes there was a person in the chamber, sometimes not; this would make a difference of above two cubic feet; even one cubic foot would require to be accounted for if total quantities were measured, but the experiments as conducted are little liable to be disturbed by this cause. This would not be the case with all experiments.

Bad Air and the Sensations.

Here I am describing feelings, and to some persons they may simply be fancies, but I shall describe them nevertheless, as I believe man has learnt nearly all he knows of ventilation by attention to these feelings, whilst chemical analysis is attempting to struggle after him, and is continually finding itself behind in the race. The feelings are uncertain, it is said. This is not quite correct; they are the most certain facts; but they register so many phenomena at once that they become uncertain guides when one only is sought after. For example, we

may imagine that they tell of increased carbonic acid, whereas they may simply be telling us of diminished digestion and vigour. As to personal qualifications for such experiments, I may merely say that I am not peculiarly sensitive to bad air; many of my friends are more so; but having my mind more directed to the subject I obtain a certain advantage. Perhaps my love of fresh air is beyond the average, as I have an actual pleasure in east wind. If these two conditions are contradictory it certainly is not my fault; but they are not so; experiments in the lead chamber showed that even when nothing unpleasant was perceived, the pleasure of coming out to the air of the laboratory was like that which we have on the sea shore or the mountains, so that the love of pure air is not in exact proportion to our incapacity to endure bad air. Again, I may say that all my fancies lead me to imagine I can bear anything that others can in the way of air, and although this may not be true, it entirely kept away all imaginings of evil during these experiments, and led me to points where actual and long continued discomfort was the result. I think it important to mention this entire freedom from any illness or tendency to illness caused by the imagination.

The first trial of the chamber was made by simply sitting down for an hour and forty minutes. This produces about one per cent. of carbonic acid. The day was clear and the air pleasant; the temperature 45° F. No difference was, to a certainty, perceptible for 25 minutes. Then when the air was drawn from the top by means of an umbrella, it it seemed like a soft wind, and had to some extent a pleasant feeling, but was entirely devoid of a faculty of cheering.

A dull cheerless air is well known. Here we had it produced at once. The air was very moist, and deposited water when drawn out through a tube on taking a specimen.

After an hour the unpleasant smell of organic matter, such as is so well known in a crowded school, was perceptible on stepping rapidly from one end to the other or on moving the air rapidly. Here we learn that when a current of air blows on us, the chemical actions accumulate, and although if continued for one instant only they may be imperceptible, if repeated for many they culminate in a sensation. A sensation, such as smell or taste, is evidently the result of a chemical action. This may be infinitesimally small; in that case the mind does not take cognizance of it; but if many of these small actions occur, either all at once, or so rapidly one after another that they cannot be separated, the mind observes them, and a sensation is the result. How many atoms or molecules must be moved to cause a sensation it is not possible for us to tell, but we can very readily tell that for some persons one, two, or twenty times more must be moved than for others. These chemical actions are constantly going on in the body. They may take ten years to gather impetus to make their movements strong enough to produce sensations, and disease may be generated unknown to the individual, although it may kill him in the eleventh year. But if the chemical action began at the first so violently as to produce decided sensations, he might be able to avoid it at once before it produced any abiding impression. For this reason, a bad climate is more dangerous than the fumes of vitriol, when we are at all able to move out of the way. Concerning the climate, we reason from very distant premises frequently, as no smell is perceived, but the vitriol explains its character at once, and tells its intentions.

Exactly in the same category as the bad climate are all places in which the air is inferior, without containing any peculiarity which the senses can detect. Now although the mine air is all or nearly all such that the senses would perceive it at once, if we were introduced into it at once, we enter so gradually that we are scarcely conscious of the increasing deterioration. As it takes a long time to enter, and a long time to come out, we are incapable of comparing the air of mines by the use of our senses in the same way that we can compare the air of any place above ground, out of which we can come suddenly. This being the case we are obliged to pay more attention to those phenomena that are not perceptible to the senses (except in their results after years), and also to chemical experiment, which two methods after all must turn out our most certain guides.

It was very decidedly perceived after remaining an hour, that the air was soft when made to move in this chamber. This arose from the moisture, and shows us at least that a soft air may be a very impure one. Soft air, air with a good deal of vapour, is very soothing; it calms the mind and the body and the burning of a candle or a fire. In this state it cannot be very cold, as the warmth is essential to the existence of the vapour. This air has a tendency to leave the skin and its action unchanged; it causes little evaporation, and perhaps an influence is due to this that the amount of oxygen introduced into the lungs is diminished, whilst no injurious ingredient is added. I think I hear the question, Will not the air in the lungs decide for itself at once how much vapour there shall be, as there is such an abundant moist surface? The entrance to the lungs, that is, the nostrils and the mouth, feel the moisture with great clearness, and when the air is dry they are dried up. But the lungs seem to feel it also, and it seems a very common thing to know the difference in the respiration. Dry air stimulates the skin, because it removes moisture, and the skin must set to work to renew it. Dry air, therefore, would in this respect be in its first action cheering, and in its last irritating. Moist air would from this point of view be calming in its action, and often at once calming to languor, probably preservative of the vital powers, which are not frittered away by constant irritations. I speak only as a chemist.

After staying in the chamber for 100 minutes, the air had an unpleasant flavour or smell, and I came out; three persons entered at once and pronounced it very bad; I entered after a minute and found it extremely bad. It seemed to me, however, that we are frequently exposed to air equally bad, although I have not found any in daily life so much deprived of its oxygen as this must have been, reduced, that is, to 20 per cent.

I was extremely glad of the escape from this impure air; this gladness not arising from any previous discomfort. I was not uncomfortable. I chose that time of coming out, as it was the moment when the organic matter was most distinctly perceptible; still to perceive it when quiet required attention. The pleasure on coming out was one wholly unexpected; although I now recognise it as exactly that which one has on

coming home on a fine evening after leaving a room which has been crowded—it was the re-assertion of the rights of oxidation ; the blood was evidently in active change desirous to take up a position that was lost ; else why was this feeling of unusual delight in the mere act of breathing, which feeling continued for four hours ? Dinner seems to have first removed it. From the long time required to bring the functions of breathing to their former state, we may of course argue that they had been much disturbed. If to this it is replied, that after all it was merely the memory of the chamber still remaining, it may be said that if the mind is fixed upon the subject, such a memory may exist, without, as far as we know, any equal corresponding prior affection of the body ; but if the condition be unexpected and unthought of, the result seems to indicate distinct chemical or physiological action. In about four hours the lungs recovered their tone. By the tone is meant their unconscious working. Food seemed to be more than usually required, and was followed with unusual rapidity by the feeling of refreshment. Now as there was no unusual bodily exertion, the demand could not arise from an unusual wear of the system, and indeed the peculiar feeling was more that of need of support than that hunger which demands food. We cannot suppose that much wear and tear was going on. We seem left to suppose only that the decompositions which are needful to repair the body had not been made, although material was present, and that it took four hours and dinner to make up lost time. Although oxygen does not directly repair, it takes the initiative in any union of labour for the purpose.

The second stay in the chamber, the day after the above, was continued for 160 minutes. At two hours and twenty minutes, it was observed that very long inspirations became frequent and more agreeable than usual. The air about that time gave a very decided feeling of closeness. Standing on a chair it was found less agreeable than below.

Immediately on opening the door two or three persons entered, and again perceived how uncomfortable it was. The amount of oxygen was found to be 19·61.

After the experiment (tables 3 and 4), we entered with candles and a spirit lamp. The lights were soon extinguished, and it was found impossible to rekindle them with matches : wooden matches were used, they refused to ignite. Still we breathed without difficulty at first, but a gradual feeling of discomfort appeared of a kind which is not easily described; it was restlessness and anxiety without pain, whilst the breathing increased in rapidity.

Afterwards gas was lighted and it burned with brilliancy. On entering after the gas had gone out candles were extinguished as rapidly and completely as if they had been thrust into water; nevertheless we still breathed, and although every one was anxious to go out, no very correct description of the feelings could be given. I stood on a chair and then a feeling of incipient fainting began, but the senses were not annoyed by anything beyond a feeling of closeness, by no means so unpleasant as a school room or close end. This is a very important fact, as it points again to the organic matter, of which there was little here, and of which there is much in the school room. The lungs seemed to refuse expansion, without the senses being able to indicate a reason. The actual amount of oxygen when the gas went out is not given; but a specimen taken from the room after the door had been opened long enough to allow three persons to enter contained 17·45 per cent.

All these experiments tend to diminish our faith in the senses as guides, under certain conditions. The senses are quite unable to measure degrees of closeness and raise as much alarm at a state which may be represented by 0·1 per cent. of carbonic acid, as they sometimes do when there is nearly 4 per cent. with a diminishing pulse and a quickening respiration, or incipient gasping for breath.

After a while the air really becomes by no means proportionately worse to the feelings, but the approach of fainting in the case mentioned showed that the lack of oxygen or presence of carbonic acid was telling on the moving vital act.

It is proved that badly ventilated rooms containing less than 20·7 per cent. of oxygen are unwholesome, The present inquiry is believed to establish this point without affirming that the oxygen is much more than the index ; and the late sanitary movements have really been operating on such a condition of things, however unexpressed. I say this because such an amount of oxygen represents what we call a badly ventilated room. Now there is a faintness produced when the oxygen is at 17·4, but is there a corresponding injury when the numbers range between these ? and if a man lives where a candle will not, is it not a proof that he is well ?

It is not possible to obtain exact results with the human being at all these varying stages without going into the region of statistics, and the argument may be considered by some as dependent on that wider range of facts ; but for most persons it will appear clear that if the loss of 0·2 of oxygen and its replacement by 0·2 of carbonic acid, be found to make the air disagreeable and injurious to the extent which is attributed by overwhelming evidence to bad ventilation, double the loss of oxygen and double the carbonic acid will produce still worse consequences. The senses begin the argument, but it takes months or years to show the bad effects of that air which they dislike. At the other extremity the vital powers give way, and between these two we must have a gradation of effect.

We cannot and dare not experiment on human beings beyond near limits ; but one experiment made with two per cent. of carbonic acid without intention shows that the amount which persons can bear differs with the strength. A young lady was anxious to be in the chamber when the candles went out. She was extremely fond of pure air, but when she entered was not much struck by the impurity of that in the chamber, although the candles were threatening to go out, so that there could not be quite 19 per cent. of oxygen or 2·1 of carbonic acid. No one had been breathing in it, so that the organic matter from the person was absent. She stood five minutes perfectly well and making light of the difficulty, but suddenly became white and could not come out without help. She was remarkably healthy, never was ill, and was troubled with no fear of the air in which she stood. Several of the specimens of air from the mines had almost the same amount of oxygen as the air on this occasion and some had less. This is one of the gradations between 21 and 17·4 per cent., the two extremes in which breathing was tried.

On another occasion a still greater amount of carbonic acid was present in the chamber, but it

was not accompanied with a corresponding loss of oxygen, as the gas was driven in upon pure air. The oxygen, therefore, was 20·19 with 3·84 of carbonic acid. On this occasion Dr. Reissig and Mr. Higgins got headaches instantaneously on entering and were unable to stay above seven or eight minutes. I stayed about twenty minutes, still felt very anxious to get out, as all my movements were made with great haste, and both mind and body betrayed symptoms of feverish activity. There was also a rush of blood to the head, the face was flushed, and the lungs acted more rapidly than usual, the inspirations being 26, whilst the average of waking hours is as nearly as possible 20. Similar feelings, but not to quite so great an extent, were observed when the experiment on table 7 was made, carbonic acid being then also poured into the chamber. On that occasion only do I think that the sensations could in any way be heightened by the imagination. At that time I had not the slightest experience of carbonic acid, and it was pouring rapidly into the room, requiring some time to mix it. I had no certainty that the results might not be very bad, and the interest might have been mixed with a little anxiety not to go too far with the experiment. In the case more fully described above there was not that feeling; I knew the circumstances, and was satisfied that the condition of body and mind was caused entirely by physical agents, not by the imagination. There was a burning haste to live, as if life were afraid of being put out.

January 26th, 1864.

EXPERIMENTS IN THE LEAD CHAMBER.

No. 1 TABLE

Experiment to ascertain the General Effects on the Feelings and on a Candle.

Time.	Temp. of Floor. Fahr.	Temp. of Table level. C.	Temp. of Table level. Fahr.	Temp. of Top. Fahr.
h. m.				
12 45	52·5	10·3	50·54	52·5
After 10	53·25	12·2	53·96	54·5
„ 20	53·8	12·4	54·8	55·0
„ 30	54·7	13·2	55·7	55·25
„ 40	54·9	13·4	56·1	55·7
„ 50	55·2	13·78	56·8	55·9
„ 60	55·5	13·9	57·05	55·25
	Carbonic acid - 0·38			
	Oxygen - - 20·54			
„ 70	55·6	14·0	57·2	56·4
„ 80	55·7	14·05	57·29	56·49
„ 90	55·75	14·1	57·47	56·6
„ 100	56·0	14·0	57·2	56·6
„ 110	55·8	14·0	57·2	56·6
„ 130	56·2	14·2	57·56	56·8
„ 140	56·3	14·2	57·56	57·0
	Carbonic acid - 1·130			
	Oxygen - - 19·73			
	It seemed pleasant here to take long breaths.			
„ 150	56·6	14·25	57·65	57·2
	Begins to feel decidedly close.			
„ 155	56·5	14·0	57·2	57·0
	Carbonic acid - 1·26			
	Oxygen - - 19·61			

January 27th, 1864.

No. 2 TABLE.

Four Miners' Candles in the Lead Chamber. No person inside.

Time.	Below. Temp. Cent.	Below. Temp. Fahr.	At Table. Temp. Cent.	At Table. Temp. Fahr.	Above. Temp. Cent.	Above. Temp. Fahr.
h. m.						
1 50	—	53·5	10·4	—	—	51·7
—	Outside 53°		—	—	—	—
After 10	12°	—	—	59°	—	59·5
„ 20	12·7	—	—	63·5	—	—
„ 30	13·5	—	—	65·25	—	—
	Windows dim with moisture; difficult to read the thermometer.					
„ 40	13·5	—	—	65°	—	—
„ 45	14·3	—	—	65°	—	64°
Outside	—	53°	—	—	—	—
	Carbonic acid 1·78 / Oxygen - - 19·14 — Top.					
	Carbonic acid 1·81 / Oxygen - - 19·02 — Middle.					
	Carbonic acid 1·38 / Oxygen - - 19·31 — Middle.					
	Carbonic acid 2·28 / Oxygen - - 18·80 — When the candles went out, which was at 7 o'clock.					

January 29th, 1864.

No. 3 TABLE.

Eight Candles, one Paraffine Lamp and one Spirit Lamp.

Experiments to ascertain the differences of Candles and Lamps, and also the effect of difference of position of the Lights.

Time.	Bottom, Temp. Fahr.	Middle, Temp. Fahr.	Top, Temp. Fahr.
	Outside 50°	— —	—
h. m.			
12 30	Dry 53°	— 60·25	Dry 76°
	Wet 52°	— —	Wet 51°
After 10	Dry 56°	— —	Dry 70°
	Wet 56°	— 66°	Wet 66·5
	Appeared already to burn worse.		
„ 15	Dry 59°	— 68°	Dry 73°
	Wet 57°	— —	Wet 69°
	Carbonic acid 1·13 / Oxygen - - 19·87 — Windows dim. Three candles, inclined, burnt badly.		
„ 50	The candle nearest the roof went out.		
	Carbonic acid 2·27 / Oxygen - - 18·50		
„ 58	Nearly at same time a candle at the window as high as one on the table; one on the floor near the side; one on the corner of the table, near the chair and window candles; one on the opposite corner went out.		
„ 75	Another on the table „		
„ 90	One on the chair „		
„ 93	One on the floor „		
„ 98	Paraffine lamp „		
	Carbonic acid 2·32 / Oxygen - - 18·48		
„ 150	The spirit lamp „		
	Carbonic acid 2·45 / Oxygen - - 18·40		

ACTION OF THE PULSE.

Amount of Carbonic Acid given out by a Man and a Candle.

TABLE A.

One Person and one Paraffine Light in the Lead Chamber.

Time in Minutes.	Temperature. Cent.	Carbonic acid.
min.		
After 10	—	0·20
„ 40	—	0·63
„ 60	—	0·95
„ 90	—	1·31
„ 120	—	1·61
„ 150	—	1·76
„ 180	—	1·88
30th March, 1864.		
„ 15	8·0	0·41
„ 60	1·2	0·94
„ 90	9·8	1·32
„ 120	10·2	1·62
„ 150	11·0	1·77
„ 180	11·0	1·89

TABLE B.

One Person in the Close Chamber.

	Carbonic Acid. I.	Carbonic Acid II.
After 20 minutes	0·18%	0·19%
„ 40 „	0·32	0·36
„ 1 hour	0·49	0·49
„ 80 minutes	0·62	0·64
„ 100 „	0·74	0·75
„ 2 hours	0·88	0·89
„ 140 minutes	1·06	1·03
„ 160 „	1·20	1·22
„ 3 hours	1·25	1·34
„ 200 minutes	1·52	1·48
„ 220 „	1·54	1·60
„ 4 hours	—	1·81
„ 260	—	1·98
„ 280	—	2·10
„ 5 hours	—	2·25

I have not had time to attend to the full explanation of each experiment, and some require a continuation of the inquiry, but this last must not be passed over without special notice. The amount breathed every hour is the same—no matter whether there be 0·04 or 2 per cent. of carbonic acid in the air, and no matter, although there be 20·94 or only 18·8 of oxygen. This is strongly corroborative of the views taken by Liebig, but other circumstances tend on the other hand to show that this state of things is kept up at the sacrifice of comfort to other vital functions. In this atmosphere the breathing was changed from 16 inspirations per minute to 22, the pulse fell from 76 to 55, whilst it was so weak that it was difficult to find. My assistant, was in the chamber this time; I requested him to attend to his pulse and breathing, as on another occasion when there was still more carbonic acid in the air, namely, 3·9 per cent., my breathing rose up to 26 inspirations, and my pulse became so weak as to cause alarm. This has happened so regularly that it must be put down as the result of poisoning with carbonic acid. On one occasion there was a comparatively large amount of oxygen in the room, viz., 20·1. The carbonic acid had been driven in upon fresh air, and no oxygen removed. Even here the pulse was weak, although the breathing was not very difficult, and the candles burnt moderately well.

The conclusion is, that in the air containing an increased amount of carbonic acid, this gas alone, even without the other hurtful ingredients, begins to poison, and the men are really gasping for breath without knowing it. All the other hurtful conditions contribute their powerful aid.

As I came on this result at the end of the intended inquiry, it is not easy to do it justice. We learn much from it. We learn that the blood can take its oxygen out of very impure mixtures, but we learn also that some functions are meantime suffering greatly. It is, to my view, a most important thing to show that with an amount of oxygen not less than is found in the air of some mines, and an amount of carbonic acid actually less, such extraordinary changes should result in the functions of a healthy man. We want no other experiment than this to prove great evil arising from the impure air in mines.

In order to obtain similar results in a shorter time, five persons entered the lead chamber, expecting to have in one hour the same results that were obtained by one person in five hours. The figures are here given; it is seen that they are not exactly the same as previously. Time causes us to yield, although we may struggle against the evil influences for an hour or so. The effects are not exactly such as were expected. The pulse begins to be irregular very soon, and certainly when the air contains 0·4 per cent. of carbonic acid; in three cases, 0·2. It rises and falls, but at last begins to fall. In all cases, however, it becomes very weak, as in the first experiment. Thére are many individual peculiarities; here the youngest had the slowest pulse.

With the younger it rose rapidly at first, and seems to indicate the more rapid struggle for life; it was a steady determination with the more advanced not to be changed by external circumstances, although these gradually caused a change at last.

These figures will probably induce many others to continue the inquiry.

May not the lowness of the pulse show us a mode of lowering it during a fever? And here come questions. The organic matter increases; would that increase the fever? If so, must the experiment be tried with pure carbonic acid? And how much was due to the carbonic acid, and how much to organic matter? All these are interesting enquiries. Meantime one question is so far answered that we see the effects due to the want of ventilation.

TABLE C.

Beats of the Pulse. Five Persons in the Chamber.
Observations every 5 minutes.

	A.	B.	C.	D.	E.	Temp.
To begin -	60	78	84	70	73	68° F.
After 5 min.	60	70	90	70	72	
„ 10 „	59	76	90	75	72	
„ 15 „	72	74	91	74	70	
„ 20 „	70	74	89	74	72	
„ 25 „	79	77	91	71	74	
„ 30 „	74	81	89	70	71	
„ 35 „	78	79	87	74	68	72° F.
„ 40 „	73	76	89	76	70	
„ 45 „	70	70	90	73	72	
„ 50 „	74	72	89	72	71	
„ 55 „	70	73	89	72	70	
„ 60 „	66	73	88	73	72	
„ 65 „	66	74	88	72	70	
„ 70 „	69	73	86	71	69	
„ 75 „	70	70	85	71	70	
„ 80 „	73	70	86	70	69	
After coming out 5 min. -	66	68	89	68	68	
After 3 hours	63	74	84	74	73	
„	61	75	85	74	73	

Number of Respirations.

Normal -	20	15½	22	20	20
After 33 min.	24	16½	25	20	25
„ 58 „	23	17	25	22	24½
On coming out after 5 min.	20	16	23	19	21

After 5 minutes.

Organic matter not pleasant.

After 15 minutes.

A. Pulse stronger and quicker.
B. Irregular pulse but strong.
C. Weaker and already difficult to feel.
D. Same to the feeling.
E. Much weaker.

After 25 minutes.

A. Stronger.
B. Irregular.
C. Irregular and weak.
D. Irregular.

After 45 minutes.

Organic matter less sensible than at first to the majority.

D.—Feels air to be bad.

After 50 minutes.

A. Can scarcely feel his pulse; several attempts made to count it. Still feels quite well.
B. Begins to feel head uneasy.
C. Feels his heart beat more than usual.
D. Pulse weak.
E. Pulse very weak.

Here every one was observed to be sighing, although all were cheerful.

After 6 minutes.

B. Flushed.
C. and D. Headache began slightly.

The effect of company was considerable in preventing the lowering of the pulse by keeping the mind cheerful.

But the last experiment, Table F, shows that even when quite alone the pulse did not lower when the air was pure.

This experiment differs from that of Table D. The impure air was formed five times more rapidly, and the results were not so perceptible. It would appear that we can resist for a short time when we cannot resist for a long time.

The irregularity of most of the pulses is apparent.

A. was the youngest, being about 17, and having a naturally low pulse; his was raised.

B. was about 21 years old; his pulse went lower, then higher, then finally lower.

C. about 24; his pulse went higher, then sank to nearly its usual point, but he was the most affected in sensation.

D. 27; his pulse went higher and then lower.

E. 47; his pulse went lower, higher, and lower, but he felt no discomfort; forehead began slightly to warm.

It is remarkable that the breathing increased in all cases, and that it went back to its normal amount very rapidly.

TABLE D.

One person in the Lead Chamber.

Respiration and beats of the pulse taken every 10 minutes.

Time.	Pulse.	Respiration.	Temperature, Celsius.	Carbonic acid in the same periods.
h. m. 10 55	73	15·5	18°·2	0·04
min. After 10	73	16	18·2	0·114
„ 20	72	16	18·2	0·187
„ 30	71	17	18·4	0·261
„ 40	71	16	18·4	0·335
„ 50	70	16	18·5	0·408
„ 60	68	16	18·6	0·482
„ 70	67	16·5	18·7	0·556
„ 80	67	17	18·8	0·629
„ 90	66	17	18·9	0·703
„ 100	65	18·	19·0	0·777
„ 110	65	18·5	19·0	0·850
„ 120	64	19	19·0	0·924
„ 130	63	19	19·2	0·997
„ 140	62	19·5	19·1	1·071
„ 150	62	20	19·1	1·145
„ 160	62	20	19·1	1·218
„ 170	61	20	19·1	1·292
„ 180	60	21	19·1	1·366
„ 190	60	22	19·2	1·439
„ 200	59	23	19·2	1·513
„ 210	58	24	19·4	1·587
„ 220	57	24	19·4	1·661
„ 230	57	24	19·4	1·734

TABLE E.

When the door was opened.

Time.	Pulse.	Respiration.
After 10 min.	59	22
„ 20 „	59	19·5
„ 30 „	60	19
„ 40 „	60	18
„ 50 „	60	17

TABLE F.

Sitting quiet for an hour in the Lead Chamber in pure air.

Time.	Pulse.	Respiration.
h. m. 4 50	75	17
After 10 min.	76	17
„ 20 „	76	17
„ 30 „	76	17
„ 40 „	77	17
„ 50 „	76	17
„ 60 „	76	17

The same quiet condition in pure air produced no change.

Experiments B, C, and D, on the beats of the pulse, seem decisive. The air affects the pulse when the ventilation is such that the amount of carbonic acid reaches 0·18. The question of carbonic acid and organic matter, viz., which is the most hurtful, in this case must be decided by other experiments. My belief is that much is due to the carbonic acid, because the progress of the pulse downwards is so regular, and I believe that the organic matter does not increase so regularly. This may not be true at the temperature given, and is another point to be ascertained.

But leaving out all the details, the great broad fact remains that carbonic acid and other emanations from the person diminish the circulation, and hasten the respiration, and that the effect is perceptible when the per-centage of carbonic acid reaches 0·18, or say one-fifth of a per cent. If, however, we do not wish to infer too much from one beat of the pulse, let us for rough practice say $\frac{1}{4}$ per cent.

COMBUSTION OF CANDLES.

I cannot quote any experiments on the combustion of a candle in the conditions required, excepting those of Wehrle. At p. 11 he says:* "If a candle continues to burn (meaning thereby even with difficulty), the amount of oxygen is 18 per cent.; but if it goes out and a common mining lamp burns, the oxygen is 16–18 per cent.; but if that goes out, and an argand lamp burns, then the amount is under 16; when this goes out also it is 14. The light goes out sooner or later according to the different substances used for burning, and the construction of the lamp." At p. 13 he says: "Candles go out completely when the amount of carbonic acid in the air is only 10 per cent. If it is between 5 and 8 per cent. they burn badly; a small round flame hops round the wick and then goes out."

These accounts do not quite agree, and there is some indefiniteness. Some time ago I made experiments on this subject burning the candle in a tin vessel about two feet high on nine inches square, standing over water, an apparatus belonging to Dr. Holland, with whom the trials were made. The vessel was open below and placed in water. A window in the side showed when the light burnt. The results were:

	Oxygen in the Air when the Light went out.
With a common dip tallow candle	15·2 to 16·2 p. c.
Paraffin oil lamp with diminished draught	15·5
Same lamp, very low, with a $\frac{1}{2}$-inch flame	14·4
Spirit lamp	12·
Petroleum very volatile	10·8

In operating in the lead chamber the candles, as a rule, went out with the oxygen between 18 and 19. These results are still more decidedly in contradiction than those of Dr. Wehrle, but the cause will appear. It was found in the lead house that before the candle went out the tallow around the wick became gradually less liquid and at last solid. If, however, it were again rendered liquid by any means, the light rose up and burnt freely even in air which contained only 18 per cent. of oxygen, and in which a candle would not usually burn. For this reason the miners incline the candles in order that the flame may approach more nearly to the grease and melt it more rapidly. Sometimes this is done to such an extent that there is a constant stream of tallow moving past the lower part of the wick and dropping on the floor. When a small vessel is used for the combustion of the candle, such a box as that above described, it is necessary, in order to observe the varying stages of combustion, to let the candle be in full flame when it is inserted; at that time the tallow is melted around it and a considerable supply is at hand. Before this supply is used up the amount of oxygen is reduced to the number spoken of. Such an experiment, therefore, is not satisfactory; it shows only the combustion of a candle of a given size with a given extra supply of oily matter. If, however, the space is large, as in the lead chamber or the mine, the few additional drops of melted fat will not perceptibly affect an experiment lasting for hours, as, after all, their effect is over in a few seconds, at most 30. In this case the combustion ceases whenever the candle is incapable of giving out heat enough to melt sufficient fat for its consumption. If the experiment last for hours, a gradual diminution of the heat takes place and with it a gradual diminution of light. But if the candle be held on the side, or if additional fat be melted, the flame may be made to rise as high as in the ordinary air; still if left to itself the hardening will take place again. As in this case the flame is artificially made as large as usual, there appears as much heat as usual, and still the tallow is not melted. The tallow is melted by radiant heat, and the hardening seems to prove that there is an obstruction to this radiation. The carbonic acid, the watery vapour, and the fatty matters themselves which exist unburnt in the air, may be these non-conductors. The experiments in tables 4 to 8 will show that this diminution of light, of heat, and of melted matter takes place with vapour of water alone to some extent, and with carbonic acid without any additional vapour added to the air, but that when both the acid and the vapour were present the action was most rapid.

It will be seen from diagram 1, that the diminution of the combustion was not caused by a diminished quantity of oxygen merely, because when the carbonic acid was removed the candle burnt very well in the remaining air, although this air would only have 18·7 per cent. of oxygen in it, whereas

* Ueber die Grubenwetter. Von D. Alois Wehrle, Wien, 1835.

by experiment in table 7, the light was very much diminished by the presence of carbonic acid, although the air contained actually 20·1 of oxygen with little of additional watery vapour to disturb it, and was otherwise in a condition to support very fair combustion.

When Dr. Frankland was on the top of Mont Blanc he found that a candle burnt with an elongated blue flame without consuming less fatty matter than usual. In air rendered bad by carbonic acid and watery vapour, or by any of the substances floating or volatilized in the air of mines, the candle has no tendency to become blue, but preserves its whiteness to the last. On the other hand, the blue edges, especially at the beginning of the combustion, entirely disappear, thus giving what is called a "sickly" or a pale yellow appearance to the light. At the last a pale white flame hovers over the wick, which has become short from a process of self-snuffing. The red wick burns short, and, when the small lambent flame escapes, still glows for some time.

When candles burn in fairly ventilated places the unburnt vapours are not always perceived, but when many candles are burnt in close places these vapours become very perceptible to the senses. Perhaps this is owing partly or wholly to a less thorough combustion than in pure air. Acrolein is probably one of these vapours, and, according to Dr. Tyndall's investigations, we must ascribe to them no small influence in preventing the radiation of heat.

When powder smoke is present, the light of the candle is diminished to a considerable extent. The solid matter, as well as the gases which are evolved, prevent the combustion, and I suppose also the radiation. This is clearly seen from table 8.

By table 4 the light of the candle is observed to to be shorter even after half an hour's delay in the chamber, and with 18·57 of oxygen the candle still retains one fifth of its power. This occurred when the exhalations from a candle and a man rendered the air impure. The exact point of extinction depends on the gases, vapours, and temperature united.

If we compare table 5, showing an experiment in the lead chamber when a small amount of steam was sent into the space where there was one person with a candle, we find the result, after 190 minutes, almost exactly similar to the experiment of table 4; the candle diminishing to the same fraction after the same time, the amount of vapour from the candle and the person saturating the air towards the conclusion.

But if we examine the change in the candle at the beginning of the experiment, we find that, in table 4, without steam, the value of the candle had in half an hour gone down to 0·933, whereas with a small amount of steam, not affecting the air to the sight, the amount had fallen to 0·875 in 25 minutes; and with a large amount of steam to supersaturation, the candle fell in 10 minutes to 0·826, and in 20 minutes was diminished by half. It may here be said that the steam might act as an obstruction to the light if it condensed in the room; but to show that this effect is not that which is observed here, we find that the values of the candle are, after 103 minutes, with steam 0·206, without steam 0·376. The numbers are thus rapidly approaching each other, and at the point of saturation of the air, when no steam was used, would no doubt have met, or nearly so. As the temperature was raised with the steam, the candle would burn a little better, because the tallow would melt more easily. When these experiments are carefully examined, the influence of watery vapour is remarkably shown.

In experiments, tables 4 and 5, the two numbers actually do meet, and at 190 and 195 minutes the values of the candle are 0·0108 and 0·0104. We may draw then this conclusion, that the effect of the vapour of water in preventing combustion is very great. In number 5 the amount of vapour sent in at once more nearly approached that which would arise from natural causes in the mines, and there we see that there is a diminution of light of one tenth of a candle beyond that which is caused when there is the ordinary amount of vapour in the air. This will be the most useful and practical experiment, although the study of experiment, table 6, affords also some valuable information. In No. 5 no steam was ever visible.

At the end of each of these three experiments the air was saturated with vapour, and all were practically very nearly in the same condition.

The experiment in table 7 is given to show the effect of carbonic acid on the combustion of a candle. The only value which I can attribute to this experiment is this, that it proves the effect on the candle to be very great. Here there was one person inside and a candle, and therefore the amount of moisture was considerable after one hour, but the effect is visible in ten minutes, or before the moisture could be formed.

At the end of the experiment the candle was nearly expiring with the same amount of carbonic acid as in experiment, table 4, confirmatory therefore of both, although, from the fact of the carbonic acid having been poured into the chamber, and not formed by the simultaneous removal of the oxygen, some difference might have been expected.

This difference was seen in another experiment when the carbonic acid was thrown in from the outside and no person or candle was present in the chamber; in this case the candles taken in afterwards burnt moderately, when there was 3·9 per cent of carbonic acid in the room. The reason of this I attribute to two causes: first, there was less vapour of water in the room, and secondly there was more oxygen in proportion, as it had not been removed by combustion.

As the combustion of a candle depends very much on the state of the air, it is not a surprising thing that the combustion of a fire should be in the same condition. In cold weather the vapour is removed from the air even if the ground may appear moist, and it is still further removed if the ground is frozen, and this also in proportion to the hardness of the frost. In warm weather the vapour is proportionately increased and the fire burns proportionately dull. The warmth cannot do otherwise than assist the combustion; we learn this on a grand scale by the effects of the hot blast. In cold weather a fire burns brightly even although the cold is an agent of an obstructive kind to the combustion. In warm weather the fire burns less clearly, although the heat is an assistance to the combustion. The reason seems to lie in this fact, that the cold air is deprived in a great measure of its moisture. Its effects on the candle are such as the least observant eye may remark, and the changes on a fire are of the same kind. The value of this action is very great in economising the products of nature which are used for heat, and in economising the labour which must bring these products into active use. If this be so, it is a lesson which may be taught to many who will

N° 1 is air with 2.2 p° carbonic acid

2 the same with the acid washed out

3 common air

DIAGRAM N° 2

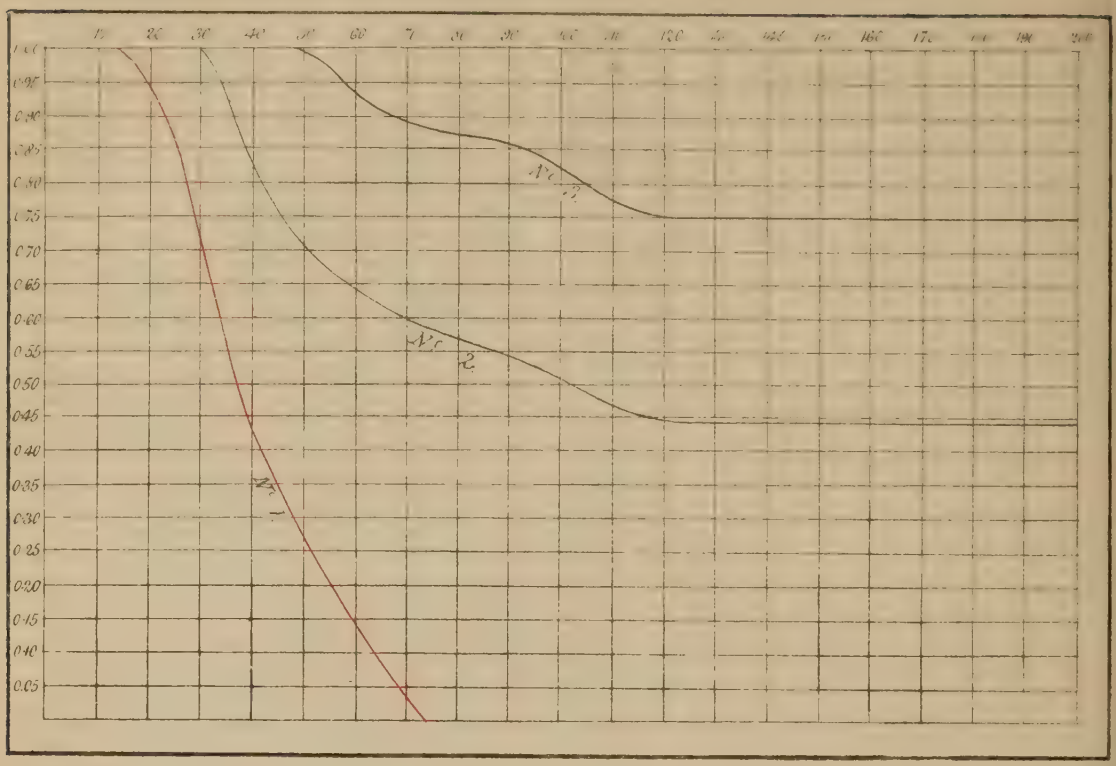
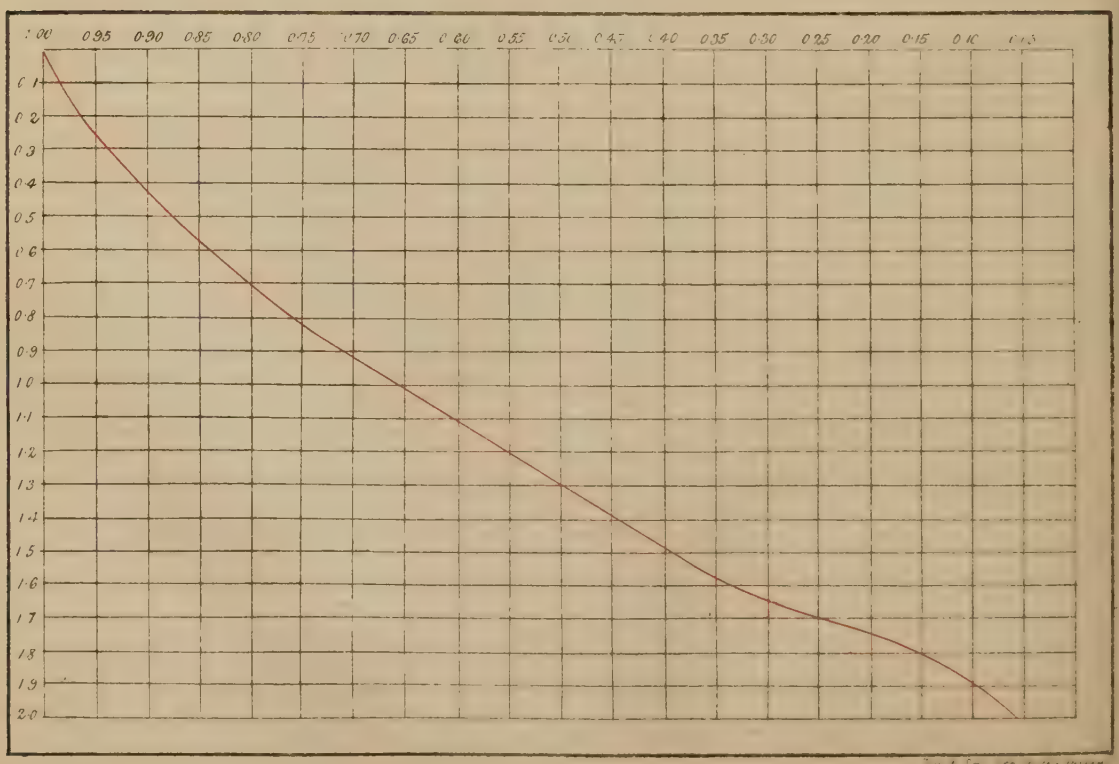


DIAGRAM N° 1

Relation between the carbonic acid in air and the light from a candle



persist in attempting to increase the amount of heat in the fire by pouring in either water or watery vapour.

It may be said that the diminished combustion is due to the imperfect conduction of the heat of the flame to the candle. This appears at first a very remote conception, which will require much reasoning to bring it within the range of daily thought, but in reality it is not so. As the candle stands before you, the grease is seen hardening and the flame expiring simultaneously, you add a little heat by a blowpipe or any other means, and the flame starts up. There is nothing wanted but power to melt the tallow; you raise the flame to a height greater even than the average, and still it soon sinks and goes out. The heat does not pass from the flame to the tallow.

The capacity of the atmosphere to absorb the heated rays of the sun has long been known to be great, and we readily believe that after passing through many miles of air, as these rays do toward the evening, the heat might be diminished till it would be very small, but that it should be absorbed in the space of an inch to such an extent as I now mention would scarcely have been conceived before the investigations of Professor Tyndall. He has shown us that the absorptive power of water, carbonic acid, ammonia, and scents or odours, bodies not unlike those distilled from fat, as well as olefiant gas, one of its products, all powerfully absorb heat; and although he has not worked with such small layers of gas as an inch, the principle seems to apply.

In his inquiry into the absorption of heat by gases and vapours, Professor Tyndall says: "Air sent through the system of drying tubes and through the caustic potash tube produced an absorption of about 1. Air direct from the laboratory containing therefore its carbonic acid and aqueous vapour, produced an absorption of 15." The amount of carbonic acid in the laboratory would in all probability not exceed 0·1 per cent. even allowing for a very bad state of things, whilst the aqueous vapour would in all probability be far from such saturation as was found necessary in my experiments. I trust I do not misapply his theory.

It is extremely probable that the exhalations of animal matter from the body have also their own peculiar influence on the candle as well as on the breathing.

There is, however, another explanation; when 21 per cent. of oxygen surrounds a burning body, the action may be greater by $\frac{1}{21}$st part than when 20 per cent. only surround it. A candle was placed under a receiver and supplied with air containing about 18·5 per cent. of oxygen with a corresponding amount of carbonic acid, that is about 2·5 per cent. This was simply prepared by burning candles in the lead chamber until they went out. A vessel of flexible material was then filled with the air and pressure put upon it, so that the air was driven into a receiver containing a burning candle. The candle went out. The same quality of air was washed with caustic soda and driven into the receiver, and the candle could then be maintained burning, although at an inferior speed, compared with burning in common air. Diagram 2 shows the difference of combustion under the two circumstances.

There are then two influences at work, the active principle of the carbonic acid (a narcotic poison as W. Müller calls it),* and the absence of oxygen. The last would begin to act instantly, and its effects would be visible at the lower part of the flame, the burning being feeble. This may be seen well when a paraffine candle burns; as soon as 1·5 per cent. of carbonic acid is reached the melting is so slow that the flame leaves the lower part and goes above to burn the paraffine that has been drawn up; when this is done it seems inclined to go out. The flame leaves the upper part of the wick, which becomes completely burnt; it then passes down. For this reason the heat is communicated again to the candle. more is melted, and the flame rises; this goes on constantly and we have a candle brightening intermittently, these intervals shortening after a while. That the combustion is rendered less complete at the lower part of the wick is pretty clear; the flame is entirely changed and its clearness is gone, as well as its blueness. Very probably when there is abundant oxygen that gas mixes with the evaporated oil, and explodes with the hydrogen, forming that pale blueish flame which heats the rest of the vapour and produces whiteness above, but with less oxygen there is a dull external combustion producing less heat and so supplying less melted fat. Whilst it is probable that the diminution of heat is one cause, I cannot see that all the circumstances can be explained without introducing the non-conduction of carbonic acid. Perhaps some would suppose an influence such as is exercised by an antiseptic preventing chemical action. There is room here for much experiment and much theory, but the fact is clear.

In photometric experiments a candle was burnt inside the chamber and another outside. I stood inside and the disk of the photometer was within also. Two candles giving the same light were used. These candles, I know by experience, seldom vary above two or three grains in the amount burnt per hour.

The photometer disk was about two inches from the glass of the window. The candle was distant 22 inches from the photometer. That is, when the outside candle was 16½ inches from the photometric disk it was just equal to the inside candle at 22 inches distant, so that the glass destroyed 0·438 or nearly half the light of the candle.

According as the candle within gave less light from the deterioration of the air it was gradually moved nearer to the disk of the photometer.

The change of light was sometimes perceptible at an earlier stage than any figure given in the table, and I can readily believe that much experience might cause the candle in some conditions to be a very sensitive indicator; not in all.

* Annalen der Chemie und Ph., 1858.

TABLE No. 4.

The EFFECT of IMPURE AIR on the Combustion of a CANDLE.—February 6th 1864.

Time.	Outside Candle.	Inside Candle.	Value of the Light in Candles.	Temperature, Fahr., near Roof.
	Inches.	Inches.		
11 h., 20 min.	16·5	22·	1·	49·5
After 30 min.	„	21·25	·933	49·
Flame observed to be shorter				52·0
Outside 2 inches	Carbonic Acid 20·38			
Inside 1·6	Oxygen 0·59			
45 min.	„	18·8	·734	54·5
60 „		18·25	·688	55·
75 „		17·1	·604	55·
90 „		15·5	·496	55·25
105 „		13·5	·376	55·25
120 „		12·8	·338	54·5
135 „		10·5	·227	54·5
	Carbonic Acid 2·31			
	Oxygen 18·57			
150 min.		9·	·167	57·5
165 „		7·75	·124	54·
		Very small flame.		
180 „		6·75	·0941	54·
195 „		2·25	·0104	54·

Before lighting.	At End of Experiment.	
Inside candle 33·82	Grammes 14·715.	=5·87 per hour.
Outside	Grammes 2·440.	24·26 diminution when 3 per cent. oxygen were removed from the air.

TABLE No. 5.

EFFECT of STEAM, ONE PERSON and ONE CANDLE in the Chamber.—February, 11th 1864.

Time.	Distance of Candle from Photom. Disk.	Squares.	Candle's value.	Temp. Fahr.	Height of Flame inside Candle and out.
h. min.					
10·52	24·	576·	1·	40	Both 1·5 inch.
After 25 min.	22·5	506·25	0·879	41	Still the same.
„ 40 „	21·	441·	0·765	46	
*„ 55 „	19·5	380·25	0·660	48	A difference observable in the
„ 70 „	18·	324·	0·562	52	height of the flame.
„ 100 „	14·5	210·25	0·365	54	Flame bad.
†„ 130 „	11·5	132·25	0·229	55	About $\frac{1}{3}$ of its former height.
„ 160 „	7·	49·	0·085	55	Flame changeable, the largest
„ 190 „	2·5	6·25	0·0108	55	given.
**„ 200 „	out			5	Flame out.
		Before burning. Grammes.	After burning. Grammes.		
Outside Candle		33·946	6·547	used	27·398
Inside „		31·01	15·584	„	15·426
			4·63 per hour		40·26 per cent. diminished.
		2·00 per cent. Co_2			

2 Spermaceti Candles burnt in the Chamber and One Person present, 180 grammes of Steam driven in.

There was no particular inconvenience felt in the chamber during any of the time.

*At this point the steam began to enter the chamber, causing a rapid fall of the light.

Specimen α taken - 1·02 p.c. of carbonic acid.
The steam continued to the end - 20·03 oxygen.

†Here the moisture was strongly remarked in breathing.

Specimen β - 2·10 carb. ac.
18·80 oxygen.

** Specimen γ - 2·66 carb. ac.
18·48 oxygen.

TABLE No. 6.

STEAM in the LEAD CHAMBER sent in from a flask of boiling water. ONE PERSON and ONE CANDLE inside. Experiment compound.—February 16th.

Candle outside 16½ inches from disk.

Time.	Candle inside.	Squares.	Value of Candle.	Temp. Fahr.	——
12 o'clock -	22·	484·	1·00	59·0	Although steam was visible.
After 10 minutes	20·	400·	8·26	63·	
„ 13 „ -	16·5	272·25	0·462	65·	Sudden fall. Steam collected above and fell. Candle visibly declined.
„ 20 „ -	—	—	—		
	Here the steam was interrupted till the air became clear, yet the candle lowered rapidly.				
Ditto -	14·5	210·25	0·434	65·5	Fall rapid. Steam visibly condensed, and thick vapour.
„ 40 „ -	Steam begun; the heat fallen to - -			62·	
„ 50 „ -	12·5	156·25	0·322	65·5	
„ 60 „ -	*12·5	156·25	0·322	68·5	
„ 70 „ -	12·	144·	0·297	70·	Flame appears very dull.
	Entrance of steam stopt to see if the flame would recover.				
„ 77 „ -	*15·	225·	0·464	69·5	
	*Probably this rise of 15—12 due to the visible steam.				
„ 85 „ -	11·	121·	0·250	65·5	Supply of fat is suddenly stopt.
„ 95 „ -	11·5	132·250	0·273	65·	
„ 98 „ -	12·	144·	0·297	62·5	
„ 103 „ -	10·	100·	0·206	62·	
	At this point the candle began to take its usual course.				
	Specimen of air taken - - -		0·85 Carb. ac. 20·01 oxygen.		

TABLE No. 7.

Pure CARBONIC ACID poured into the LEAD CHAMBER. ONE PERSON in the CHAMBER.—February 13th.

Time.	Inside Candle.	Squares.	Candles.	——
11h. 25m. -	22·	484·	1·00	
After 10 minutes	14·5	210·25	3·434	Feeling here an acid or prickly sensation on the face.
„ 15 „ -	12·	144·	0·297	
	Carbonic acid - - -		0·579	
„ 19 „ -	11·	121·	0·250	
„ 25 „ -	10·5	110·25	0·227	
„ 30 „ -	9·5	90·25	0 186	Breathing 25½; pulse above average.
„ 45 „ -	5·	25·	0·051	Here came steam, and the candle fell suddenly to 0·227.
	3·5	12·25	0·227	
„ 50 „ -	3·	9·	0·018	Candle became very changeable, as if supplied by an intermittent fountain of oil.
„ 55 „ -	2·5	6·25	0·013	
„ 60 „ -	Nearly out - -		-	Breathing very heavy and frequent.
	Carbonic acid - - -		2·59	Those who entered immediately after found the air very bad.

TABLE No. 8.

GUNPOWDER in the Lead Chamber.—Feb. 17th.

Time.	Squares.	Candles.	Temp. Fahr.
12 h. 56 min.	·22 inches 484	1·00	41
After 14 min.	20 „ 400	·826	51·5
After 45 grains of gunpowder had been burnt in the chamber, the gunpowder did not cause an immediate fall; but in a few minutes the candle changed suddenly, as the smoke fell down upon it.			
After 24 min.	18 inches 324	·669	51·5
15 grains then burnt—60 in all.			
„ 27 „	18 inches 324	·669	52
„ 29 „	16 „ 256	·529	52·5
Very unpleasant breathing, as if every little crystal was felt sharply; caused coughing and discomfort.			
After 39 min.	14·5 inches 210·25	·434	53
Distinct taste of salt as it came from the throat, after collecting there and causing much phlegm. Depressing. Breathing worse than after three and a half hours in the chamber without saltpetre.			
After 47 min.	Fired other 15 grains.		
„ 51 „	13 inches 169	·349	53·5
Decided weakening of the flame, as seen by its indistinct edges; it becomes shorter. The flame at the bottom becomes whitish; it is usually blue.			
30 grains fired.			
After 64 min.	11·5 inches 132·25	·273	54·5

Weight of outside candle on entering, 27·04 grammes; at end of experiment, 12·11 grammes.
„ inside candle „ 21·87 „ „ „ 8·59 „
Outside candle burnt 14·93 grammes.
Inside „ „ 13·37 „ - - - - 6·48 per hour.
13·80 per cent. diminution.

TABLE No. 9.

GENERAL VIEW of the Amount of Light from a Candle under various Conditions, showing Parts of a Candle, a Candle being 1·00.

After Minutes burning.	With Person and Candle Value of Candle.	A little Steam and 1 Person.	With great Excess of Steam and 1 Person.	With Carbonic Acid and Person.	With Gunpowder and Person.
10			·826	·434	
13				·562	
14 (45 gram. of gunp.)					·826
15				·297	
19				·250	
20			·434		
24					·669
25		·879		·227	
27 (6 grammes burnt)					·669
29					·529
30	·993			·186	
39					·434
40		·765			
45	·734			·051	
50			·322	·018	
51					·349
55		·660		·013	
60	·688		·322	nearly out	
64 (100 grms. altogether)					·273
70		·562	·297		
75	·604				
77 (steam stopped)			·464		
90	·496				
100		·365			
105	·376				
120	·338				
130		·229			
135	·227				
150	·167				
160		·085			
165	·124				
180	·0941				
190		·0108			
195	·0104				
200		out			

TABLE No. 10.

BURNING of a PARAFFINE CANDLE in the Lead Chamber.

Time.	Amount of Candle consumed inside.	Amount of Candle consumed outside.	Per-centage burnt less inside than outside.	Carbonic Acid formed by the burning inside.
In one hour - -	7·52 grammes			Per cent.
„ - -	7·456 „			
„ - -	7·14 „	(mean) 7·751	6·2	·312
„ 2½ hours -	19 „	20·47	6·5	·80
„ 3 „ - -	20·828 „	22·574	7·7	·96
„ 3½ „ - -	25·37 „	27·19	6·69	1·12
„ 4¾ „ - -	31·73 „	36·27	12·5	1·52
„ 3¼ „ - -	19·1 „	25·19	24·26	2·21
„ 3h. 20 min. and steam.	15·426 „	25·57	40·26	2·80
„ 2h. 4 min., with gunpowder.	13·37 „	15·96	13·80	

Due to 90 grains of gunpowder exploded - - 8·8 per cent.

* This is 0·07 Co_2 for 1 per cent. of diminution of combustion.

TABLE 10—*continued.*

	Amount burnt in Grammes.	Per Hour.	Less in than outside, Per Cent	By Measure. Inches.
In 4½ hours -	24·700	5·489	29·27	
	26·802	5·956	23·44	
	25·522	5·670	27·09	
In 3 hours -	19·280	6·42	20·19	
	18·803	6·26	22·16	
	20·040	6·64	18·68	

Weight of Candle burnt in Air of various qualities.

By tables 10–13 the amount of sperm and paraffine candles burnt in different atmospheres is seen. The amount burnt is in proportion to the light with remarkable exactness. No. 10 gives the amount burnt in certain times, with the carbonic acid at the end of the experiment. From tables 4, 5, and 6, the amount of light given at various stages is obtained, and by combining these we have table 13 which shows the amount of light presented by given quantities of carbonic acid. Moisture is present in all, but in the lower numbers not to saturation, whilst the saturation will be nearly complete in the higher. Again it seems to me that it makes a difference if the exhalations other than moisture from a human being are present or not, and I cannot therefore call this table accurate as far as carbonic acid is concerned alone. It is given, however, as a very near approach to the condition of things actually found in the mines. It will only be made perfect when each agent is separately examined and the effect of each added to make a total. A mode of making these experiments is already devised, but they may not be ready, if ever made, for the Report of the Commission, and are not strictly demanded by the inquiry.

In order to ascertain the amount of light given by a candle at various stages of impurity of the air, a photometer was used inside and a candle was placed outside. The disk of the photometer was within and the candle was moved towards it as it diminished in light. The distance was generally 22 inches, and the experiment ended by the candle almost touching the disk.

When these experiments were making, it was observed that the outside candle was burnt rapidly down, whilst the candle inside the chamber was still long. It will be seen by experiments in table 10, 11, &c., that this shortening was in exact proportion to the amount of light given. This would not be the case if the candle burnt with a blue flame as in rarefied air. We may conclude from these experiments that the value of the light of a candle may be measured in three ways: 1st, by the photometer; 2nd, by simply weighing it before and after burning; 3rd, by measuring the length of the candle before and after burning. It has been shown that these three modes of measurement may be used for estimating the condition of the atmosphere in a mine, not with great nicety, but to an extent far beyond any method ever yet used in mines. The plans 2d and 3d are actually applicable, and may be said to constitute the best method of applying the candle test, if time is allowed. The amount may be weighed to an accuracy far beyond anything that can be done with the eye only. If therefore the candle is valuable as a test this is one true mode of using it, perhaps the safest; but either a paraffine, spermaceti, or wax candle would be required, and it would require to burn a long time. This length of time is an objection in many cases.

The number of witnesses to the value of the candle as a test is so great that to give them all would seem more to be the transcription of a catalogue of books. In all the writers who in the course of centuries have spoken of the subject, no dissentient voice has been found except perhaps one. Bartels, in his report on ventilation in 1711, says that old air was generally blown back to the places requiring ventilation, and although it was not bad

enough to affect the candles much, it was still hurtful to the workmen.

A belief so long and so well established as that concerning the infallibility of the candle is not to be supposed to be entirely unfounded. It will be seen from the experiments given, that, within bounds, it really is remarkably well founded, and by the aid of fine measures or balances may be carried out to an extent far exceeding that which it has hitherto reached. This great value it certainly has, that it indicates impurity of air of almost every kind usual in mines, little heeding whether that impurity be pure vapours of water or poisonous carbonic acid; and to a great extent the effect of the two substances on the candle very much resembles their effect on human life or at least comfort. A certain amount of moisture, carbonic acid, and powder smoke affect the candle, but this gives no indication whether one or the other is in excess, and although a certain lassitude be produced by the vapour of water in excess we cannot attribute to it the same principal effects which are made apparent by the smoke of powder. There is also a difference if the carbonic acid is brought into the air, and not formed in it by removing the oxygen. As an example the candles will not go out with 4 per cent. of carbonic acid when the acid is poured in, but they are extinguished by 2½ per cent. if the carbonic acid is formed by burning the oxygen. These two extreme cases illustrate some weak points of the candle as a test. They illustrate, also, experiments related to me by Professor Bunsen, in which it seemed clear that the candle burnt longer than the human life.

Reference to similar results is found in Professor Miller's Chemistry. In such cases it is probable that other gases were present. If for example, sulphuretted hydrogen had been present our calculations would be incorrect, as a small amount would be deadly.

The candle will go out when the accumulated effects of the vapours and acids amount to a certain point, but a very large portion of this effect may be due to deadly gases, and none to watery vapours, or the contrary. If the large effect be due to watery vapour a man will have the greater chance of living on. If the chief effect is due to carbonic acid, we cannot doubt that the danger is greater, but this cannot be distinctly proved although it was somewhat illustrated by experiment.

A certain amount of moisture in the air is agreeable, but it diminishes the burning power of the candle ; a time then comes when this moisture is prejudicial both to men and candles; but go further again, it is impossible to add moisture enough to the air to do rapid injury to any man, whilst it is very easy to add carbonic acid to that amount. Again, the eye is not quick enough to observe the differences in the early stages, such as when there is a quarter of a per cent. of carbonic acid, and still less able when the amount is below a quarter per cent. Now this is the only state of things in which men should ever be allowed to work; it follows therefore that the candle as used is valuable only when the air is so bad that no one should be allowed to remain in it.

* See *Acta Historico-Chronologico-Mechanica circa Metallurgiam in Hercynia superiori*, by Henning Calvör.

TABLE 11.

The MEASUREMENT of the Length of the Candle as a Test of the Air.

	In 4½ Hours.	Per Cent. burnt.	Actual Amount in Inches.	Calculated Length from Amount burnt.	Difference.
	Grammes.				
Amount burnt in common air.	34·987		4·036		
1st	24·70	70·73	2·812	2·84	0·028
2nd	26·802	76·56	3·312	3·092	·220
3rd	25·522	72·91	3·	2·94	·060

TABLE 12.

COMBUSTION of Candle in an Atmosphere with Carbonic Acid and Vapour from a Candle and Person.

Time of burning in minutes.	Carbonic acid in the air.	Differences.	Value of the light and candle being 1.
30			0·933
40	0·63	0·43	
45			0·734
60	0·95	0·32	0·688
75			0·604
90	1·31	0·36	0·496
105			0·376
120	1·61	0·30	0·338
135			0·227
150	1·76	0·15	0·166
165			0·124
180	1·88	0·11	0·094
195			0·0014

TABLE 13.

AMOUNT of Light lost by the action of Carbonic Acid in the Air.—Moisture being present.

Carbonic Acid.	Light lost, per cent.
0·63	26·6
0·95	31·2
1·31	50·4
1·61	66·2
1·76	83·4
1·88	90·6

There is here an irregularity, because, as will be seen, the heat rises rapidly the first hour, and slowly the second, whilst it remains stationary afterwards. The amount of light lost may be reckoned for the present, in a rough way, as nearly 10 per cent. for every 0·2 to 0·22 per cent. of carbonic acid, whilst it is somewhat less with some conditions of vapour more nearly approaching 0·25, although both these numbers are disturbed by the temperature. The experiment is not a simple but a very complex one.

Diagrams 1 and 2 illustrate this question. See also under "Carbonic Acid and Ventilation."

Method of ascertaining the State of the Air by the Amount of Candle burnt.

These methods are obtained from 11 and 13.

If a candle burns 120 grains per hour in pure air, and is found in any place to burn only 110, there is

a loss of 9·1 per cent. Let 10 per cent. be equal to 0·25 of carbonic acid, the 9·1 will be equal to 0·22 of carbonic acid. Or let us say, if a candle burns 26·6 p. c. less than its normal amount estimated either by weighing or measuring, the amount of carbonic acid is 0·63, and so on.

I have not applied this to such small quantities, but the principle is found correct in experiments in the lead chamber, and I hope to make use of it a little further.

The mode of measuring is similar, but less exact; a longer time must be allowed for burning, as the edges are unequal, and prevent great accuracy in short lengths.

Effects of Moisture.

It is probable that the amount of moisture in the chamber during the experiment alluded to in table 6 seldom is found in the mines, but the amount in table 5 is, I believe, found. Not having any observations on the hygrometric condition of the mines, a comparison cannot be made. In both the experiments the moisture was at last brought to saturation, in one at an early period. It is true that moisture with a high temperature is oppressive, but when the temperature falls it is a great agent of purification. The organic matter was wonderfully well washed out after the temperature had fallen; it was, in fact, dissolved in the dew. Even when the temperature was high the organic matter was less sensible; this, no doubt, because there was during the whole time a deposit of dew on the substances in the chamber.

The same thing occurs on a summer's evening. The organic matter is removed, but unfortunately it is brought down to be removed, so that in places where it has been abundant and impure the results are disastrous. After the air is cleared of this deposit, it must be much more wholesome. This effect of moisture in purifying the air is remarkably seen in the tables of the carbonic acid of Manchester and elsewhere, also in the amount of oxygen, whilst it was observed several years ago, when examining the air before and after rain, with the permanganate of potash.

This purification of the air by rain is so readily seen to be a matter of course, that it is rather to be wondered at that no one has more fully examined the subject. When we look at the deaths per cent. in different countries of Europe, we are glad to see England stand before the continent; when we go north to Scotland, a moister climate, we find that the number of deaths is still smaller there, whilst the more watery counties of England have in many cases the most healthy spots. Going again to Scotland, the counties in the west that are most deluged with water show a remarkably small amount of deaths. I know there will be many attempts to explain this away by various means, but still I must allow generally the remark to stand, with a belief that it teaches much and unteaches us also much.

The moisture on the clothes and person is a very different matter, and I suppose it cannot be denied that the miners suffer much from it; but even that depends on the amount of animal heat, and the evil is in the great and rapid cooling which takes place when leaving the mine, or going into a cooler place, or resting undried.

Cold and moisture produce according to this view better air,—these are two things dreadfully feared, but the great fact is to be remembered, that, in such amounts as they are found in Great Britain, they are capable of producing powerful constitutions. It is heat and moisture that we must still more fear, as far as atmosphere is concerned.

I have sometimes thought it would be well to put persons in the close chamber, to try their power of raising the thermometer, and in this way judge of their heat producing powers, endeavouring also to find if it is in relation to the production of carbonic acid and so ,coming to some knowledge of their capacity of burning hydrogen compounds; in other words, to discover if fat or starch suited best their digestion.

One of the chief evils caused by moisture in the air of mines arises from the temperature being high. There is then a disinclination to exertion which is not idleness, but on one side an actual diminution of oxidation apparently. There may be other causes less purely chemical. The moisture cannot be removed without removing the heat.

CARBONIC ACID AND VENTILATION.

The carbonic acid of the air increases with the activity of life and with artificial warming and lighting, as well as with animal and vegetable decay. It follows us everywhere living and dying, and we can only get rid of it by keeping in the natural currents of the air. We know it in certain conditions by a peculiar smell and taste which it apparently has when in conjunction with other substances, but of itself it has none, or at least very little. We enter into an atmosphere with $2\frac{1}{2}$ per cent. of carbonic acid, and we smell nothing; we enter into one with 4 per cent. and the candles are long ago out, but we perceive nothing. It has been a question if it really does any harm or is only negative. I have always considered it as remarkably innocent in small quantities and been accustomed to look on the organic substances as the real evils, but the experiments in the close chamber have so far changed my mind, that I am inclined to think that carbonic acid has an injurious influence in small amounts. To prove this absolutely is not easy, we cannot readily obtain an atmosphere for a long period with different amounts of carbonic acid without organic matter existing in it at the same time. Such atmospheres do exist in nature, and in all probability there are persons living in them the statistics of whose lives would give us the required information, but this has yet to be collected. We can prove the bad effects of the minutest quantities of the organic matter, but the bad effects of minute quantities of carbonic acid exist as yet only on suspicion.

We can, however, reason in this way:—The carbonic acid increases constantly and regularly in a close place where men breathe. The organic matter does not do so; it deposits with moisture, it covers every surface, and we smell it when all the carbonic acid is washed out by fresh air. The air is not limited in its capacity of holding carbonic acid; it seems to be so with regard to organic matter. In a closed space the capacity of the air to support life diminishes regularly, and the capacity to support a candle diminishes also, in a manner more consistent with the idea of the activity of the acid air than the absence of oxygen. There is much oxygen still left when the candle goes out, and it will be seen by diagram 1 that the air when freed from carbonic acid is at once able to support a candle with much more vigour.

We do not know enough about the absorption of oxygen by the blood independently of oxidation, but allowing it to follow laws such as those that govern

absorption by water, and this to some extent it does, we see that the amount of carbonic acid absorbed increases with great rapidity when the amount of gas present is increased.

For example, let there be 0·1 of carbonic acid
20·9 of oxygen
79· of nitrogen
using Bunsen's tables for calculation.

The amount of these gases absorbed by water at 68 F. or 20° C. will be 0·09914 carbonic acid
0·59142 oxygen
1·10837 nitrogen

but let the carbonic acid be 4 per cent. as was nearly the case in one experiment, the amount absorbed would be 3·6056 carbonic acid
0·4824 oxygen
1·1083 nitrogen

It is to be observed how rapidly the carbonic acid rises, whilst the oxygen diminishes slowly. The numbers will not be exactly the same at blood heat, and blood may act differently independently of its power of retaining oxygen far beyond that amount which water can retain.

It is to be remembered, however, that oxygen is not absorbed by the blood merely according to the laws of absorption regulating the amount taken up by water; that is, the amount absorbed is retained chemically, and the blood is then able to take up another portion. The first act is probably physical, and although the next is chemical, the ordinary law of absorption will in all probability have a very great influence on the rapidity of the act of supply. Liebig does not reason exactly in this method, but his words on this subject are of great weight and value, and explain it more fully and clearly than has elsewhere been done. His chapter in the "Letters on Chemistry" has great beauty and power. I shall here quote a portion of it, remarking only that it does not seem well proved that the increase of oxygen has little influence. Liebig says:

"Moreover, if the quantity of oxygen that can be absorbed depend, according to a certain law, on the amount of the carbonic acid to be expelled, it is clear that the increase of the amount of oxygen in the air must be altogether without influence on the respiratory process. This remarkable fact has been satisfactorily ascertained by Regnault and Reiset in their admirable researches. They found that animals living for 22 to 24 hours in an atmosphere containing twice or thrice as much oxygen as the air, experienced no kind of uneasiness; and that the products of respiration, in their quantity and relative proportion, were exactly the same as when the same animals lived in common air.

"It is further evident, that the amount of carbonic acid in the air is one chief obstacle to the separation of that gas from the blood, and, therefore, an obstacle to the absorption of oxygen. When the amount of carbonic acid increases, the absorption of oxygen is impeded, even when its quantity remains the same. It is only by a corresponding addition of oxygen that this injurious effect of carbonic acid can be counteracted. Such an increase of oxygen never occurs under ordinary circumstances; but Regnault and Reiset have observed, that animals could live in air containing one and a half to twice as much oxygen as common air, even if the amount of carbonic acid were so great as from 17 to 23 per cent., that is, about 400 times greater than in common air; and this, without any injurious effect, after 22 to 26 hours. Such a proportion of carbonic acid in common air is absolutely incompatible with life.

"The fact that men and animals die very rapidly from inhaling pure carbonic acid, while they live comparatively much longer in nitrogen or hydrogen gases, is explained by this—that in an atmosphere of carbonic acid the blood cannot give off any portion of that gas, but on the contrary, absorbs more of it, by which the small proportion of oxygen in venous blood is expelled from the blood, and consequently its vital functions are much impeded, nay arrested.

"The condition most favourable to a rapid and perfect formation of arterial blood, and a more accelerated expulsion of carbonic acid from the venous blood is, consequently, a rapid change of air in the air cells of the lungs.

"When the inspired air has the same composition as that which is exhaled, the object of respiration is no longer attained. The expired air is used air, which cannot a second time perform the same functions in the lungs. The venous blood is no longer changed into arterial; difficulty of breathing, and finally suffocation, soon come on, just as if the mouth and nose had been closed.

"In this case, death is determined by two causes. One is, beyond doubt, the deficiency of oxygen; the other is the presence of carbonic acid, by the presence of which the absorption of oxygen is impeded. In one of the experiments of Regnault and Reiset, a dog, three years old, in an atmosphere,—the amount of oxygen in which had fallen to $4\frac{1}{2}$ per cent., while that of carbonic acid was $9\frac{3}{4}$ per cent.,—fell into death-like convulsions; but he soon recovered in pure air, and in half an hour was as lively as before. In these experiments the carbonic acid given out from the lungs was for the most part removed, in the confined space in which the animal breathed, by solution of potash, introduced along with the animal.

"If we reckon, in the state of rest, 15 respirations per minute, and for each 31 cubic inches of air (English measure), and in the expired air five per cent. of carbonic acid, and 15 per cent. of oxygen, we easily find that a man in 24 hours produces 540 litres or about 19 cubic feet (English measure) of carbonic acid, consuming in the same time 10,800 litres, or about 380 cubic feet, of air.

"In a closed space, 8 feet high, 9 long, and 8 wide, a man could not breathe 24 hours without uneasiness. At the end of that time the air would have the composition of expired air; and if the patient remained longer in the same air, a morbid state, and finally death, would ensue. Lavoisier and Seguin found that the carbonic acid of expired air when again inspired, may be raised to 10 per cent., but not beyond that quantity, even when respiration was continued, which it could only be for a very short time. This proportion of carbonic acid may be regarded as the limit at which life is endangered in man." (p. 360, et seq.; 4th Ed.)

Here I would remark that the experiment in Table B, showing that the amount of carbonic acid given out was as much when the air had been breathed for five hours as at first, is a companion experiment to that of MM. Regnault and Reiset, when it was found that twice or thrice the usual amount of oxygen did not hurt animals. But I may be allowed to remember that the experiments here recorded were performed on human beings who could register their sensations. All those made with animals take cognizance only of extreme results, such as spasms or approaches to death. I should judge that uneasiness comes on before the air has the composition of expired air, when it reaches that point the discomfort is very

great indeed; and if the air may be raised to the point of having 10 per cent. of carbonic acid, it must surely be by breathing small quantities; at least it seems to me impossible to endure four per cent. for any length of time.

Liebig also says, alluding to the subject, "These "variations in the density of the air from tempera- "ture, evaporation, or pressure, exert no perceptible "influence on the quantity of oxygen taken up by "the blood in every second of time."

M. Em. Fernet,* speaking of the organic substances in blood, says, "The volume of carbonic acid absorbed remains equal to one and a half that which pure water would absorb under the same circumstances. On the contrary, in the absorption of oxygen there is observed a very small diminution of the co-efficient of solubility, and a notable augmentation of the volume absorbed, independent of the pressure. The absorption of oxygen by the serum is on the whole regulated by the law of simple solution." On p. 675, "The volume, chemically combined, is almost five times the volume dissolved under atmospheric pressure."

Meyer and Fernet found that blood took less air up at low temperatures than at high. The contrary is the case with water; but it is clear that if the blood does take up oxygen according to pressure, it retains it by another power, and this is exercised more at a temperature equal to or above animal heat.

Muller† has done interesting work on this subject, and has shown that an animal can reduce the amount of oxygen almost to disappearance before dying. But his experiments were made on animals confined in very small spaces or bottles, the air not being equal to the bulk of the animal itself. The results, although interesting, do not bear on the subject of health. He concludes that the removal of two-thirds of the oxygen does not affect life, and explains thereby the possibility of living in the rare atmosphere of mountains. But that which he called no effect was an observation of ten minutes; and I can bear witness with myself and others that such a short experiment is not sufficient. That which may be borne for many hours, yet depresses deeply, and changes are taking place during the time in the body and mind, which many hours afterwards of fine air are required to obliterate.

That the difference of a small amount in the proportion of oxygen should be perceived in the burning of a candle, whilst the difference of a great amount in absolute quantity is not equally perceived if this difference is caused by rarefaction, points rather to the importance of the proportion of the elements being preserved. The 23rd conclusion of Vierordt seems to be the true one: "The quantity of carbonic acid given out into the lungs increases or diminishes with the amount in the lungs. If the lungs were to be cleared entirely of carbonic acid by the addition of fresh air, the freshest air would clear them most rapidly; but use air with carbonic acid, and near the end of the process the amount of air required would be very great to make any change." This is easily seen by table 16, showing the very great amount required to ventilate. For a similar reason the time required to change the composition of the mixture of gases in the blood, granting it to be changed, would be considerable, and impure air, which would finally kill, might be borne with for a time, although at first scarcely perceived.

When the air has been reduced to 18 per cent. of oxygen, and the carbonic acid removed by caustic soda or lime, leaving then an atmosphere with 18·5 per cent. of oxygen, the difference is great both in the candle and in man, a difference which the change of half a per cent. of oxygen will not give; the breathing becomes pleasant, and the candles burn better. (See diagram.) This difference, if I understand Dr. Frankland's experiments aright, is not produced by diminishing the oxygen to the same extent by rarefaction.

Table 14.

Composition of the Air.			Amount of the Gases absorbed in Water at 20 C. 68° F.		
Carbonic Acid.	Oxygen.	Nitrogen.	Carbonic Acid.	Oxygen.	Nitrogen.
0·025	20·978	79	0·02253	0·59527	1·10837
0·05	20·95	79	0.04507	0·59456	1·10837
0·075	20·915	79	0·06705	0·593851	1·10837
0·1	29·9	79	0·09014	0·593142	1·10837
0·2	20·8	79	0·18028	0·590304	1·10837
0·3	20·7	79	0·27042	0·587466	1·10837
0·4	20·6	79	0·36056	0·584628	1·10837
0·5	20·5	79	0·45070	0·58179	1·10837
1·0	20·0	79	0·9014	0·5676	1·10837
2·0	19·0	79	1·8028	0·53922	1·10837
3·0	18·0	79	2·7042	0·51084	1·10837
4·0	17·0	79	3·6056	0·48246	1·10387
5·0	16·0	79	4·5070	0·45408	1·10387
6·0	15·0	79	5·4084	0·42570	1·10837
7·0	14·0	79	6·3098	0·39732	1·10837
3·84	20.19	75·96	3·461376	0·572992	1·0657188

Table 15.

Composition of Air, Carbonic Acid removed.		Amount of the Gases absorbed by Water at 20° C., 68° F.	
Oxygen	Nitrogen.	Oxygen.	Nitrogen.
20·98	79·01	0·594912	1.108636
20·960	79·041	0·594844	1·108931
20·940	79·059	0·594277	1·109197
20·920	79·079	0·593709	1·109478
20·841	79·158	0·591467	1·110586
20·762	79·237	0·58922	1·11169
20·682	79·311	0·586955	1·112817
20·603	79·396	0·58471	1.11392
20·202	79·796	0·57333	1·11955
19·387	80·612	0·549287	1·130986
18·556	81·443	0·526619	1·142645
17·708	82·291	0·50255	1·15454
16·842	83·157	0·47797	1·16586
15·957	84·042	0·452859	1·179109
15·053	84·946	0·427204	1·191792

* Comptes Rendus, vol. 46, p. 623.

† Annalen der Chemie und Ph. vol. 108.

I do not know that the passage of carbonic acid through moist membranes has been applied to any condition found in the lungs. The table 14 was made, and may be again referred to, in order to explain the action of carbonic acid, supposing it to keep in contact simply with a liquid such as water which will absorb it. We find that with 0·1 per cent. carbonic acid gas, the absorption is 0·09, and of oxygen 0·593, but how rapidly the rise is made in the column for carbonic acid. When we reach 0·2 the amount of carbonic acid is doubled, and that of oxygen scarcely altered. With 0·1 carbonic acid the absorption is 15 per cent. of the absorption of the oxygen, with 0·2 it is 30 per cent.

Knowing as we do the necessity that blood should give out carbonic acid, it is easy to believe that such a constant exposure to an acid gas would prevent this action.

If we shake a volume of common air containing 0·04 per cent. of carbonic acid with water the amount of oxygen dissolved is much greater than that of the carbonic acid, but let the carbonic acid rise only to 0·6 and the amount dissolved would be greater than the amount of oxygen; when we arrive at 2 per cent. the amount of carbonic acid dissolved is actually more than three times the amount of oxygen; at 4 per cent. it is eight times. This estimation is for water, whilst the oxygen in respiration is absorbed by blood; and this is for 68° Fahr., whilst that of respiration is nearly 30 degrees higher; but although there are experiments on the absorption of oxygen by blood, the knowledge is not in such a state as to admit of decisive replies. It does, however, admit of illustration. R. F. Marchand, and after him Fernet, found that the absorption of oxygen by the blood did not produce instantly carbonic acid,* the oxygen is carried into the blood and gradually acts upon it. Oxygen has been found along with carbonic acid in the blood, and in greater quantity. Meyer's experiments in Watt's Dict. of Chemistry give from two to three times more oxygen than carbonic acid; Bernard found in a dog's arterial blood 19·46 of oxygen.† Much dispute has arisen whether the oxygen was combined or absorbed; without inquiring into the mode by which it is retained, it seems probable that the act of absorption is first physical. The blood has in reality no pure air exposed to it, as Vierordt has shown that in the deepest portions of the organs of respiration there is more carbonic acid. This explains why death does not at once occur, with a moderate increase of carbonic acid, such would immediately be the result if the absorption were exactly as in table 14. Still it is fair to draw this conclusion, that the more carbonic acid there is in the air, the more difficult will it be for the blood to keep its excess of oxygen.

The table B shows that the formation of the normal amount of carbonic acid is no proof that there is a sufficient supply of oxygen or that a place is healthy. There is evidently power lost in supplementing a deficient supply by great exertions. I must not attempt to speak as a physiologist; the chemical fact was well proved.

It would of course be much better if we could reason in a more direct way, and by experiment in a laboratory prove that the smallest amount began the mischief. It would be better, because people have more faith in that which goes on before their eyes rapidly; when the operation is extended through years they begin to lose sight of the cause, and besides this, other influences cause the argument to be more mixed.

In brewhouses the carbonic acid is nearly pure, and I am inclined to think from inquiries made, and from a little more trial of it myself, that even when pure it is not well to have an amount so great as 0·15 per cent., although 0·19 is not perceptible to me. (See under Organic Matter.) This is going farther in that direction than I expected to go, 0·25 will scarcely show on a common photometer, and it is certainly not perceived by the senses in a direct way.

If we look at the diagram showing the effect of bad air on the burning of a candle, we shall see that the beginning is very rapid. The whole bearing of the experiment leads us to think that there is no point at which the effects of the carbonic acid can be called null, but that the effect shades out as finely as the acid itself.

The proportion of the gases in the atmosphere is adjusted so that we can keep combustion freely under control. If we use very little more oxygen the rate of combustion is perceptibly increased; if we take any less than one per cent. (0·8) the rate of combustion is diminished at least a third. If 0·8 per cent. will have such a great effect, is it a strain on our reasoning to attribute a considerable influence to one tenth per cent.? And if the absence of 0·1 of oxygen be felt how much more will this be the case when it is replaced by an equal amount of carbonic acid?

It is extremely probable that the carbonic acid and oxygen are adjusted to the condition of the blood and lungs, or, as some would prefer it, that the blood has adjusted itself to the oxygen and lungs; the slightest excess of oxidation might in a few years destroy the smooth action of the organs; and it is not to be wondered at that some persons are more fitted for working as it were under low pressure, and if put into pure air give way, whilst others again require all the stimulus of the purest air and exercise to set them in harmonious action.

If we were to examine the air of various climates we might arrive at the lowest amount of carbonic acid which affected individuals, but this is only partially done, and we must look rather to analyses such as those here given of the air of mines and close places.

It has been said, and probably with truth, that animals seek inferior air when sleeping, and man also dislikes then a bracing air. It may be well to breathe less oxygen for a short time, such air, for example, as is got by putting the head under the bed clothes. It is probable that it removes the stimulus caused by pure air and calms one down to sleep, but this impure air by degrees becomes more and more unwholesome, and when the sleep has begun it seems more natural that the lungs should themselves adjust the amount of air required, by respiring more slowly rather than moving with rapidity in impure air. But as few persons seem to regulate themselves so well, and as the stimulus required in active life is not required in sleep, it is probable that for many persons, if not all, the air may be with propriety diminished in oxygen to the extent of two or more parts in 10,000; if this is not the case it will be difficult to explain many of the habits of both men and animals.

Viewing the subject from another point it becomes in fact practically necessary to have this diminution;

* Kopp's Jahresb. 1858.

† Kopp's Jahresb. 1858, p. 260.

we cannot during sleep bear so much cold; we breathe less and must be kept warmer, and probably cannot therefore have equal ventilation. In conformity with this it is universally agreed that the temperature shall rule the ventilation in domestic life; a law by no means very bad, and in many circumstances quite sufficient. Could this law be applied in mines, could we use a fine thermometer, so as to indicate the rise? Mr. Holland proposes a differential thermometer, with one bulb in the earth. But the value of this measure would be limited to places in constant occupation. It could give no idea of the value of air, which, although bad, had become cool or produced *cold damp*.

There are certain advantages gained by rising up into a lighter air; to some persons it is essential. There are also advantages gained by a condensed atmosphere, if not permanently, still for a time; speaking here entirely from the evidence of others. To what is the benefit owing in the first, and in the second entirely opposite, condition? On rising up a mountain people speak of the air being lighter; may it not be that, on the pressure being removed, the carbonic acid escapes more readily from the blood and is removed by the lungs, when more oxygen can be absorbed? For this reason a lighter air within certain limits may actually give us more oxygen although it contains less. When advantage is obtained from compressed air, it may be that the oxygen is driven in by the pressure and more oxygen obtained in this way. Both suppositions go on the belief that more oxygen gives pleasure; and this is true, but, as usual, within limits. These are not the only causes. One reason why we are pleased with mountain air, is, to my mind, very clearly the same that makes us seek better ventilation. We seek air freed from all matter capable of oxidizing. Probably we do not require to go very high for this, and it will be very interesting to find how high.

This enquiry would lead us to the conclusion that cold air, moist air, and rather but not very high air where the wind blows, is the purest; it is certainly that which braces. When we lose vigour we are inclined not to seek such air. This is in agreement with much traditional belief; it explains the old instead of introducing new.

But let us put the question clearly: Will the loss of 0·1 of oxygen make any change in the respiration if its place is not supplied by a hurtful substance? According to the quotations already given, the blood would seem to have a reserve of oxygen, and would not require to be supplied with any definite amount. But it is evidently limited in its power of absorbing oxygen, because if you give it more oxygen it can bear more carbonic acid, as Liebig's quotations from Regnault and Reiset prove. Every addiiton, therefore, of oxygen gives a corresponding amount of resistance to the carbonic acid poison. I see no way out of this reasoning myself, considering the position of our knowledge.

Another condition seems to exist in which this small amount will have its effect. In a close place, where the oxygen is becoming less by consumption, every atom will have its value.

In cases which seem to allow of much true reasoning on either side, it generally happens that the subject divides itself into two or more parts. It does certainly appear that the respiration is not affected sensibly by a small or even by a considerable diminution of oxygen, when the place of that gas is not taken up by others of a noxious character. The report is written with this belief. The question, Would the respiration or the health be affected if we lived long in air with a diminished quantity? is not yet answered. It seems rational to believe that an active agent like oxygen cannot fail to show itself. It is against all our knowledge of oxygen to believe that it could remain entirely without character in the presence of organic matter. The only dispute that can be on the subject will turn on the amount of effect, whether it will be perceptible in minutes or years. If the oxygen should be as ozone, I am inclined to believe in the power of very minute quantities perceptible at once; and I think most chemists will agree to believe in some such effect, whatever their theory of the substance called ozone may be. If, however, the oxygen is the common gas, the proof of any rapid effect is wanting, although it is clear that there is no rapid injury. However, the question is not of much practical value, although extremely interesting theoretically.

Washing the Air.

If the oxygen which nature supplies were more than is required, we might wash out the carbonic acid of the mine with lime water or soda, and have again air as good as at first.

This was proposed both by Dr. Bernays and myself, and I find that it has often been proposed. Liebig advocates its use in confined sleeping places. It seemed to me that it would be easy to use that beautiful jet made by Sir Goldsworthy Gurney for washing the air supplied to the Houses of Parliament. The water passes from a narrow tube and strikes a plate of metal, which drives it off on every side in the finest dust, as we have learned to call it, or, as the inventor styles it, Scotch mist. I thought to send caustic soda in the same way; but it was found that practically very pure liquids must be used. These could not be obtained in mines at all times, and after much annoyance it was decided that caustic soda would not do. And why annoyance? The experiments were tried in the lead chamber, and air with 3 per cent. of carbonic acid was attempted to be washed, but the amount of confusion caused by the pumps, added to the causticity of the soda, rendering everything dangerous to touch, made the place less comfortable than the worst washing house, and more disagreeable than a mine, if we consider everything except the atmosphere. Caustic lime could not be used conveniently in such places. Lime water is too weak; it is surprising how much liquid is necessary. The milk of lime would be required.

The lime water or milk would become carbonated at the exit of the tube, and be found destructive. It would whiten the floor and all the rocks, so that the strata could not be seen, and it would increase the water of wet mines, whilst it would render dry mines wet. Finding a jet impossible because so easily stopt up, cloths moistened with milk of lime were used merely as an experiment. By this means the air was rendered pleasant to breathe; a candle burnt better, as the diagram shows; but it did not seem advisable to manufacture such air for men, and I came to the conclusion that if the air were really bad, it was proper simply to replace it by good and to avoid mending. Time is wanting for details of this experiment.

VENTILATION.

The question how much air shall be given to an individual is a very natural one, and has been variously answered. Probably the best answer is that given by Professor Pettenkofer, and mentioned when speaking of carbonic acid. The question of ventilation would best be answered if we could reply to these questions :—What is the smallest amount of carbonic acid which may be called injurious ? and what is the smallest amount of organic matter ?

The amount of carbonic acid in the air is 0·04 per thousand in many places that are healthy, but less at times, perhaps less in some places at all times. About five times that amount affects a candle sensibly, a photometer being used, and it is extremely probable that less affects it also ; are we affected as readily ? I rather avoid this question at present, we have not facts enough. But we do not require to speak of the gas except in conjunction with organic matter, and 1 per mille, Pettenkofer's point, seems a very natural point to fix on as the first stage of very bad ventilation when the exhalations from the body are present with it. Let us take the two together and we then find that much depends on the temperature also. If the day is warm we may pass from a room having 0·06 in a hundred of carbonic acid to the air with 0·04 and feel refreshed. If the day is not warm, we do not feel the difference, at least such persons as I have examined do not. *The conclusion is that in the early stages of the want of ventilation the organic exhalations are the most injurious.* Now they increase with the temperature whilst the acid does not. For this reason we ventilate in warm weather for the organic matter far more than for the sake of the acid. As the former cannot be estimated by weight, I have viewed the subject only in relation to the carbonic acid. I think it probable that we shall be able to view it also in relation to other substances. For example, so much temperature will represent so much organic exhalation and the volume of air will differ accordingly. This is not attempted yet.

It is often asked how often must we renew the air of a place in order to keep up the purity at a given point ? The first column of this table gives the amount of per-centage of carbonic acid which it is desired to maintain in the air, the other columns the amount of air required per 100 cubic feet of space, in order that the amount of carbonic acid should not be exceeded.

Table 16.

Amount of Air required per hour.

Carbonic acid per cent.	For a man.	For a candle.	For a man and candle together.
·4	100	50	150
·3	133	66	200
·25	160	80	240
·2	200	100	300
·1	400	200	600
·09	444	222	666
·08	500	250	750
·07	571	286	857
·06	666	333	1000
·05	800	400	1200
·04	1000	500	1500
·03	1333	666	1999
·02	2000	1000	3000

Here a man is supposed to render 100 cubic feet of of air impure up to 0·4 percent. in an hour, a candle up to 0·2, both together to 0·6. But there is a great variety of candles as well as of men. The number is got thus :—If the carbonic acid must never exceed 0·4, the whole must be renewed every hour, if a man is in the space ; if the candle only, every two hours ; if a man and candle, add the two.

Here we have a rule to guide us for every amount of carbonic acid. When that gas is removed the organic matter goes with it. But the removal must be entire, the whole air must be moved forward, the draught must not be in one corner only, whilst the rest of the space remains impure, otherwise we have a mere mixture of good and bad ; ten times the proper amount of air required may be driven past a place and still do little good. The amount of air as stated in the table will not suffice for those cases where the draught is required for the purposes of cooling by producing evaporation, but I think it will be enough for all temperate places. When the cold is great, a smaller amount is required, because then we do not ventilate for organic matter so much as perhaps carbonic acid, and we can bear more readily carbonic acid in small amounts than organic matter.

I wished to determine how much carbonic acid we can bear pleasantly at very low temperatures, but I have not done so. It is less important to determine how much we can bear at high temperatures as the amount becomes almost too small to consider, the annoyance of the organic matter increases so much. This again varies with individuals more than the acid.

Now that we have the amount of air required in order to produce a certain purity, the next question arises : On what number in these columns shall we fix ? For really warm air there is no difficulty ; the air around us for comfort and absolute purity must be changed at least three times a minute, so that we may breathe it fresh every time. For houses in a moderate temperature we may take numbers opposite ·07, or if the temperature would bear it ·06, and still better ·05 ; but as Pettenkofer advises I would not go above ·07 unless cold compels us.

In summer when we keep the windows up as far as possible, we may even arrive at ·04 in the country, and after rain at still less. It is a fair question, How much is the pleasant influence of summer air in a house due to this frequency of change ?

The next question that may be asked is, How are we to know that we send into a room 100 or any other number of cubic feet ? This I shall not pretend definitely to answer. It is a mechanical riddle not yet solved for private houses. I should prefer answering indirectly, and estimating the amount of carbonic acid by one of the simple methods given under tests for carbonic acid. The per-centage found will determine if the proper amount of air is supplied.

HEAT.

The heat of the mines is often very much increased above that of the ground in which the mine exists. The effects are greater than the theory of internal heat will explain. This has been supposed to arise from the oxidation of pyrites in the ground ; and miners generally testify to the greater warmth of such mines as contain sulphur compounds which are readily oxidizable. It is of interest, and perhaps of

use; to know how much of this depends on the men and the candles; and a few experiments were tried in the lead chamber. The results are not in reality of much value in themselves, although they may lead to other ideas and inquiries. This part was very incomplete.

The experiments were made by simply remaining in the chamber and observing the temperature, or by placing a paraffin candle in the chamber and observing, and by both together.

The amount of heat can be better calculated when a paraffine candle is used; and Messrs. Field, of Lambeth, were good enough to make into candles some of the purest paraffin obtained from my friend Mr. Young. It was taken as containing 20 atoms of hydrogen and 20 of carbon. Of this 7·75 grammes burnt in an hour=6·85 carbon and 0·9 hydrogen :—

One of carbon burning into carbonic acid will give 8080 units of heat, or will raise 8080 of water one degree C.

One of hydrogen heats 34,462 of water.

6·85 × 8080 units of heat - 55,348
·9 × 34462 - - 31,015

Grammes of water heated a deg. C. - 86,363
Or the air in the chamber 150* cubic feet, raised - - - 65·8° Cent.
Or - - - 118·4° Fahr

A man burns carbon variously. It will be seen that (10·27 ounces) 302·4 grammes per day was the rate at which the carbon was burnt in some experiments mentioned, or 12·6 grammes per hour (194 grains).

12·6 × 8080 = 101.808

Or the air in the chamber 150 cubic feet heated - - - 77·5° Cent.
Or - - - - 139·6° Fahr.

100 grammes of gunpowder (about 3½ ounces) containing - - 13·3 sulphur, 11·9 carbon,

would give 13·3 × 2221 - - 29,538
11·9 × 8080 - - 96,152

Units of heat - - 125,961

Or the air of the chamber 150 cubic feet, raised - - - 95·8° Cent.
Or - - - 172·4° Fahr.

If we took 100 grains, and had the same percentage of sulphur and carbon, we should have 8,138 units of heat.

The actual rise of temperature in the chamber is shown in the following :—

TABLE 17.

One Person in the Lead Chamber.

Time.	Temperature outside.	Temperature inside, top.	Temperature inside, middle.	Temperature inside, bottom.
h. m.	cent.	Fahr.	Fahr.	Fahr.
	5·4	45·	44·	43·5
After 15	5·4	47·	51·	46·5
30	5·6	48.5	52·	48·0
45	5·6	49·	52·8	48·5
60	5·8	49·5	53·5	49·2
75	6·	49·6	53·8	49·5
90	6·	49·8	54·	49·5
105	6·	50·2	54·8	50·
120	6·2	50·5	54·8	50·2

* This has been calculated for 150 instead of 170.

TABLE 18.

One Person in the Lead Chamber.

Time.	Temperature outside.	Temperature inside, top.	Temperature inside, middle.	Temperature inside, bottom.
h. m.	cent.	Fahr.	Fahr.	Fahr.
	5·9	44·8	49·	44·
After 15	6·	47·4	51·	47·
30	6·2	48·5	52·4	48·4
45	6·3	49·4	53·2	49·2
60	6·4	49·9	53.9	49·8
75	6·4	50·5	54·4	50·2
90	6·6	50·5	54·5	50·4
105	6·5	50·6	54·9	50·5
120	6·6	50·8	55·	50·6

TABLE 19.

One Person in the Lead Chamber.

Time.	Temperature outside.	Temperature inside, top.	Temperature inside, middle.	Temperature inside, bottom.
h. m.	cent.	Fahr.	Fahr.	Fahr.
2 0	5·8	45·5	44·8	44·4
After 15	—	48·1	46·5	47·8
30	—	49·6	48·0	49·4
45	—	50·2	48·9	50·0
60	—	50·6	49·2	50·4
75	—	50·8	49·5	50·5
90	—	50·8	49·8	50·5
105	—	51·0	50·0	50·8
120	—	51·0	50·0	50·8
135	—	51·0	50·0	50·8
150	—	51·2	50·1	51·0
165	—	51·0	50·1	50·8
180	6·3	51·1	50·1	50·8

TAALE 20.

One Person in the Chamber.

Time.	Temperature outside.	Temperature inside, top.	Temperature inside, bottom.	Temperature inside.
h. m.	cent.	Fahr.	Fahr.	Fahr.
	5·5	44·3	43·4	
After 15	5·7	46·3	46·4	
30	5·8	47·9	48·1	
45	5·8	48·5	48·8	
60	5·8	49·3	49·5	

TABLE 21.

One Person in the Lead Chamber.

Time.	Temperature outside.	Temperature inside, top.	Temperature inside, bottom.	
h. m.	cent.	Fahr.	Fahr.	
	4·6	42·3	41·7	
After 15	4·6	44·3	44·4	
30	4·6	45·9	46·2	
45	4·6	46·8	47·1	
60	4·7	47·5	47·8	

TABLE 22.

One Paraffine Light in the Lead Chamber.

Time.	Temperature outside.	Temperature inside, top.	Temperature inside, middle.	Temperature inside, bottom.
h. m.	cent.	Fahr.	Fahr.	Fahr.
9 10	5·0	43·1	42·7	42·2
After 15	5·0	45·3	44·0	43·4
30	5·0	47·0	45·0	44·4
45	5·0	47·6	45·8	45·0
60	5·1	48·2	46·3	45·3
75	5·1	48·5	46·6	45·7
90	5·2	48·6	46·9	46·0
105	5·3	48·9	47·1	46·2
120	5·4	49·0	47·3	46·4
135	5·4	49·2	47·6	46·5
150	5·5	49·4	47·6	46·7
165	5·6	49·5	47·8	46·8
180	5·6	49·5	48·0	46·9

TABLE 23.

One Paraffine Light in the Lead Chamber.

Time.	Temperature outside.	Temperature inside, top.	Temperature inside middle.	Temperature inside, bottom.
h. m.	cent.	Fahr.	Fahr.	Fahr.
	5·9	44·5	43·9	43·7
After 15	5·9	47·1	45·4	44·7
30	6·0	48·4	46·4	45·5
45	6·0	49·0	47·0	46·0
60	6·2	49·5	47·3	46·4
75	6·2	49·9	47·8	46·7
90	6·2	50·0	48·0	46·9
105	6·2	50·0	48·1	47·0
120	6·3	50·0	48·2	47·1
135	6·3	50·1	48·2	47·2
150	6·3	50·1	48·3	47·3

TABLE 24.

One Paraffine Light in the Lead Chamber, and one outside.

Time.	Temperature outside.	Temperature inside, top.	Temperature inside. middle.	Temperature inside. bottom.
h. m.	cent.	Fahr.	Fahr.	Fahr.
10 0	4·2	42·5	42·0	41·5
After 30	4·4	45·6	44·0	43·3
45	4·8	46·5	44·9	43·8
60	4·9	46·9	45·1	44·2
75	5·0	47·3	45·5	44·6
90	5·2	47·5	45·8	44·8
105	5·3	47·7	46·1	45·2
120	5·4	48·0	46·2	45·4
135	5·5	48·1	46·5	45·5
150	5·6	48·3	46·7	45·6
165	5·6	48·4	46·8	45·7
180	5·6	48·5	46·9	45·8
195	5·7	48·6	47·0	46·0
280	5·7	48·9	47·0	46·0

TABLE 25.

One Paraffine Light in the Lead Chamber.

Time.	Temperature inside.	Temperature inside, top.	Temperature inside, middle.	Temperature inside. bottom.
h. m.	cent.	Fahr.	Fahr.	Fahr.
9 0	4·5	42·0	41·3	40·9
After 15	4·4	44·5	43·0	42·0
30	4·4	46·0	44·2	42·9
45	4·4	46·7	45·0	43·6
60	4·6	47·3	45·6	44·3
75	4·6	47·6	46·0	44·5
90	4 8	48·0	46·4	44·9
105	5·0	48·2	46·5	45·2
120	5·2	48·5	46·9	45·4
135	5·3	48·6	47·3	45·6
150	5·4	48·7	47·4	45·8
165	5·4	48·8	47·5	46·0
180	5·5	49·0	47·6	46·2
195	5·5	49·0	47·6	46·2
110	5·5	49·0	47·6	46·2

TABLE 26.

The following Table gives the abridged Results. Increase of Heat caused by a candle in 170 cubic feet of air in Lead Chamber.

	Average Increase of Temperature.		
	In 1st hour.	In 2nd hour.	Total in 2 hours.
1	3·4	1·1	4·5
2	4·3	1·2	5·5
3	3·7	0·7	4·4
4	4·0	1·0	5·0
	4) 15·4	4) 4·0	4) 19·4
	3·85 Mean increase in one hour.	1·0	4·85 Mean increase in two hours.

TABLE 27.

Rise of Temperature caused to the 170 cubic feet of air in the Lead Chamber by one man during one hour.

1st March - -	5·16
3rd „ - - -	6·57
4th „ - - -	5·27
8th „ - - -	5·55
9th „ - -	5·65
	5) 28·20
Mean increase in one hour -	5·64

Heat caused by Gunpowder.

1st.			rise.
Temperature to begin - (8 grammes gunpowder burnt.)	roof 43·7 F.	floor 43·5 F	
After 13 minutes -	47·3	47·3	
Total heat - - - - - - -			3·7 deg.

We may feel surprise at the enormous amount of heat passing from candles, fires, and animals, as shewn in the calculation, and wonder how it is so rapidly removed as appears by the experiments. The surface of the lead was very large, and we can readily understand the mode by which the heat was conducted. The amount of heat given out by a man is not accounted for by the amount of carbon burnt. The estimation of the carbon was not made at the same time with the observation of the heat. Still, I found the carbonic acid very constant, as it was always made immediately after a meal, and it will be found to stand high, although not at the highest point. The amount of carbon not being able to produce all the heat found, we must have recourse to hydrogen burnt in the body for the production of the remainder; and it may be worth inquiring whether this method of working may not produce results of importance to medical men. Some men will burn less carbon and more hydrogen, as some men eat less starch and more fat; and the capacities for food, and the quality of the decomposition, may in this be observed, not forgetting also the actual power of producing warmth.

I afterwards found in some experiments that the man gave as nearly as possible double the amount of carbonic acid given by a sperm or paraffine candle. A man produced in an hour 0·6 of that gas to 100 feet of air, a candle 0·31. The miners' candles produced more, as is believed, but this was not estimated.

On the effect of heat I have little to observe. We all know how it relaxes the exertions of body and of mind, especially when moisture at the same time saturates the air. Dr. Edward Smith has explained this clearly, by showing that a rise of temperature at once diminishes the amount of carbonic acid formed. The rate of life is arrested, but apparently also the functions of life. When life is allowed to move more rapidly by a lowering of temperature, the rate of living may not be more increased, as the repair seems to depend as directly on the oxidation as the waste depends.

There is at a certain temperature a very decided change in the body. This change is marked on all thermometers at 55° Fahrenheit, 12·7 Cent., as temperate. Above that we require little artificial warmth, and a little exercise supplies sufficient for most persons. On making experiments on putrefaction, the temperature of 54° was observed to be a marked one, or, perhaps, it ought to be 55°, as it was only obtained by many approximate observations, and was not definite. It was supposed that the oxidation was facilitated by the temperature. when colder it is probable that the conducting power is too great for the amount of heat developed, and action is arrested. The same may be the case with man: below 55° the conducting power of his own person is too great to enable him to keep up his warmth, and he must therefore increase his combustion by exercise, or obtain heat from external sources. Above that point the heat is not required, and the oxidation diminishes. In the case of putrefying blood the oxidation increases above 55° in a very marked degree; but it is probable that both depend on the same fundamental fact or facts.

At any rate the point in question is one to be noted, and it is extremely probable that labour will be diminished as the heat rises above that temperature. There is a difficulty in the analogy, as the temperature of man is not lowered to that of the external air.

The use of the lead chamber leads to a new mode of finding the amount of heat given out by man, here it is done in a way that is merely incipient. We are obliged to judge of the amount of heat after the greater amount is actually lost. The chamber might be made with sides less capable of conducting, and a more exact result found.

The production of heat from gunpowder and gun cotton is more rapid, and less is lost. If a thermometer were used capable of rising more rapidly than the mercurial, much more would be gained.

The ventilation requires to be greater in proportion as the temperature rises.

I was led to consider one of the causes of this when working on the gases of putrefaction. It was then perfectly clear that the putrefaction proceeded exactly as the temperature rose, not ceasing at a little above 130°, perhaps approaching nearly 140°,—which marks another point in organic substances of importance, as being that at which albumen coagulates. At any rate, as the temperature rises within any attainable limits natural to this country, the necessity for ventilation is felt. The organic matter becomes especially annoying, even with a small increase of carbonic acid. The heat expands it. The substances that annoy us are very volatile, and we may suppose that they begin to decompose in the air when the temperature rises. Indeed, it is scarcely a supposition; it is a fact that after a time they become entirely changed, whether they be organic or inorganic. Sulphuretted hydrogen becomes oxidized, and the unpleasant odours in the mining galleries become the smell of apples. In a house, the organic odours, if shut up, become mouldy or putrefactive according to circumstances; but if the last, they are more rapidly remedied by abundance of air, which oxidises and washes them away. In a low temperature they will lie unaltered on every substance, and start out again when are they warmed. This action is more distinctly seen when the quantities of oxidizing matter are large; then the eye can perceive the amount daily diminishing until it is all carried away.

If this result be caused by the action of warmth it is not right to demand as much air for ventilation in a cold day as in a warm; it is not right to break the windows of patients in winter, and to tell them that fresh air is better than heat. The chemical action, and with it the feelings, demand warmth first above all things. It is the very first demand, as no function can go on without it. You may live hours, days, or years in badly ventilated places with more or less discomfort and danger; but a draught of cold air may kill like a sword, almost instantly. In railway carriages, therefore, and in houses also, the great instinct of man is first to be warm enough; and he is quite right. Such a universal instinct must not be sneered at; and even if it had no good scientific foundation it must be considered as a power strong enough to stand on account of the number of its supporters.

Whatever it be that causes organic substances to be unpleasant, they are very much connected with the lungs, as the body may bear the heat if the mouth only has the advantage of a good current of air. Certainly this points strongly to want of oxidation and diminished strength on that account. Again, if these minute substances are oxidizing in the air, they will

in the lungs be candidates for the oxygen of the air that the blood is seeking, and act just as sulphuretted hydrogen would act. Moreover they are taken up more rapidly than mere gases would be, as we know from the capacity they have of remaining so as to make a room unpleasant long after the air has been changed; that is, if time has been given them to settle. This is peculiarly to be observed in some churches, and so far is it true that you may know for some time, and at some feet distant by the smell of the clothes, if people have just lately come from such a church. This will not occur when there is warm air, or when the windows have been sufficiently open. Again, near a great number of the working people the same smell is perceived as in their houses. And this great fact is, after all, one of the main causes of cleanliness, as it has produced in us a dislike which demands its removal.

The intense heating power of the gunpowder is to be remarked, and the sudden change which it produces. It is not easy to imagine any greater advantage to the miner than the removal of this evil. Analyses point to a fresh current on the floor, whilst a warm and less pure current is above. Some such thing must take place to keep the mines even in the condition in which they are, and to explain why they do not become filled with poison. Although gunpowder is said to have been used at Rammelsberg, as early as the 12th century,* it was not used with great effect till very modern times. We cannot say, however, that its use has made the mines less fitted for life, as before its time it was usual to heat the rocks by burning wood upon them, after which the place was left for a day or two, till the smoke became tolerable. Some recommend the miners to wait from Saturday to Monday, some from Friday. This practice is not entirely given up, according to accounts received, as it is found useful for very hard rocks.

If gun cotton could be used of a kind which gives out none of the oxides of nitrogen, an advantage of the most pleasing kind would be gained. The solid matter, the crystals and carbon, would cease to trouble the miner, as well as the sulphur compounds that follow every explosion.

The production of heat must be of great advantage to the mine ; it makes ventilation possible. A mine without workers becomes filled with stagnant air. It is the problem of miners to compel that heat which is formed so to warm the air as to produce a current. If the air is led towards the shafts this effect will be produced. There are two modes of doing this : one is by drawing out the warm and foul air directly, another is by driving in pure air to the men, and so forcing the foul air towards the shafts.

GUN COTTON.

As gunpowder is evidently one of the most deleterious ingredients affecting the air of mines, the Commission was desirous that the products of combustion of gun cotton should be examined, in order to find if that substance promised to perform the work of blasting with a less injurious influence on the air.

Hecker with Schmidt and Teschemacher with Porret obtained as products of combustion of gun cotton†:—

	Hecker with Schmidt.	Teschemacher with Porret.
Carbonic acid - -	20·8	12·92
Carbonic oxide - -	37·6	20·47
Binoxide of nitrogen -	17·2	21·94
Nitrogen - - -	4·0	4·11
Cyanogen - -	—	7·58
Carburetted hydrogen -	4·6	—
Water and loss - -	15·8	32·98
Parts by weight -	100·0	100·00

In a report by a committee of the British Association the gases from gun cotton and gunpowder are given as below, the analyses of the powder being made by Lieut. Karolyi :—

Gases of combustion, volume per cent.	Bunsen.	Karolyi.		
	Sporting powder.	Rifle powder.	Ordnance powder.	Gun cotton.
Nitrogen, N -	41·1	35·3	37·6	12·7
Carbonic acid, CO_2 -	32 7	48·9	42·7	20·8
Carbonic oxide, CO -	3·9	5·2	10·2	29·0
Hydrogen, H -	1·2	6·9	5·9	3·2
Sulphuretted hydrogen, HS - -	0·6	0·67	0·86	1·8 carbon
Oxygen, O -	0·52	—	—	25·37 water
Light carburetted hydrogen - -	—	3·02	2·7	7·2

Among these gases there is no nitric acid and no binoxide of nitrogen.

Nitrous fumes must be considered dangerous to breathe. Fatal cases reported in the "Chemical News"* prove that some of the oxides of nitrogen are dangerous to a degree far beyond that which the senses would expect. The sufferer leaves the place well, imagines he has recovered when he feels the influence of purer air, and in a few hours the effects of breathing the nitrous fumes begin, and he is fatally attacked.

Nitric acid and most of the oxides of nitrogen have a powerful oxidizing action on metals, and this characteristic has caused gun cotton to be much feared in connexion with fire-arms.

The improvements made by Baron Lenk in the manufacture of gun cotton has made the analysis by Karolyi of the products of combustion more probable than that by Porret and Teschemacher. The difference between the two is great.

As it was well known that Mr. Abel, F.R.S., of the Woolwich Arsenal, was engaged working on gun cotton, I was very desirous that he should give his experiments to the Commission. He informed me that he had made some advance in the subject, and that the results promised well ; he was inclined to believe that when the explosion was under pressure the oxides of nitrogen were decomposed. It is not agreeable to enter on a subject when you may even by accident reap the labours of another, but the Commission was unable to wait, and Mr. Abel was not immediately occupied with the question. I was

* Reitemeier's Geschichte des Bergbaues.
†Jahresber., Liebig and Kopp Vol. 1, 1141.

* Vol. 7, 1863, pp. 132, 156 167.

besides informed by Mr. Scott Russell that although an official inquiry was going forward, the whole question was quite open, being made so by the Austrian Government under which the later improvements were made. It was therefore clear that to make a few experiments on the subject was not an act for which I could be blamed.

Mr. Abel kindly supplied the specimens of cotton, and I suppose therefore that it was of the best quality.

The main results are contained in a few lines, which may be here put at the beginning.

Left loose, and lighted with a hot wire.

Amount of gun cotton exploded.	Per-centage of acid calculated as nitric acid.
0·2 grammes	3·48
0·2 „	3·48

Heated by the lamp, as shewn in fig. 9, but loosely rammed.

0·2 grammes	5·22
0·2 „	5·22
0·2 „	4·06
0·2 „	4·06
0·1 „	3·48

Rammed hard and beaten in the same way.

0·1 gramme	1·16
0·1 „	1·16
0·1 „	1·16
0·1 „	1·16
0·1 „	1·16

In the last five no very perceptible difference could be ascertained.

In the mines.

About 30·0 grammes - Trace.

In all cases, those at the mines excepted, the amount of acid was evident to the senses, but it must be remembered that the gases were confined to a very small space, and not diffused through a great volume of air as in the mines. In order to obtain the gases after explosion a copper cylinder was made 14 in. long, and 4½ in. diameter. A small cannon was attached to one end and pointed into the cylinder. At the other was a tube which was fitted into an air-pump. The cannon was loaded and screwed into the cylinder, which was then attached to the air-pump and freed from air. The touch hole of the cannon was screwed up also, and firing was performed by placing a lamp under the cotton as at fig. (9). By this means all the gases were retained. The only wadding used was soft paper, and when the explosion occurred the only sound which could be heard was a slight tinkling caused by this paper striking against the opposite end of the cylinder. This showed that a good enough vacuum was obtained. Very different was the result even with 1½ grain, which caused a very loud explosion when no vacuum was used. No cyanogen compounds were obtained amongst the products of combustion.

Mr. Prentice informed me that this mode of heating the gun cotton was not a fair one, because heat caused the evolution of acid. This seems to be the case from the results given. Some explosions of the cannon were therefore made by firing gunpowder first, which communicated the fire to the cotton. Still in this was found binoxide of nitrogen. It was not apparently less than in the previous cases, but an absolutely unobjectionable way of doing this experiment quantitatively would require a change of apparatus; it has been done qualitatively several times.

As the oxides of nitrogen, the substances to be feared, are found diminished according to the violence of the explosion, it was important to know if the use of greater quantities of gun cotton, producing more heat during combustion, would give out gases of a more innocent character still. To examine this, Lord Kinnaird had arranged a meeting of captains of mines at Dolcoath, Camborne, with whom I was to act, examining the products of combustion. Accident prevented me going down the mine, but Mr. Richard Pearce of the Royal Institution, Truro, took the apparatus down, passed the air through the solutions, and brought up specimens immediately after the explosions. Several solutions were examined, the amount of air passed through being 1470 cubic inches, but only a trace of oxides of nitrogen could be found in any, and with difficulty. Considering that nitrates could be found in a few cubic inches of air after the explosion of gunpowder, the result must be considered excellent.

One of the principal objects in view was the observation of the effect of the products of combustion of gun cotton on the senses.

Whilst the experiments were going on underground I selected a hut somewhat about the height and breadth of a "close end," and about 10 feet long, as fitted for making similar trials aboveground. In this was laid a large mass of granite; a hole was bored in it by a miner, and it was fired with gun cotton. When the fuse was lighted all present ran into distant corners, and remained quiet for about a minute or two, their usual time. At the end of that time they became impatient, and some were actually rushing towards the hut to examine into the cause of the delay of the explosion. Some of us who had more caution interfered, and advised a return to the hiding holes. It was well they returned. The explosion was pronounced successful, but although it was believed by the miners present that the gun cotton had done all to the stone that powder could possibly have done, they were surprised that the roof of the hut was not blown away. They held this as a proof that the action of the cotton was different from that of the powder. Probably the vapour of water condensed before reaching the roof.

We all entered the hut instantly. The place was full of a light coloured or nearly white vapour, with a rather pungent smell, having in it nothing at all resembling nitrous gas, or indeed any acid substance whatever. I could think of nothing similar to this containing nitrogen. After all there was not much of it, and it was far from resembling in intensity the smell of gunpowder after explosion in such a place. If the senses could detect any nitrous gases in the vapour, I would not speak in favour of it, but after remaining in the midst of it till it disappeared, I am compelled to defend it against any such charge. The man who bored was much pleased, and all the workmen with whom I spoke preferred very much the vapour of gun cotton to that of gunpowder.

I had tried gun cotton loosely burnt in the lead chamber, which was made to resemble a "dead end," and there the amount of nitrous gases was so great that it was determined that if no improvement did take place the report must be rather against cotton. But in the hut all this fear had disappeared, and Mr. Richard Pearce informed me that underground also there was not the slightest smell of nitrous gas.

There was now a new riddle. Why was there smoke, and what was the smell observed? No one seemed to

know the smell of a fuse; it is never used by itself, and although sometimes it burns without lighting the charge, the men do not enter such places till the smoke is gone. Of this I was informed, although the reckless intention which was leading the miners to the hut before the explosion occurred made that doubtful.

In order to settle the point, the hut was shut up, a burning fuse being inclosed in it; when we entered it after two minutes, there was the same white smoke and the same smell before described; it was now explained to be that of distilled or half-burnt canvas and tar mixed with the gunpowder of the fuse. So strong was it, that I do not hesitate to say that the smell of the gun cotton was not in the slightest degree perceptible; in other words, it had no perceptible influence on the smell in the hut. Such a fuse is not necessary. It is not used everywhere, and in reality seems rather to be a peculiarity of some districts; those manufactured in Camborne for most places being different in composition.

In every trial in which the effect on the senses or the breathing, and as far as we can judge on health, was considered, gun cotton has come with off the highest character. I feel much confidence in speaking thus highly in its favour.

Combustibility of Gun Cotton.

When the trial was in progress in the mine, a circumstance occurred not seen by any one but the sufferer. It was told me by Mr. Richard Pearce. A miner, to whom a piece of gun cotton had been given in the form of a rope, found it too long, and having no knife, struck it with a hatchet; it took fire and burnt him. The burn was unpleasant, but not serious. The act illustrates one of the characteristics of the cotton. In order to obtain definite results regarding its combustibility, a few experiments were made, and are here described.

A thick plate of iron was placed over a gas lamp and heated. On the plate was laid a little gunpowder and gun cotton. It was intended to add a little at short intervals until the plate cooled, in order to obtain some comparative idea to begin with of the different temperatures at which the two exploded. It was found that the plate was so thick that it could not be heated sufficiently to explode the gunpowder. The gun cotton, however, went off readily. The two were placed n contact, and still only the gun cotton exploded.

Then the gunpowder was added in a thick layer, so that gun cotton might be laid over it without touching the iron. When this was done, the powder was heated to such an extent that the cotton fired, but although the flame covered over the powder, it failed to cause ignition. Six times was the gunpowder enveloped in the flame of the gun cotton without combustion being effected. The gunpowder melted, that is, the sulphur became soft and began to distil, and the whole was finally fired by touching with a hot wire, which, however, appeared quite black in daylight.

This experiment may not always be successful when the gunpowder is warmed. In one case also a piece of gun cotton fired powder even when cold. The purity of the cotton will probably influence this, solid matter conveying the fire easily.

This experiment shows an extraordinary difference between these two substances. The want of solid matter in the flame of the cotton, a circumstance to which Mr. Scott Russell in his lecture at the Royal Institute attributed much of the peculiarity of gun cotton, is no doubt one of the causes of the incapacity to fire gunpowder; another cause may be the rapidity of the explosion, although gun cotton will ignite another piece placed at a distance, that is, at the extremity of the flame.

Gun cotton on melted sulphur takes fire at a temperature below that at which sulphur will take fire.

It was found to explode on sulphur when the thermometer in the melted sulphur stood at 437°.

It was found to explode on mercury when the thermometer there was at 415°.

This readiness to take fire is against gun cotton. On the other hand its disinclination to ignite other bodies tells a little in its favour, but not so much as its combustibility tells against it.

When gun cotton is struck on iron by a hammer it explodes. Very curiously it does not communicate its fire to itself very readily, as it frequently burns exactly under the hammer, and no farther, showing partly the effect of suddenness, and partly the effect of the hammer enclosing a space for an instant, in which the explosion takes place, and out of which no flame can issue. For this reason a heavy blow will be less efficacious in causing explosion than one moderate and well measured. With such a blow the whole mass explodes, and that violently. If the cotton is wrapt up in a ball the whole will explode more readily; if it lies loose it may not explode except exactly under the hammer.

Gunpowder struck with a hammer in the same way takes fire readily, and the whole of the amount used is generally quite consumed.

Gun cotton struck between two plates of copper requires a very hard blow; the plates I used were rather flexible.

Gun cotton on stone fires with a very light blow. The friction of the rough stone seems to aid the explosion.

In the Report of the Committee of the British Association a comparison is made of the products of combustion of cotton and powder which scarcely does justice to the first. We must consider that for the same purpose one of the gun cotton will be equal to four at least of the gunpowder. We have no analysis of the gases of mining gunpowder, and it really varies so much that no analysis will be quite correct; but let us take as nearest to it that of ordnance powder, and we shall have, by dividing the gases of gun cotton by four, according to the analyses already adduced:

Gases of combustion.

	Ordnance powder.	Gun cotton.
Nitrogen	37·6	3·1
Carbonic acid	42·7	5·2
Carbonic oxide	10·2	7·2
Hydrogen	5·9	0·8
Sulphuretted hydrogen	0·86	0·0
Light carburetted hydr.	2·7	1·8
Carbon	-	0·4
Water	-	6·2

In all sanitary points the cotton has the superiority, according to the above, except perhaps in the carbon, and the superiority would have been there also if the carbon of the gunpowder had not been forgotten.

When we view the gun cotton with relation to its combustibility, we have not the same favourable view. Six of us stood before the mass of granite in the hut, when a man was preparing the charge by violent blows with a heavy tamping rod of iron.

With a light hammer and slight blows I caused fifty explosions in a few minutes. It seems to me that men should not be exposed to such danger, and even with gunpowder it is not a fair treatment of a man with his dependencies and his responsibilities. I cannot go farther in this matter than saying that it seems to me that care should be taken that no direct blow should ever come against the cotton, or even the powder.

Again, the present mode of manufacturing gun cotton produces it in the form of a rope. The advantages obtained have been fully explained by Baron Lenk; my short experience of it makes me afraid of using any friction whatever, and my belief is that it will not be safe if it is given out otherwise than as a cartridge, not to be divided. If, however, it were made readily divisible, and the purity of the cotton obtained by the rope system still preserved, it may be remembered that the grains of the gunpowder are so convenient that an approach to them would offer many advantages. Suppose, for example, that the rope were cut when moist into pieces of the size of play-marbles.

I do not wish to draw extravagant conclusions from the following, but it speaks well. Calculation in this case is really better than one day's experiment, as we know how much carbonic acid and oxide are produced.

Analysis of Air.

Before blasting in a close end -	20·77 oxygen.
After blasting - - -	20·76
„	20·74

PART III.

SUMMARY OF INFORMATION DERIVED FROM GERMANY AND GERMAN SOURCES.

The advantages of pure air and the importance of arrangements for obtaining it have been strongly insisted on in England for many years, but the knowledge has not penetrated the entire community even yet with sufficient vigour, and the most instructed are unable to give directions suitable to all the circumstances of the population. The whole mining population has known the advantage of pure air, whilst the causes of its deterioration, as well as the mode of rendering it wholesome, have been more thoroughly perceived by them than any other class of the working people. They have acted on this knowledge, but the results have never been known to them in all their fulness, and as with a large part of the population in their houses, so with the miners in their mines, the test of the impurity of the air has been an inability to breathe or an inability to see. It is exactly as if we were not to pronounce food unwholesome unless we found that either we could not retain it when swallowed, or if retained we were poisoned by it. Unwholesomeness in food shows it to be a slow poison; it may diminish life by one year or by twenty or more years. Ordinary observation neglects the one, two, three, and even the twenty and thirty per cent. of diminution, and begins to be impressed only when such gross numbers as fifty or sixty are reached. This is abundantly shown in the history of the sanitary inquiry in England, where it has been found that in large communities a death-rate of 36, being 66 per cent. on the average death-rate of the country, has not been clearly observed, and although its existence is proved as well as man can desire, there is even now a lurking belief that after all there is some mistake. This, however, does not represent the still higher death rate of certain portions of the community, entirely unobserved by the passing or inexact spectator. All the chronicles of the world are full of this carelessness or want of observation, and the history of the sufferings of our race is, to a large extent, a history of this very absence of attention.

As no country has paid so much attention to domestic ventilation as England, it might be expected that in other countries there would be very little new information obtained; but I nevertheless thought it right to examine the condition of the subject of the ventilation of mines in Germany, for with them the art may be said to have begun. This was done with a strong faith also that much information would be gained. Germany has many keen and constant observers, who are penetrating continually into new corners, and although I had not met anything on the air of mines in their writings of late, I did not think it probable that the subject would be neglected entirely in such famous mining academies as Freiberg, or the younger institution at Clausthal in the ancient mining district of the Harz. I expected to find some knowledge, not merely because I had been long aware of the wide scope of thought, as well as the great capacity of detail, that characterized the German scientific man, but because of the great care which the Governments of Germany had taken of departments in many respects quite disregarded by us. It is not to be discussed here whether this custom of Government supervision has been politically or socially a failure. I believe, as a rule, it is the latter only because it has been excessive. But with regard to many of the arts and sciences, and to mining especially, the most valuable results have been obtained by the combined labours of the many professors and other officials who have received from the Governments clear and distinct duties, and still more, have had a fair amount of leisure, with active minds, ready to use it for the study of their calling. As I had not found the knowledge desired in journals and books, it seemed better to ask in the academies themselves.

The result of a short journey was to assure myself that although the subject had not been entirely neglected, it stood with them almost exactly as with us. One physician, Dr. Brockmann, in Clausthal, has examined the diseases of the miners there with great completeness, and has given also some analyses of specimens of the air. His results are extremely valuable, and his volume full of fine suggestions. I translate and abridge certain portions. The Government has not given it full attention, and, like new subjects, this has been left to the original research of one or a few. First, individuals make their inquiries; other individuals have their own busy thoughts and it requires much time for them to learn the exertions of the first. So with us when Dr. Moyle made his inquiries in Cornwall some years ago; they were printed, it is true, but entirely neglected for a long time. We certainly cannot complain of the professors of Freiberg or Clausthal on account of idleness; but, as Dr. Reich, whose experience has been great, said, "There has been such a pressing demand for the examination of minerals, that the subject of air has been neglected."

Pure air is certainly not an object of anxiety in Germany, and it is marvellous to find so many good complexions without it. People live in contracted

corners which would produce illness here, and plants grow in luxuriance where no blade of grass would grow with us. The light may be greater, and the heat in summer greater, or some other explanation may be better than this. Here is a subject for physiologists. But the result probably still remains, that the people suffer for their neglect.

On conversing with persons at Freiberg not connected with mines, I found an impression strongly marked that the occupation of mining was a very unwholesome one. Several persons at once said that the miner's life was about 45 years of age. The diseases are described as those of the chest and rheumatism. The first are ascribed to the bad air ; the second to the frequent exposure to wet in the mines. As soon as a miner comes home he must change his clothes and have them dried. This is done in a warm room, a room heated, where fuel is abundant, to a point far surpassing anything I had ever observed in a German house, and extremely oppressive. Brockman says from 90°5 to 107°5 F. (26—30 R.) ; Hausmann says that too much wood is used.

In the Harz, where the wood is obtained free, the custom is universal to use excessively warm rooms at home ; it may not be so common in Saxony. Among our navvies it is the rule, I am informed, never to enter a warm room with wet clothes. Some of these workers and ordinary day labourers were employed together at the reservoir of a printwork in Lancashire, where the gas-house was given them as a place of rest and warmth. The regular navvy would not enter, however wet and cold ; the others sought the warmth frequently, and suffered severely, one so much as to be quite disabled for above a year. Although this practice may be well known, it is extremely interesting to hear of it as the experience of a class of men having such opportunities of judging as the navvy.

In speaking with the more educated class of men in Germany, the opinion concerning the bad air did not agree with that of the common people, or of the general popular idea. The belief was that the suffering in connexion with the breathing apparatus was caused by the great length of the ladders. The ladder is universally used, although the man-engine is occasionally brought to assist. So far as I could hear, habitual ascent or descent by the bucket was unknown, although occasionally made against orders. It was believed impossible to take some hundred men up and down daily by such a small apparatus. There, as in England, the two opinions stood confronting us ; but it may be interesting to inquire why one existed among the educated, and the other among the uneducated. The miner's instincts are not to be disregarded ; he seems strongly impressed with the evils of foul air. The physiologist, looking at the lungs, is inclined to think of their excessive strain. Have we no class of men that are exposed to similar fatigue in pure air ? We have the shepherd of Scotland and elsewhere, who thinks little of 6,000 feet ascent or twice the height of the usual hills every day, but in a pure and bracing air. This tells against the air of the mines, and not against the exercise. On the other hand, the ascent is not so steep, and the amount is not performed in the same time as the ladder ascent. We have the bricklayer, too, who ascends 3,700 feet with 90 lbs. on his back ; but none of them do it with the violent haste of the miner, anxious to get home. This haste may be the great secret, but the sequel will show also that the air is injurious even to those who are at rest, and how much more to those who must exert themselves violently in it. The professor may see the men come to the surface panting, but he does not see them below with an enfeebled circulation. He is apt to judge of the little point in the miner's life which he sees.

It was the common opinion that the workmen at the smelting works were a shorter-lived race than the miners, the age of the first being about 40, whilst the latter arrived at 45. This opinion agrees with the numbers found by Dr. Brockmann as to the relative length of life, although the actual numbers are lower than his. This again leads us to the air as the main cause, as the workmen at the metal works have no special strain on the lungs, except so far as I can see, in some cases where very violent exertions are made, and with abundant intervals between the movements. The smelting works themselves are probably less hurtful, but the roasting processes going on around are of a most dangerous class. The metallic compounds of sulphur and arsenic are roasted in large heaps, and send out perpetual fumes which are perceptible to a great distance to the eye and to the taste and smell, as well as by their effect on breathing and on the vegetation, which is in some places completely eradicated from the soil,—at the Ockersthal Works, for example, in the Upper Harz and the Mulden Works at Freiberg. These opinions are universal in the district, and there must be a deep foundation for them. Men who have been disabled by working in the pit seem to be spoken of as known everywhere abundantly by every one. Some of these are only partially disabled, and are fit for one shift of eight hours. These are able sometimes to follow a little out-door work at home, some to keep a little garden, and some a cow. One man in this condition kept birds, by which he made about a pound a year, submitting to his fate as that common to his neighbours. He had, as all the others had, a peculiar look, well-made and apparently strong, and 43 years of age. The sight of such persons is very melancholy.

Going down the Samson mine at Andreasberg, we saw wide cracks as they might be termed at the side of the present levels. These were the workings of old times, when men were accustomed to squeeze themselves through sideways, or crawl like serpents on the ground, forcing a passage with great difficulty, without the free use of their arms, and without the advantage of the fan. Perhaps I do not do them justice ; the sides of the rock may have approached. In those days the passages were high or wide enough where there was ore sufficient to justify the formation of a roomy spot. In those days, *berg krankheit*, the mining sickness, was common, according to Professor Gätzschmann, but it has almost disappeared since wide passages were made. Now wide passages have come in with deep mines, and yet the disease has, according to good authority, diminished. This speaks conclusively as to the cause of the evil being connected with the state of the air, and not the depth of the mine, or in other words, the length of the ladders. According to Brockmann this mining sickness has by no means disappeared, but it has not by any accounts increased.

It would be unfair, however, to older miners to speak of them as ignorant of ventilation ; the accounts of the 16th century prove the contrary. The mines have deepened, and the workings enlarged. The necessity for more care is a natural consequence.

The miner is nourished in this belief of the shortness of his days, and his whole life receives a tinge from it. He sings of it in his hymns, he hears of it in his sermons, and the annuities established by the state continually remind him by taking a portion of his weekly wage as a compulsory insurance against evil days. Notwithstanding, therefore, the existence of some of the enthusiasm from old times, and the undoubted preference still shown among the young population for the mining life, a strict inquiry does not prove that the experience of the people gives to this occupation a favourable character. This spirit I might illustrate from my own experience; but illustrations from printed matter, such as the songs and hymns among the people, will be far more valuable; and my belief is that the evidence proves the miner's life to be hard, badly paid, and unwholesome, even in the very centre of the district which admires it most.

Hausmann on the Harz Miners.

Hausmann* whose work in 1832 on the Harz is almost exhaustive, speaks strongly of the great enthusiasm existing for the work of the mines, and finds it scarcely possible to induce the men to work at anything else; but after all, the actual number in the mines is not great, namely, 5,434 at the silver, lead, and iron mines and works. His successor, Jugler, in giving the statistics of the Harz, puts down the present number at 5,805. In both cases the forest workmen are left out.

Hausmann makes the number of deaths in 1830, 25·4 in a 1,000, but no long details are given. The number of births, male 492 female 485
deaths „ 359 „ 339.
The number of deaths among females is less than among males by 14, or 3·9 per cent.

The actual number of deaths, however, does not seem very high considering the circumstances. To give this any significance, the value of life of those in mines and out of mines must be taken. This number refers to the whole population, which in 1830 was 27,487.—5,434 were on mining works, but little more than half would actually be in the mines. Hausmann looks on the accidents as the dangerous part of the labour in the mine (p. 59). He gives the average in a year at 10–12. He puts the wages at 6–9 shillings, but from his table 7 to 8 would approach more nearly.

Hausmann's work is written in great anxiety for the future of the Harz. He was well acquainted with the miners, and considered it quite impossible for one to keep his family without working over-hours or bye-shifts even when the wife attended to out-door work of any kind that could be got. We learn from him, as we may learn by looking on now, that the girls were sent out in summer to gather berries, in winter to gather dry wood. The boys were more carefully kept at school, but generally were put to work very early. Attempts had been made to introduce other manufactures and work for the women especially, but these had failed; hands could not be got amongst them for wool spinning when they were very much wanted. Still some were occupied in making wafers, starch, vinegar, brandy, soap, candles, lace, paper, sieves, buckets, and other wooden articles, as well as in sawing wood. Since then matches have begun to occupy at least 1,000 persons. It is probable, however, a proof of insufficient labour to find so many employed as I saw in 1863 in the lounging occupation of bird snaring.

Dr. Brockmann's Work on the Harz Miners.

Dr. Brockmann's work on the diseases of miners, especially of the Ober Harz, deserves the attention of medical men, but in the mean time I shall give some of the opinions and facts found in it more immediately relating to our subject.

The greater number of the inhabitants live 1,800 feet above the level of the sea. The inhabitants are of a powerful make.

At Clausthal the pressure of the atmosphere is 314 Paris inches of mercury instead of 336 as on the plains. This will give on the Paris inch 15·0889 pounds instead of 16·1461. Allowing the oxygen absorbed at 336 to be 1·1505 grammes, it would only be 1·0751 grammes at 314 inches. The carbonic acid found in the first case would be 1·353 grammes, in the other 1·2644. The difference would be considerable if not compensated by an instinctive increase of rapidity and power in breathing and other conditions. For example, he thinks that one of the conditions is the low temperature, which is 43¼ F. at Clausthal. (+ 5 R.)

He considers the temperature dry, and the air to be seldom still, removing unwholesome vapours and preventing epidemics.

He mentions the small amount of electricity as caused by the absence of thunder storms, and imagines that, although free from the influences of air so charged, its absence may increase rheumatism.

As foreign bodies in the atmosphere, the balsamic emanations of the fir forests are mentioned, although it is supposed that they may slightly diminish the oxygen.

The Dwellings.—The houses are badly built, kept extremely hot, and are densely crowded; as a slight compensation they are full of draughts, if this can be a good mode of introducing air. He speaks of several families dwelling in one apartment, and of the warmth being from 90 to 107 of Fahrenheit during the whole year, and of the small sleeping rooms with three or four beds in contact. In such case he adds it is well when the roof is not very tight.

Food.—Dr. Brockmann laments especially the want of abundant vegetables, a want which is partly made up by the great abundance of strawberries and bilberries. But he speaks also of the great lack of animal food. The workman has flesh at most only once a week, and is contented with bread and bacon. (This is not a very inferior diet, and is superior to that of the Saxon miner, if it is had in abundance.) The food is very carbonaceous; the water very pure.

The habits of the people are cleanly; no decent workman ever thinks of eating after returning from his work, until he has washed himself from head to foot and changed his clothes.

The Harz miner is a descendant of Bohemian, Saxon, and Frank miners, who came in ancient times and have left proofs of their migrations in the language itself. They form, as Heron de Villefosse says, a strong and patient people, which have taken for a thousand years numerous treasures from the earth, and have still remained poor; a people proud of the dangers of its occupation, and the rigour of its climate; preferring to the rest of the world its own hills and mines in the happy possession of a constant community of feeling and a peculiar natural pride.

* Ueber den gegenwartigen Zustand und die Wichtigkeit des Hannoverischen Harzes, von D. J. Fr. L. Hausmann. Göttingen, 1832.

The pleasure which many writers have in speaking of the strength of the Harz people forbids us looking to any general deterioration of character of body or of mind.

Entering the Mines.—Entry is made by means of ladders which stand at an angle of 60°–90° (or as we should frequently say 0°–30°). The shaft is 6 to 8 feet in diameter, and the ladders have steps about 10 inches long and 2½ thick. (p. 22.)

Exit.—The intense activity required for going up and down is described, and its result in acute or chronic inflammation of the heart. The man-engine, introduced in 1833, is mentioned as hopeful, but its character had not been decided. (p. 24.)

State of the Mines.—The evils encountered in the mine, are described as (p. 26) :—

1. The emanations from rotting wood.—It must be remembered that the amount of wood in the Harz mines is far greater than with us.

2. The combustion of oil.—For an eight hours' shift two workmen receive 7 ounces of oil, of which 6 ounces burn, producing 1·031 lb. of carbonic acid. Oxygen must also be consumed by the hydrogen.

3. The combustion of the gunpowder.—100 parts contain 29·5 oxygen and 21·28 carbon. These burn to 50 of carbonic oxide or 75 of carbonic acid. If then two workmen in eight hours burn ¾ lb. of powder, they will increase the amount of carbonic acid by 0·5625 lbs. Add to this the dust of the gunpowder.

4. The dust from the boring and hammering.

5. The increased humidity of the mines.—This is often very great, as besides the amount of water to be got rid of by adits and pumps, the apparatus for wetting the timbering spreads about so much water, that the men often become wet at once. (This operation is for preventing the decay of the wood, which may be preserved for about 30 years if well moistened. The water is passed through tubes, with small apertures cut along the sides like those for gas jets).

6. The carbonic acid exhaled by the men.—According to Andral and Gavarret, a healthy man between 20 and 40, which age includes the majority of miners, expires 44·746 grammes carbonic acid in an hour. The poverty of the air in oxygen might diminish the amount, but the great exertion of the workmen would increase it. Allowing one to compensate for the other, the two workmen will give 715·93 grammes or 1·53072 lbs. carbonic acid. Besides these causes there are peculiarities of the mine atmosphere, which, although of less importance are not to be forgotten.

7. The want of sunlight.

8. The sudden change of atmospheric pressure, which is obtained by going up and down.

9. The frequent and sudden change of temperature.

10. The action of draughts.

11. The mechanical injuries, caused by falling stones, and the action of numerous machines.

We may characterise the air as (p. 29):

a. Constantly dark; often very wet, heavy, changeable and draughty.

b. As filled with mechanical particles.

c. As poor in oxygen.

d. As rich in carbonic acid.

The excess of carbonic acid is easily determined; two men in an eight hours' shift will produce—

a. By burning the oil	-	1·031 lbs.
b. „ „ gunpowder	-	0·562 „
c. By breathing	- -	1·530 „
		3·123 lbs. carbonic acid.

Bodemann found neither carbonic oxide, carbohydrogens, sulphuretted hydrogen, nor sulphurous acid (p. 33.)

The particles of carbon (p. 34) from the candle, and the fine dust from explosions, if not at once so irritating, are more frequently hurtful than the particles of stone. By means of their great fineness they are taken into the lungs by every inspiration. There they must excite the fine organs to inflammation, and cause great textural changes. If they could pass into the blood they would increase the atrabilious state peculiar to the miner. Still they always assist in forming the black discoloration of the lungs, which is the ordinary characteristic of the old miner.

The diminished amount of oxygen must contribute to an imperfect decarbonisation of the blood.

The persons chiefly exposed (p. 35), according to the same author, are those who bore the rocks. They are obliged to bend a great deal, by which a pressure is caused chiefly affecting the liver. The increased breathing consequent on the labour of boring, must dispose the lungs to take up the impurities of the mine atmosphere in a very high degree.

It is not surprising, therefore, if the borer should not live above 52 years.

Those who blast are exposed to danger in the next degree (p. 36).—Accidents are yearly occurring from this occupation, although the new mode of tamping by means of a clay stopper, has diminished them. The under captain may live to sixty-one years.

The carriage of the ore, no matter how undertaken, is always one of the most difficult and most dreaded, when carriages are used, with 4 or 5 cwt., on a rough road; the lifting and pushing are laborious occupations (p. 37). But if on a smooth railroad of iron the carriage with 18 cwt. is less fatiguing, or the boat which is pushed along by one man, although it contains 100 cwt.

Still, under all circumstances, the removal of the ore and blasted rock demands great muscular exercise, and the consequence is numberless cases of hernia.

If all these movements call forth many disturbances of the health in the open daylight, how much greater must be their result when a portion of the strength is removed by passing down the mine, and some preserved for the way up again.

We think it unnecessary to say much concerning the officers of the mines, as on account of the frequent change of their employment they are very little exposed to danger. At the same time we include the most exposed of all. The captain of the mine (*Grubensteiger*, it is not easy to obtain an exact synonym) who is most exposed of all, and from early life, still arrives at the age of 66.*

The *Einfahrer* and the *Geschworenen*, Inspectors, higher officers still, attain an age of 67.

The master attains an age of 76. This shows that a life of pleasantly-mingled rest and motion is the first condition necessary for the attainment of advanced age.

* He is exposed to danger when going along the mine, and when examining certain spots, but he is not kept long in any one danger, and has change of occupation.

Those officials who are not connected with the actual working of the mines (officers of the pen) need not be taken into consideration.

Hygienic Influence of the Preparation of Ores.

In the mine itself the ore is separated roughly from the unpromising rock; it is afterwards, on the surface, broken into pieces by boys, who also sort these according to quality. This occupation is performed in large rooms, round which the boys sit. The rooms have generally or always large stoves in winter and summer for the warming of food, as well as of the apartment (p. 40).

After this operation the ore is stamped and washed.

Dr. Brockmann continues:—The dressing of the ores is then in a great measure done by machinery, and in any case demands only a moderate application of strength; for which reason this department generally forms the entrance and exit of a miner's life.

At the same time he includes, among the dangers, a violent muscular action as occasional. The chief evils, he adds, connected with preparing the ore are:—

1. Violent muscular exercise.
2. Action of damp.
3. Action of draughts from working in open workshops.
4. Action of dust.
5. Substances set free during the stamping, such as lime.
6. Mechanical lesions from the action of the machinery.

Still the danger of the stamping and washing and the labour on the waste heaps cannot be compared with mining. The evils connected with the preparation of the ore can all be avoided by a little attention.

There are, however, some dangers connected with the work of breaking the ores, of perhaps more importance than those directly connected with health. Dr. Brockmann says:—

The great evil is that boys should be employed, individuals whose growth is unfinished, and whose powers are not ripened. It is a sad experience that whenever men are compelled to gain their living at an early age their powers are readily misused. This is seen in our manufacturing places. If we read the annals of foreign countries* we must see how true this is, and be glad that we cannot in the Harz vie with them in this direction, which is so destructive to every sound organization. Still, we are not free from the disadvantages. The father who is at work seeks as soon as possible to use the strength of his son, and brings him about his tenth year to the sorting room. The choice too is not always according to the father's wish, and healthy sons are found to be living at their ease when the weakest are sinking under the work of the ore breaking.

Sometimes the boy must work twelve hours a day for six days in the week. In the morning he must rise at 4, and go to the mine overpowered with sleep, and sometimes fasting; if late he goes very rapidly. He works without intermission from 5 to 11. He has then an hour to rest, but he must work again till 4. If he has to go to school he leaves earlier, a weary mind in a weary body. Sometimes his rest is broken by night work.

The exercises of youth, fighting, wrestling, leaping, and running, excellent as they are and advantageous to a strong person, are extremely hurtful to relaxed muscles.

Under the head of Asphyxia Metallurgica we include all sudden danger to life produced by the air of the mines. (p. 187).

The common bad Air.

This is characterized by an excess of nitrogen, and by its specific lightness,* as well as by its unfitness to support combustion. Hausmann found in the year 1805 in a mine at Andreasberg air of the following composition—

81·42 nitrogen.
13·75 oxygen.
4·83 carbonic acid.

An analysis of air obtained at Bockwiese, where it could be more accurately examined, gave—

86·52 nitrogen.
12·12 oxygen.
1·36 carbonic acid.

"We must, however, remark that these analyses, as well as those undertaken of mine air give more or less uncertain results, as, in order to make them, air must be used which is better than the original injurious quality." (This relates to a mode of analysis evidently producing uncertainty in the results.)

This kind of air is common in choked or flooded workings.

Combustible gases have been observed in the Harz probably arising from decayed woods, and gases arising from the combustion of wood have also caused great misfortunes.

ABRIDGMENT OF DR. BROCKMNAN'S SUMMARY.

PART I.

General Principles of Metallurgic Prophylaxis.

General Principles for the Board of Management.

(p. 330.)

The care of the physical welfare of the workmen is the first and most sacred duty.

Decisions are not to be left to individuals.

The careful consideration of such important matter as the method of obtaining the highest earthly good for men surrounded with such dangers as miners are exposed to, must be based on the widest views, both as regards technical and sanitary knowlege, and as these are not to be found united in the individual, a metallurgic sanitary committee under the chief board of management is advisable.

This committee might consist of officers from the three departments, the mining, the dressing, and the smelting; and of a physician.

They ought to report quarterly.

They would give constant attention:

1st, to the works.

2nd, to the workers.

They would see that the works were conducted according to the precautions of the sanitary police, and observe any dangers, whether mechanical, chemical, or dynamical. Also they would be expected to introduce requisite precautions.

As duties may be named:—

1st. To decide on the proper time of life for beginning work. This would include an inquiry into the condition of health and constitution best suited for it. Also on the freedom from those diseases which are found by experience to attack the workers.

* I fear England is alluded to here.

* Surely not in Harz mines.

2nd. The individualization of the workman; that is, suiting the work to individuals, or seeking the suitable individual for each kind of work. The son follows the business of the father without consideration of fitness. "All hitherto done in this direction has been proved entirely insufficient."

3rd. The change of occupations (p. 335). The plan of preventing any change of occupation is very hurtful, although certain technical facilities are obtained by keeping men strictly to one class of labour. "How easy is the change; consider the great variety of labour in metallurgic works, and what a difference there is between the miner and the ore dresser." It will repay the trouble of overcoming a few little difficulties by giving up old principles and customs, although a few technical obstructions may occur; although also the expense is apparently increased, a satisfactory equilibrium would soon be established.

4th. The proper time to cease working. Men are anxious to finish the work of the week and obtain their full wages. This they are often not able to do without injury. In the Oberharz no one is allowed to return from sickness to work without a certificate of convalescence. But this is not sufficient; when weakness or age unfits a man for any particular kind of labour he may yet be fitted for work of another kind, and it is extremely important for himself and his family to find this. How trifling is the small gratuity of the union. It is a pity that some department of the dressing or washing does not offer some relief here. Places such as overlookers might be given to such men and not to the young.

The sanitary committee should keep itself well acquainted with the condition of the workmen, and the influence of every class of work in the widest sense. For this purpose no superficial view will be sufficient, but a careful examination at stated times. The progress of the health of each should be observed, and the Commttee should know exactly the hygienic relation of the men, so as to fit it for deciding on the amount and quality of the work which is in the power of each man.

This leads to inspection of the workman's health, as it leads to inspection of the sanitary state of the mine. We know that it will be necessary to remove many an ancient custom and break down much of the deep reverence that exists for old habits amongst the miners of the Harz; but we doubt not that all difficulties might be removed. "And to remove all objections we take as our arms the picture of the metallurgist wasting away. Dumb as that mouth may be, it will rise into command, and put all objections to silence. Therefore to work, and may the sorrowing complaints of the dying metallurgist change into a blessing on those in authority!" *

General Principles for Metallurgic Workmen.

He should see that all his senses are in good condition. By this means he will much more readily avoid all the dangers of his occupation (p. 339).

He must regulate well his life diet. Life diet consists of food diet and work diet.

He must dress himself warm and clean, although he does not require unusually warm clothing; it must, however, be dry.

Every workman should have a double suit with him at his work, that when he becomes wet he may change at once.

He should have a warm, roomy, and well-ventilated house.

He must attend to great personal cleanliness, washing from head to foot every day after work, and every week having a plunge bath.

He must be especially careful to wash out the mouth, nose, and ears.

He must eat good and abundant food, using more animal than vegetable and more lean than fat meat.

He must not allow long fastings.

An important advice is to take warm soup. It is an actual necessity for him twice a day, and his meat must be more frequently warm than cold.

Brandy, if used, must be taken moderately. It may be considered as always out of place, if taken before work, and as taken in excess when it produces complete restoration of the exhausted strength and warming of the body when cold. It should only be used after long work or great exertion, or during work in cold, wet, and draughty places.

A good beer especially is recommended.

He must be moderate in all things.

He should never go fasting to his work. It is well to take a cup of coffee and bread and butter, a warm or cold breakfast with a drink of beer, as a preparation for work.

He must not consider his work done until he has washed himself thoroughly, nor before this must he sit down to eat.

Part II.

Special Rules for Metallurgic Prophylaxis.

The special rules include the duties of the governing body, the physician and the workman (p. 346).

Special Rules for the Spallers and Cobbers.

The elastic power of the young dresser is a fruitful field for prophylaxis. A blessed harvest is the reward of well-directed labour; a broken down miner's life is the curse of its abuse.

Duties of the Board of Management.

1. Not to receive any boys who have not the physician's certificate of fitness.
2. To inquire if the boy is fitted for every kind of work or only for special work.
3. To take care that the boy should not be put to long tasks.
4. To take care that a proper change of labour should take place.
5. To observe him not only at his work but on his way to and from his work.
6. To obtain from the foreman every quarter an account of the behaviour of the boys, and punish or reward accordingly.
7. To obtain from the physician quarterly reports.
8. As this information will come from the doctor and the foreman, it will be necessary, in case of any difference of opinion, to speak to the individuals themselves.

Rules for the Mine Doctor.

1. The capacity of a boy for work depends, first, on the general development of his powers, but particularly of the circulation. Inspection,

* Metallurgist is used for all those who work with the metals, om the miner to him who purifies the metal.

mensuration, percussion, and auscultation must establish the complete healthiness of the heart.

2. The less the heart departs from a normal state and the less the inclination to hypertrophy and dilatation, the more is the boy fit for work. If there be a doubt, he should have light work and a short road to it. The moving of the ores must be avoided by such.
3. When there is insufficient nourishment and an inclination to scrofula, a long road is better, if the lungs are sound, or the skin not in a condition to bear heat and cold. But such constitutions are always to be protected from dust.
4. Those inclined to rheumatism should have dry work and a short road.
5. Those inclined to thyreoid swellings, light work.
6. The son of a father with pneumomelanosis should have a long road and dry work, not at night.
7. Even a slight insufficiency of diet, as well as a slight inclination to any of the miners' diseases, is sufficient reason for avoiding night work.
8. When there is an inclination to *stomacace*, the workman should not have wet or dusty work, and he should have a long road to go.
9. It is always well to take precautions against these diseases early; better too early than too late.

The spaller must himself attend to the following rules:—

1. To go to bed early, so as not to oversleep in the morning.
2. Not to go fasting to his work, but take first a cup of milk or coffee and butter-bread.
3. He should go slowly to his work, to prevent heating.
4. He should not idle, and should not work too hard. By idling at first he may have to work too hard at last.
5. He should rest in the hours given for rest, and not waste his strength by youthful pranks. Rather let him refresh himself with a good quiet breakfast.
6. He should go quietly home and not spend his remaining strength in racing and such play.
7. On his return he should soap and wash from head to foot.
8. He should then have a warm dish.
9. A glass of good beer is good for him; all brandy must be avoided.
10. At home he must take proper rest to restore his exhausted strength.

Prophylactic Rules for the Miner.

As the miner is surrounded with more dangers he requires greater attention than all other metallurgic workmen (p. 350).

The observation of the rules will bring, if not an instant, still a sure remedy, and neglect will assuredly be followed with the severest punishment.

The Board of Management has here a triple duty:

A. includes a full acquaintance with the mechanics, the chemistry, and the organisation of the mine.

B. To take all precautions against dangers.

C. To appoint to each the work for which he is most fitted.

The first relates not merely to the machinery, but to all the mine wherever there is danger, and especially to the timbering. Although much is done in this department the many accidents which occur lead us to venture to ask if more could not be accomplished. *On the chemistry of the mine air much requires to be done. We have already proved how bad and how unwholesome the atmosphere in many places is found. We look on the lulling belief that the ventilation of the Oberharz mines cannot be improved as a very dangerous dream. As we have proved that the most dangerous diseases of the district are produced by this foul atmosphere, we believe ourselves justified in calling for the fullest attention of the Board to this subject.*

It will not be difficult to satisfy the demands satisfactorily. We must have professional opinion on the subject. We look on the want of this as the most dangerous enemy to the health of the miner, and are convinced that without it the question of the sanitary state of the district cannot be answered.

It is not sufficient that the Board should establish excellent ventilation. They must see that it continues in the same condition.

For this purpose it ought, at regular seasons, to be furnished with an exact account of the constitution of the air in the various parts.

Difficult as it may be to obtain this, a trustworthy result may be obtained with ease, by establishing a regular order of procedure towards which we propose the following:—

a. Every captain (or Grubensteiger) to bring to the proper official specimens of the air from the various places under his direction.

b. This officer should give these to the assayist or chemist for chemical examination.

c. The chemist to give the detailed results of his careful analyses to the Board of Management.

d. The Board also to receive a report from the physician, before they consider whether they should take any steps.

e. The reports to be laid before the Board.

A sound organization cannot be obtained at the mines until all the young are under the required inspection, and until all those unfitted in body or mind are removed from the works, either for the time or permanently.

1. As soon as any one observes in any of the mines an unusual condition of the mine air, he must report it to his superior.
2. This officer, after taking proper steps to avoid danger, must report to the physician. In all cases a full account to be given to the Board.
3. The Board must remove all workmen, who can in any way be injured, allowing none to enter without special permission.
4. A sanitary committee must then be appointed to prevent further danger, to save the lives of those who still remain in the pit, and to bring about a normal state of the air.

The committee must sit during periods of danger. It consists of the principal officers (these we cannot easily name, simply because we have no equivalents amongst us), the chief officers of the Board of Mines, certain persons intimate with particular spots, a physician and a chemist. They must hold their meetings daily, and two at least of the committee must be present night and day. For entering the

mine during danger the following rules are given (p. 355) :—

a. No expedition to be undertaken by one person only.

b. The persons forming an expedition to be medical as well as technical, and to be chosen from their fitness of body as well as of mind.

c. The expedition should keep closely together, forming a well-connected chain.

d. Each should have a rope round him.

e. No one should go fasting or after drinking much spirits.

f. In the neighbourhood of the pit there ought to be all the means of restoration. Abundance of oxygen, as well as naphtha, spirits of wine, and oil of mustard ; also woollen blankets and brushes, with, the most important of all, a magneto-electric apparatus.

When the danger is over this committee may be dissolved. These rules refer to cases which probably do not occur in the metal mines in England. They are more fitted for the exigencies of a coal mine.

The Duties of the Physician.

These duties are given at considerable length, and with them is a more detailed account of the probable diseases, but the principles have already been quoted.

Rules for the Miners.

1. Not to go to work without taking a warm meal, but not to allow spirits to take its place ; if taken at all, it should not be before going to work.

2. Always to see that he has taken enough to eat and drink for the time he is at work.

3. He should go quietly to his work, and not waste his strength by running and heating himself.

4. Particularly careful must he be to enter the mine with his light burning clearly, and means of lighting at hand.

5. After his work let him go quietly up the shaft, taking care not to become heated on the way by too much exertion, and if he uses a man-engine let him be careful at every step.

6. Let him remember at his work that he must work neither too much nor too little. In the one case he injures his health by over exertion of his highly taxed powers, in the other he gives way to all the injurious influences of the atmosphere of the mine, especially the wet, the cold, and the dangerous draughts, which then have a doubly injurious effect. For which reason, constant and moderate work, with stated points of rest, is in all circumstances the most wholesome.

7. He must not delay to renew the strength he loses in exhausting work by taking rest at certain times, with proper food and drink. A mouthful of spirits is advisable at such times, but only a mouthful. The least excess increases the susceptibility to the influences of the mine, and leads to incalculable danger.

8. At all times must he be careful to avoid sleeping in the mine.

9. The borer especially requires occasional rest, both on account of the peculiarity of his position and the exertion required.

10. Not less does the waggoner require occasional rest.

11. Those who fill the waggons must also take care not to use too much exertion.

12. Those at the water engines must beware of the influence of moisture.

18. After hard work rest is a necessity for the miner ; after that some exercise in the open air, perhaps by garden or field work, still avoiding all excessive exertion. Let him also avoid hot and steaming rooms, which are often worse for him than the air of the mines.

20. He must have at least six hours sound sleep.

21. At every departure from strong health let him consult the doctor.

Dizziness, beating of the heart, and difficulty of breathing, are especially mentioned. If he must give up some of his work, let him remember that his health is more valuable than his wages.

The Silver and Lead Smelter.

Duties of the physicians towards the workmen of the smelting establishment, and rules for the men themselves, are then given, but they do not differ very greatly from those in the case of the miners.

The workman must carefully avoid as much as possible the breathing any lead-smoke, wash himself well, and not eat in the neighbourhood of the fires (p. 373).

9. He must be very careful of his diet.

a. He must avoid all vegetable acids, salad, and all food prepared with vinegar, as poison to him, a little before and a little after the work, and even at other times. Even the common drink in the Harz the Broihan, (a pale ale, called also Breyhan after its first brewer), is suited for him only when well fermented and entirely free from acid.

b. On the other hand he should take a good deal of sweet milk at breakfast and at other times ; he should therefore always keep a cow.

c. He ought to eat a large quantity of fat ; fat butter is as good for the workmen at the smelting works as it is hurtful to other men ; his other food may also be eaten with fat.

d. Generally let him live more on animal than vegetable food, carefully avoiding all acid fruit.

10. He should take a certain number of sulphur baths every summer.

11. If in any difficulty regarding health let him consult the doctor.

12. If he receives advice from the doctor to leave the works let him rather lose a part of his wages than the best part of his health.

For iron, copper, and arsenic works the advice does not greatly differ.

Some Remarks on the German System.

It appears then from abundant testimony, that the atmosphere of the mines in the Harz and in Saxony is very impure ; and yet we may expect it in general to be purer than that of our own mines. The reasons for this lie in the whole social and political economy of the districts. In both places the mines are under the strictest government superintendence. In both places the desire is expressed, not that the mines should yield the greatest possible profit, but that the population may be able to live on the produce of the mines for as many years as possible. The fear of poverty has rendered them cautious of using their treasures, and a strangely expressed anxiety for the state of their posterity and their country some cen-

turies after them has led them to leave the treasures in the earth, and with great self-denial, refuse to use them for the wants of the day. The next generation, or perhaps the living one, may think otherwise, and use up in a few years the treasures intended for centuries. The intention of the governments is so good that one is unwilling to see evil in any of the results, but must admire that large and still thrifty spirit that seek slike a kind mother to feed with her own hands all the descendents of her own stock, looking to herself as having the gift of feeding and her children that of consuming, but never thinking that her precious gift may also descend to the children themselves, some of whom may learn to feed more than ever came under the aged mother's eye.

The first view, that we must preserve the world for our children is narrow and presumptuous. It assumes that we have obtained the good things, and that nature has no more to give ; it assumes that if good we can secure them to any one. A wider view informs us that we know but little and have but little, and our children must know more and receive more or they will be discontented. It may be asked, Is it a pleasant thing to prepare a long but gloomy life for a people during several centuries, when all these riches might be taken out in a few years and the money used for wholesome open purposes ? Here there is wealth hid as thoroughly as if sovereigns were shut up in a box. It is capital not bearing interest, if indeed it can be called capital in such a case. If taken out rapidly it might so invigorate the community that a new era of prosperity would at once be achieved.

One rule is evidently making itself felt in the world, and that is that energy gains the day. Energy is strength used with speed, or strength multiplied by speed. You may have coals burning for years under a boiler so slowly that the water will never boil. This boiling can only be attained by burning at a certain speed. So in all manufactures, the work must be done at a given speed, or it is better not to do it at all, as loss will ensue. As the arts progress coal must be burnt faster to melt iron, and bellows must blow it ; again an advance is made and hot air must be used ; another advance and the air is applied to the iron itself, as in the Bessemer process. Steam must be raised to hundreds instead of units of pressure, and spindles must run faster. Training is used so that human beings may do their work without losing time by blundering ; and education, in the same way, is greedily sought because by its means an engine is attained of rapid work. Every high-trained business man is an engine of higher pressure, and every highly-trained literary man is also a mind with less stoppage in its movements. The glow of genius itself seems to be a higher power put on, the energy of two hours compressed into one. As a hand which can lift only 50 lbs. will labour for a life-time in vain if it tries to lift 100 lbs. at a time, so no amount of weak thought will solve a difficult problem ; but double the 50 lbs. and an equivalent to the 100 is obtained, it is two forces acting in one time, and greater energy of mind will solve the hard problem.

Dr. Brockmann speaks despairingly of the Harz, and considering now long the district has been under the careful guardianship of a state really desirous of doing its duty, as we may see by many of its daily acts, the result is not quite satisfactory, and might fairly lead us to inquire into the extent to which state interference may be regarded as valuable. Both the Saxon and the Harz mines are completely under the control of the state, and the number of officials rather surprises one coming from this country. The list would be rather tedious, and would require to be somewhat explanatory, as we have no officers exactly corresponding. The higher officers have all been educated at the academy of Freiberg or of Clausthal, in order to obtain a certain rank ; others again have been educated at the mining school only, which does not grant an education suited for the higher officials. Those actually educated at the academy and retained in office are few. At one large mine, for example, employing 3,000 persons, there was only one who had been at the academy ; he, of course, was at the head of the establishment ; that is, he was at the head of the working establishment. It is not possible to find any one with full power in any mine, as the Government engineers and inspectors, the machine directors, master engineers, mining secretaries, mining councillors, directors, and chief directors, must all be consulted. There are some advantages connected with the plan. When a course of action is pursued it is done after the most careful attention which the whole official community can give ; but it is irritating in a high degree to those who see their way clearly and rapidly ; they propose any plan with little spirit, knowing as they do how wearisome will be the process of conviction. If every official writes his report he becomes responsible for the work, and he is naturally compelled to be careful ; as he has also his share of authority he uses it accordingly. The evil is in the loss of time, strength, and patience. This slowness spreads through the whole works, and seems to penetrate every worker except the boys who hammer and sort the ores. These have the spirit of youth within them, and the impatience which it begets.

This condition of things rises out of the original object of the Government in working the mine, or the principles which govern them. It is by no means the object of the Government to make as much money as possible from the mines. The object is to maintain the population for as many years as possible. It has not been found practicable completely to act in accordance with this wish, even in Hanover,* where it has been found that the ore was supplied more rapidly than can be well used.

The law in Saxony is, that every man has a right to begin a mine ; but immediately following it is said that he must submit to certain conditions, and these form a long volume of obstructions. It thus happens, that those mines which are worked by companies differ little, if at all, from those worked by Government, except in this, that the capital and proceeds have different owners. The great fear in the Harz is that the mines will become exhausted, and the population indigent ; but this fear has been periodical, and perhaps not more so at any time than in 1816 and 1817. The inhabitants increased in the upper district from 27,500 in 1820 to 35,700 in 1852, Many of the mines have decreased in value, or ceased to produce ; but some, again, could be made to produce many times more, with great ease. No advan-

* Die Bergwerksverwaltung des Hannoverschen Oberharzes, seit 1837, und der Ernst-August-Stollen, von Oberbergrathe Jugler. Berlin, 1854.

tage, however, is taken of this, and the richer mines are merely worked so far as to make up the deficiencies of the poorer to such an extent as to give the people wages of a small or moderate amount. On some occasions, however, considerable sums have been paid for emigration, mostly to South Australia.

The amount of ore taken out has a value of 300,000*l.* annually, or about 8*l.* 10*s.* for each of the whole population. If the mines were worked with more vigour, the result would be, in all probability, either the discovery of much more treasure, or its early exhaustion. In the first case, the whole district would become richer for an indefinite time; in the second, the wealth would be obtained in a few years and cease. In the first case, the advantage to the community requires no explanation; in the second, the first generation at least would have wealth enough for the establishment of the second, perhaps on a surer basis. Whether new manufactures would come into the district and occupy still more people than now is one question; and whether some of the people would remove whilst others made more of the agricultural capacities of the place, is another. Even in Hausmann's time it was said that the land suffered from want of water irrigation, all the water being used by the mining operations; and the advance made in agriculture was either small or nothing, as around Clausthal the number of cattle had been actually diminishing. Even now the population spends its strength in carrying on its back the whole manure of the town into the fields,—a laborious and degrading operation performed by the women. When in 1821 the population was 27,500 they had 3,127 houses; in 1852 there were 35,700, in 3,592 houses, whereas if the houses had increased with the people there would have been 4,379. In 1821 there were 8·5 to a house; in 1852 there were 10·5. This is an immense increase in the crowding; and although some of it has been caused by fire, it shows an incapacity to rise with the wants of the people. Or is it an unwillingness? for we are told that much more ore might be taken from the Dorothea mine, if it were wanted. No; it is a want of elasticity in the people, which has shown itself over all Germany for many years; so that, until very lately, building was very rare, and the population crowded into the same houses as their fathers. The buildings made some two to three or even four centuries ago have fitted for the succeeding times over all the country; they would have been a benefit, if no power existed in the country to obtain others. Now there is a great change.

The actual wages for a shift of 8 hours in the Freiberg district is from 7 to 8 groschen, or it may rise to 8½ groschen, or about 10*d.* a day. A strong man can work a shift and a half; so that the first makes 5*s.*, and the second 7*s.* 6*d.* Wood is not given free. In the Harz the wages may be made up to 10*s.* 6*d.*; and besides this, wood is obtained for the mere price of carriage, and even this carriage is charged at a less rate for the workmen than the higher officers. The Government takes entire charge of the forest, and the accounts are so adjusted with the mining and smelting department that the whole shall leave a certain amount to the state. This sum is about 15,000*l.*, or somewhat more lately, but by no means large. The people have by these means abundance of fire, and the mines abundance of wood. The use of fire is too general apparently for comfort, as the warmth of the houses is excessive, but the amount used for one room would keep in a wholesome state the double accommodation which is greatly demanded in the Harz.

The price of grain is never allowed to rise above a certain point to the miner; when it does so in the district, the Government magazines give it out to the miner, at a fixed maximum rate.

In Clausthal, there is the right of pasture for cattle, so that something may thereby by gained, but the ground is not suitable for gardening. By these additions a miner may do pretty well in Clausthal, especially as the wages are much higher among the miners than the field labourers, as Dr. Brockmann informs me.

In spite of all these aids the great evil remains that the miner cannot rise in position; his limit is visible before him, and he must seek contentment in it. It is true that this is the case with all the working classes, more or less, and that few can rise; but the hope that runs through an active community by the fact that some occasionally rise is very great. At any rate, I believe that from such cause, and not from mere constitution, there is a want of exciting aspiration and effort, although no want of good and honest work. The boys go to school two or three hours a day, and receive, no doubt, excellent instruction; but there is not the spirit to keep it up, and the population does not seem to rise in proportion to its school instruction. I am told that many forget both their reading and writing; and at any rate they might as well do so, as the habit of the renewal of their knowledge by books or papers seems not to have spread among them. It is clearly proved that reading and writing are not education, but the beginning only of an education which must be continued by the circumstances of life. The social interlacing of the mining community has destroyed, in a great measure, the circumstances that would give variety of education, and bring out a variety of talent, and is one objection to interference. Yet the Saxon miner is the finest known, even now, according to the opinion of many, although I am informed that the work has not increased in proportion to the population, and his present is not equal to his former condition. He is even wanting in strength, as Mr. P. W. Lawrence, barrister, who has been much among them, and who has made some enquiries on the subject, has informed me. It agrees with my own impression, hastily made, that the Freiberg miner was not equal to the Harz mountaineers in bodily vigour; but above all it agrees with Prof. Gätzschmann's remarks.

The miner is protected from the fear of want by the State. When well he is compelled, by payment of 1–30th of his wages, to contribute to a union (knappschafft). For this he receives medical attendance, and his wages undiminished in illness for about a month; but, if compelled to succumb, he receives about 3*s.* a week, or a sum varying according to a scale of time of service, but not above 3*s.* 6*d.*

He must naturally be afraid to leave this union lest he should lose his life pension, small as it is; but in reality, it is nothing more than out-door pauper relief. This institution is applauded in their songs, and is the great pride of the community. It is right to applaud it; it has done its work well.

In a pamphlet on the condition of the miner of the Hanoverian Oberharz, F. W. Schell says: 'The mining community is a little state within a state. By

the mildness of the rulers of Hanover there have arisen so many institutions, funds for benevolent purposes, and donations in times of want, that it was not without reason said in the French assembly, 'The workman's question has been completely solved in Hanover.' This question, which has so violently threatened the political horizon, has long been settled in Hanover by the humane administrators of its laws."

He adds: The miner begins his work at about 10 years of age, as a spaller. He is not engaged by a single mine only, but may be moved according to requirements. He has no rights giving him power to claim perpetual support; but there are no cases of miners being sent away without work being obtained for them elsewhere, except of course in the case of crimes. Should the works at any time be stopped, the miner works on the roads.

Some mines are worked by companies; but these companies have no power either to hire or remove workmen or fix their wages. The management is under the general board, so that the public and private mines differ nothing in their arrangements. The wages are from 7*s.* 6*d.* to 9*s.* for common workmen; those at the machinery and woodwork, 10*s.* or 10*s.* 6*d.*

As example, the water-engine men work seven shifts of twelve hours in a week. (Every shift 6 groschen). Repairs are done in extra work, and are paid at $5\frac{7}{10}d.$ There are 15 of these in a fortnight. He is also paid per week 16 groschen for the time which he stays after these shifts. He receives then:—

			s.	*d.*
2 weeks at 7×6 groschen	= 84	=	10	6
15 bye shifts - -	55	=	6	$10\frac{1}{2}$
2 weeks at 16 gr. -	32	=	4	0
	171	=	21	$4\frac{1}{2}$
= per week - - -			10	$8\frac{1}{4}$

In sickness the workman has 3*s.* 9*d.* a week (1th. 6gr.) for six weeks; after that time he is invalided at 3*s.* per week, which continues either until he recovers, or for life, supposing he is not to blame. Widows have 6*d.* a week (4 gr.), and children under 14 years of age $4\frac{1}{2}d.$ (3 gr.).

Borers are paid 6*d.* a shift. A shift is a certain number of inches bored, from 30 to 40, according to the hardness of the rock. If they begin at six in the morning they are generally done at 10. They may rest till 12; but they use this time for over-work, which amounts to about 12 gr. (1*s.* 6*d.*) a week. This time, from 10 to 12, is used by the under-foreman for blasting the holes bored. The borers then return, and remove the broken materials. This shift is paid $5\frac{7}{10}d.$, and is finished at 3 o'clock.

Boring requires considerable strength and certain skill. The Harzman has brought it to such perfection that he frequently, during the time before 10 o'clock and with two bye shifts, has completed 120 inches. This may consist of six holes of 20 inches each; the stone is a greywacke chiefly and also clay slate. So far is certain, that at the morning shift, for which is paid 6*d.*, he has bored 30 to 40 inches, at the byeshift for $4\frac{7}{7}d.$, he has bored 36 inches. That is so much for each man, whether one or two are together.

The borer receives 2*s.* 3*d.* per week for six weeks on continuity in illness; a widow, $4\frac{1}{2}d.$; children, $4\frac{1}{2}d.$

Nearly all the work is by the piece, so that it is the interest of the men to finish their work as soon as possible.

Schell mentions that the men may rise as high as foreman (Obersteiger), with about 18*s.* a week. The best are made foremen of portions of the mine.

Still the greatest number remain in the lowest class, and may die (as gedinghaüer, whose work is various and requires experience) having about 7*s.* 6*d.* a week.

Medical inquiries have shown that the average age is scarcely 50; they die chiefly of lung disease (bergsucht). The medical and surgical service is not given free to the families of the miners, although in severe cases aid is given.

Wood is given at 2*s.* for 80 cubic feet, and the miner is allowed to cut up the stumps left in the ground and to burn them; some in this way obtain all their wood entirely free. The use of the land for cow feeding is possible to the better classes only.

In Clausthal the schools are free to boys, but girls must pay 9 to 12 pfenning=1*d.* to $1\frac{1}{2}d.$ In Zellerfeld, close to Clausthal, all the children must pay, and so elsewhere. The sons of the officials and miners receive education free when they are taken into the academy.

When rye is above 3*s.* every miner obtains, if married, two *himten* every four weeks at the price of 2*s.* 4*d.* a *himten* (fourth of a bushel). Widows receive every eight weeks one himten. In the case of large families there is power given to increase the quantity, and this institution has unquestionably preserved many from ruin. The miner may also buy for his sons grain at the same price.

There are various burial clubs, to which are paid from 2*s.* to 3*s.* yearly, for a sum of 39*s.* to 72*s.* at death. But as this money accumulates, and interest is allowed, the sums paid rise sometimes to 100 dollars =15*l.* As there is a little money always on hand, it has been used for giving loans to the men, say of 20 dollars, and also larger amounts sometimes when buying house or fields for cattle.

The pamphlet finishes with admiration of the cheerful spirit of the Harz miners, and the assertion that "the labour question is solved." Nevertheless, Prussia has not adopted the plan, and by the new law mining is free as other occupations.

Comparison of some of the German and English Habits in Mining Districts.

Having visited some of the German mines, as before stated, for the purpose of obtaining information concerning the mode of dealing with as well as the existence of impure air, it was scarcely possible to avoid making some general observations. It is true that the tour with Mr. Twite for a special purpose was short; but, on the other hand, I did not go as a stranger to Germany or its customs, and even in student days had collected ideas and facts about the mines.

Again, I had the privilege of seeing men whose information is of the very highest order, and whose position has given them the fullest opportunities of observing; men also each of whom had obtained his position from the capacity evinced of doing it honour. The impressions collected in a few hours, or even a few minutes, when the speakers converse freely and have given special attention to the point, is in such cases the very essence of their observations, and is

more than can be obtained on any one point by any amount of reading.

I make this introduction to a very few remarks, not to show that I have obtained all the information that the professors there have on their science and art, or indeed any special information whatever, but only to show that I must not be supposed to speak from my observation only. I speak of this here, that I may ward off the remark that some will at once make without listening further,—meaning that, however good their intentions, as Englishmen we cannot follow their plans. It is true we cannot; and I believe the progress of Germany will be towards their demolition. But they are not to be demolished rapidly or unthinkingly. I would rather say that it is to be hoped that the same kind spirit which caused the growth of the present institutions will preside over the change; that it may be shown that freedom and philanthropy go in parallel lines. And when we say that it would be well for our neighbours to have some of our independent action, it is the proper place here to say also that it will be well for us to have some of their solicitude for our workmen. Of course I know the remarks that may be made contradicting this view.

But leave the general character of the people aside, and let us see actually what is attempted in the one department which we view. We have tried neglect of the workman, leaving him to the masters; the acts of the legislature prove this to be a failure. Superintendence has been increased. If the Germans do too much, we have ourselves confessed by our Factory Acts and our mining inspections that we did too little. My belief is that both nations have been wrong; both have failed in their systems. We must approach them; they must approach us. Among us a strong and hopeful working class rise cheerfully, but they help to increase the sufferings of those who do not possess an equal vigour. A mighty struggle takes place with us in which the weakest fall and receive too little care; in Germany a weary sameness, with little hope, attacks a larger class, and still keeps them down.

On the other hand it has brought to the people much contentment, much quiet kindly feeling, and much confidence in each other. It has done more; it has brought to the miner remarkably solid buildings, remarkably comfortable rooms, in many cases, at the mines, and excellent passages under ground, with much care taken for safety; and it has saved the workmen from oppression. It has produced schools and a good education, a respectful demeanour, a religious habit, and sent the workman to his daily work with calmness and with courage, and it has made him proud of his occupation in spite of his poverty. This last is the most wonderful result of all.

It has produced schools of mining serving as models for the world,—learned men that have been its teachers, principles that must guide miners in all countries, and students as well as workmen that have taken their knowledge and their skill with them for the benefit of man.

Every stamper we saw in Germany was in a good building, every washer covered in, every boy breaking up the ore sat in a warm room, and had a warm oven at which to prepare his dinner.

Those who have gone among our mines here must consider this enough to justify favourable observations on the Germans.

I cannot deny, however, much misplaced carefulness. As an example, it is extremely probable that the boys would work better and be stronger in rooms less heated. In our climate heated rooms for violent work would be probably very hurtful, and strong buildings to cover over every washing machine would be an unnecessary expense, but a similar spirit of care, guiding us according to our wants, would have a most benignant influence.

HISTORICAL MINING.

The ventilation of metallic mines for the removal of foul air is nothing new; the necessity is very old, and the means of remedy also old. I thought it important to show how very high was the place which the subject took among the early miners. Without seeking to give the history of the various inventions, let us look at the work of Agricola, De Re Metallica, in 1556, or the magnificent work of Villefosse, and compare him with the latest works on mining, say the Dictionary of Arts, Manufactures, and Mines, or Lehrbuch der Bergbaukunde,—a text book of mining by Wilhelm Leo 1861,—or Dictionnaire des Arts et Manufactures by Laboulaye, &c.; and Traité de l'Exploitation des Mines, Combes. It does seem surprising how little has been the progress of ideas in the adaptation of ventilating machinery. There, have, however, been remarkable improvements in the mode of construction of the fan, and a better theory of its action has been propounded.

The most complete method given by Agricola* is the fan, which is used either in round or square boxes, and is driven either by man, water, or wind power. He also uses bellows, which he has figured, driven by men, and by animals, by wind and by water, and either for driving air into a mine or extracting it. He says:—

"When a mine or shaft is very deep, and has no adit, and no connection with another shaft, or when an adit is long and has no shaft, then the air, as it cannot be rarefied, falls heavy on the workmen: they breathe with difficulty, and are sometimes suffocated, whilst burning lights are extinguished. It is then needful to have machines such as the Greeks call πνευματικας and the Latins spiritales, although they do not use the word. These enable the workmen to breathe freely and to finish their work. There are three kinds of them.

"The first reverses the wind as it comes, and leads it into the pit. Of these there are three kinds. The first of the three is made thus. Three beams are placed on the pit mouth a little overlapping. There is one on each side, and one in the middle. At the ends are holes, into which stakes are wedged and driven into the ground, so as to make them firm. Each of these has three pieces cut out, into which cross beams fit, one being at the right, the other at the left, and the third at the middle. Boards are placed on each, and alternately connected, so that one should be alternately above and below, by which means four angles are made, and as many intermediate

* Georgii Agricolæ De Re Metallica libri XII.: Quibus officia, instrumenta, machinæ ac omnia denique ad metallicam spectantia, non modo luculentissime describuntur, sed et per effigies, suis locis insertas, adjunctis Latinis, Germanicisque appelationibus ita ob oculos ponuntur, ut clarius tradi non possint. Ejusdem de animantibus subterraneis Liber ab auctore recognitus; cum indicibus diversis, quicquid in opere tractatum est, pulchre demonstrantibus.—Froben, Basil, 1557.

hollow spaces, which receive the winds from every quarter. But in order to prevent the escape of the wind when at the top, a covering is made to cause it to be driven back, the vanes or sails being covered above and open below. By a necessity, therefore, the wind passes through these four openings. But it is not necessary to put a cover on this kind of machine in those places where the wind blows down upon it (p. 158). (Agricola A.)

"A, the first planks; B, the pegs or wedges; C, the cross beams; D the vanes or sails; E, the hollows; F, the wind; G, the covering; H, the pit; I, the machine without its covering."

The figure shows two of these ventilators, one covered the other uncovered.

"The second apparatus (Agricola B) leads the wind into the well by a long pipe. It is a square wooden tube, lengthened by fresh planks, as the depth demands; the joints are made up with clay. It may or may not protrude from the mouth of the well; if it does, a kind of funnel wider than the tube projects three or four feet, so as to receive the wind better; if it does not project, boards are placed against it on one side and higher than the mouth, so that the wind may be driven in."

"A, the projecting tube; B, the board placed on one side."

This same wooden pipe plastered with clay is still used in mines, although perhaps not in the same position as that here mentioned.

The third (Agricola C) is made of a barrel and pipes on tubes. A barrel with hoops is placed over an upright pipe four feet high and three broad, having a square opening in the side, always open, and allowing the air to pass into the barrel and thence into the tube D and by one or more passages into the pit.

"The upper part of the tube has fixed on it a circular top, as thick as the bottom of the vessel but not so wide, so that the barrel may turn. The tube stands above the circular top, and penetrates into the middle of the barrel. In the middle there is a fixed axle, which enters into a hole in the lid, and with the fixed axle and the drum above the pipe the vessel moves easily about with a slight wind. This is governed by a vane, which is fixed on the side of the barrel opposite the square hole, and keeps the hole always set to the wind. Every wind that blows enters and is carried by long pipes to the pit. Agricola D.

"A, barrel; B, the hoops; C, the wind mouth; D, the pipe; E, the ring; F, the axle; G, the hole in the bottom of the vessel; H, the vane."

"Another kind of ventilating apparatus consists of fans. The plate (Agricola D) sufficiently shows these fans in square and in round cases, with every separate portion carefully drawn, and the modes by which they are driven. In this plate we have, A, a drum; B, a box; C, the wind hole; D, another wind hole; E, the wooden tubes for conveying the air; F, the shaft on which are the fans; G, the handle; H, weighted ends. These weights are at the extremity of four rods coming from the axle, and serve as a fly wheel to keep the motion regular.

"The box is not so good as the drum, he adds, as the fan touches the drum everywhere, and all the air is impelled into the long tube whilst it escapes into the corners which exist in the square box. But the box can be put on the ground or on boards and driven by the wind like a windmill (Agricola E). It may resemble it by having four sails, these being simply driven into the axle. "This machine requires no attention, and thus no wages are paid for working it; still, when there is no wind, a frequent condition, there is no motion, so that it is less useful than the others."

"A, the box fan placed on the ground; B, the wind hole; C, the sails on the turning shaft; D, the handle; E, the weights; F, the box fan placed on beams; G, the wings on the driving shaft outside."

A water wheel may be used to drive the fan, the motion being communicated by means of toothed wheels, as in plate (Agricola F).

A, the hollow drum; B, the wind or vent hole; C, the driving shaft to which the vanes are fixed; D, its drum with indentations for the teeth of the under wheel; E, the lower axis; F, its toothed wheel; G, the water wheel.

Plate (Agricola G) gives the vanes of the fans. There are three kinds: the first is simply of boards; the second has thin shavings or laths of flexible wood fitted into a firm centre—these are shaped not unlike feathers on the plate; the third has goose feathers fitted into the centre piece. The last is not so much used as the second, and the second is less used than the first.

A, the first kind of fan; B, the second; C, the third; D, the square part of the driving shaft; E, the round part; F, the handle.

The third class of ventilating machines is not less varied and complex than the first, and consists of bellows which may be used, not only for leading air into the pit through long tubes, but also for purifying from foul air by exhaustion. The air is drawn by these bellows through long tubes, being pressed through the nozzle of the bellows, which a man, a horse, or a water wheel may drive. If a man drives it, it may be placed over the pit in this manner: the air is drawn up directly from the long tube, and driven out by the nozzle, the lower board of the bellows is fixed by woodwork, and the pipe from the pit enters it. (See Agricola H.)

"Without this machine it would have been impossible to work without driving two levels into the hill, and after going at most 200 feet to make a shaft from the upper to the lower, so that the air might flow down, and so become wholesome; and this could not be done without great expense."

Horses may drive these machines, and one of these methods is by confining the horse in a frame such as is used when shoeing and causing him to step constantly on a drum or wheel with teeth upon it. (See plate Agricola I.)

Another machine has the vertical axis driven by a horse, and the motion communicated to the horizontal axes by cogged wheels. This machine has the nozzle inserted into long tubes, and blows into the pit or adit.

Plate Agricola H, where the air is blown out by the nozzle. A, the pit (smaller part); B, a square tube; C, the bellows; D, the pit (larger part). Smaller machines are made, such as a man may carry.

Plate Agricola K, shows the air when blown in by the nozzle. A, an adit; B, a tube; C, a bellows with double nozzle.

The more complicated machines are given in plate (Agricola I). A, bellows driven by the weight of a man; B, the man driving it with his feet; C, the

bellows without the nozzle; D, the hole from which the air is driven in larger quantities; E, the long tubes; F, the level; G, the second machine; H, he round drum; I, the steps on it; K, the beams not worked; L, the hole for inserting the bar to stop the machine; M, the bar; N, the third machine; O, the vertical axis; P, its toothed drum; Q, the horizontal axis; R, the drum with cogs.

"The earliest method of ventilation was simply by the diligent shaking of a piece of cloth, as Pliny has observed. The air is heavy, not merely in proportion to the depth of the pit (or well), but in proportion to the length of the level."

Plate Agricola L. A, the level; B, the piece of cloth shaken in the hands of two men.

The passage of Pliny referred to follows immediately his words quoted concerning the amount of foul air met in digging wells. "Fit et sine his vitiis altitudine ipsa gravior aer, quem emendant assiduo linteorum jactatu eventilando." 31, 28 of Pliny's Natural History. "Even when no such evils occur, the air becomes heavier by the mere depth of the well, and this they rectify, diligently ventilating by means of shaking a linen cloth about."

It is not my intention to say much concerning any ancient methods. It is intended only to contrast these old works with one of the newest books, say Leo's, who gives the following:—1st. The air-box with the vane to keep the mouth to the wind. 2d. A box of coals hung in the pit. 3d. A spirit furnace to heat the air rapidly, and to drive it out. 4th. The fire as used in coal mines, (*a*) by regulating the air by means of doors; (*b*) by connecting tubes with the fire, which is confined in a conical brick oven, and through these flues or pipes drawing the air from distant places. 5th. By means of the water drum. 6th. By moving cylinders with water lutes. 7th. The weather wheel or fan (wetterrad), (he describes one of an inferior make). 8th. Bellows of leather or of wood; that is, in fact, cylinders with pistons for driving the air into the mine. 9th. Pumps for pumping the air out.

In the Dictionnaire des Arts et Manufactures, 1855, we have the attention given chiefly to the perfecting of ventilating fans. This we find also in Ure's latest Dictionary. I mention this only to show the relative state of knowledge, not with a desire to enter on the subject. There has been no urgent necessity to improve farther, as it was so easy to purify far enough to enable a candle to burn.

The engines of Agricola's time were capable of extracting air from passages 1,200 feet long.

His description of the air is similar to our present description. Agricola says, "the air remains immoveable in a pit not connected with another, or in a level not connected with a pit. In both cases the air remains without motion, and causes an unpleasant smell, as of a vault or some underground cell which has been shut up for many years; so that the men would not remain, even if the place abounded in gold and silver, and if they did they would have headaches and difficulty of breathing. This is especially the case where there are many people working and many lights used. These lights, too, burn feebly, whilst they give out a worse emanation than men do." (p. 81.)

"Among the miners some are attacked in the joints, some in the lungs, some in the eyes, and others yield their lives. The water is often very cold in the mines, and cold is an enemy to the strength. As a protection the men wear high boots to keep the legs from the cold water. Those who neglect this suffer severely, especially if old. Other mines are very dry, and the constant dust enters the blood and lungs, producing that difficulty of breathing which the Greeks call asthma. When the dust is corrosive it ulcerates the lungs and produces consumption; hence it is that in the Carpathian Mountains there are women who have married seven husbands, all of whom this dreadful disease has brought to an early grave. At Altenberg, in Meissen, there is a black pompholyx which causes ulcers, and eats wounds into the very bones. It destroys iron also, so that all their keys are made of wood. There is also a kind of cadmium which destroys the feet and hands that are wet, and injures the eyes and lungs. The men there use not only high boots, but gloves as high as the elbow, and bind loose coverings (bladders) to their faces. By this means the dust is not carried into the lungs and blood, and does not hurt the eyes. The Roman makers of red lead used the same plan." He speaks also of dangerous emanations, and says that when these are abundant the men fall back from the ladders when climbing and they have the feeling as if their hands were round and globular and also their feet. This feeling is mentioned as occurring when fires have been used for rendering brittle the harder rocks. In this case the wise workmen leave the place from Friday to Monday, so that the smoke may escape. The feeling of the feet having double soles under them is mentioned by Brockmann, speaking of the fire-damp.

There is no need to seek among the German towns of the 17th century for the origin of the candle test. We have it plainly written in works far older. Pliny says, that "in deep wells sulphurous or aluminous (substances) kill the workmen. The extent of the danger is tried by letting down a light to see if it is extinguished."*

This long experience may be received as a fair proof, that where a candle can burn, a man may live; but it applies only to certain qualities of air, and none of it affects the question whether a man may live in vigour. It would not apply to sulphuretted hydrogen or to prussic acid, or nitrous fumes, or even to pure oxygen, as far as we know. It applies, however, in a rough way, in wells and mines, as the usual impurities there affecting the combustion are such as are given out by men and candles.

His Excellency Von Decken, chief of the mines in West Prussia, sent the following;

"Continuous difficulties arising from the accumulation or evolution of carbonic acid gas never occur with us in the metal mines, or at least very rarely. In most cases it is sufficient to make two or more communications with the surface to different depths, such as that of a level and a shaft, or several levels if needful, to strengthen the draught of air, so that it may either remove entirely the carbonic acid in its progress or dilute it so that it may be no longer hurtful.

* Depressis puteis sulfurata vel aluminosa occurrentia putearios necant. Experimentum hujus periculi est demissa ardens lucerna, si extinguatur." 31, 28.

REFORM CLUB
PALL MALL

AGRICOLA

REFORM CLUB
PALL MALL

AGRICOLA A.

AGRICOLA A.

RETORM CLUB
PALL MALL

AGRICOLA C.

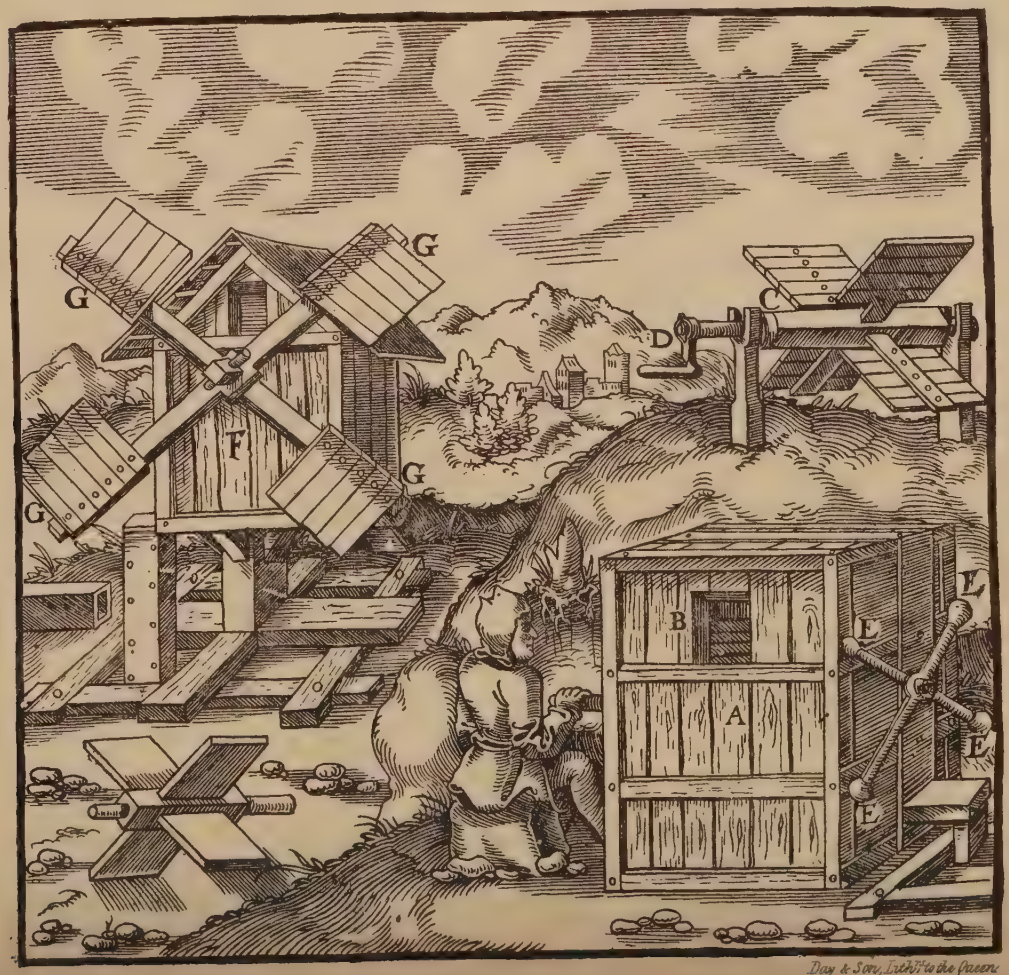
REFORM CLUB
PALL MALL

Day & Son, Lith.rs to the Queen.

RECORDS
PALL MALL

AGRICOLA D.

AGRICOLA E.



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REFORM CLUB
PALL MALL

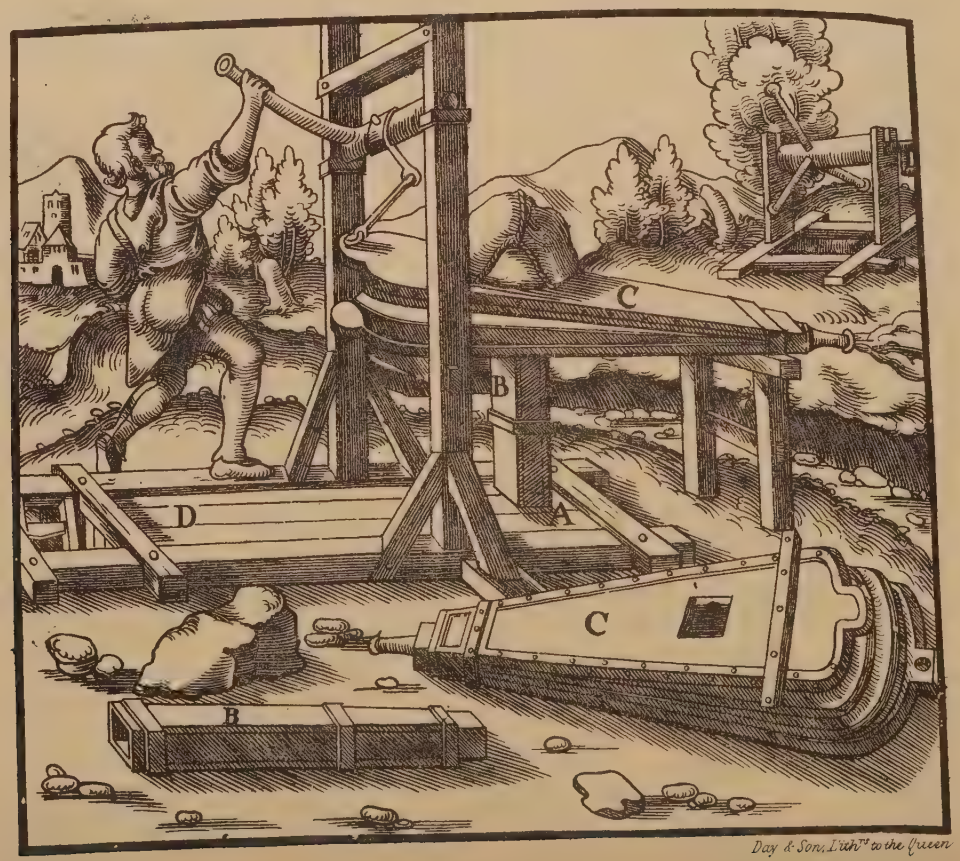
AGRICOLA F.

REFORM CLUB
PALL MALL

PALL MALL

Day & Son, Lith.rs to the Queen

AGRICOLA H.



Day & Son, Lith.rs to the Queen

PALL MALL

AGRICOLA K.

Day & Son. Lith.r to the Queen.

REFORM CLUB
PALL MALL

AGRICOLA L.

Day & Son, Lith.r to the Queen.

"In some works fire-baskets or draught fires are used, in others ventilators (fans), and in some cylinder machines, either for forcing the air forwards or for drawing it.

"Levels which are very long, 600-800 fathoms at $6\frac{2}{3}$ feet, have vaulted passages applied with great advantage. These are specially valuable in cases where the ventilating shaft is very deep. The action is increased by having an air shaft 50 or 60 fathoms from the mouth, at the bottom of which it is easy to bring a fire which is carried up to a shaft of 30–60 feet above the ground.

"In some iron mines which are not deep, and where the ironstone is covered with clay, carbonic acid is often found. Two shafts are then sunk at a distance of five fathoms from each other, and sufficient draught is obtained to enable the work to be continued."

"Bonn, 7 Oct. 1863."

Professor Gätzschmann has been kind enough to give me the following replies to questions.

"The workmen who bore are not found to suffer more than other workmen; those suffer most who use sharp instruments, such as saws, and such as are used for striking, as hammers and hatchets. This is on account of the dust, although it is less felt in Saxony than in Spain, where it is besides exceedingly dry.

"The wage of the land-labourer is greater with us than the wage of the miner, not including the colliers, and the wages of masons and carpenters are still higher. On the other hand, the miners have their living regular and secured; they receive a pension when they are sick or wounded, and in times of scarcity they are assisted; they are altogether freer and more independent than the agricultural labourers. On the other side again, it cannot be denied that the children of the miners no longer press forward to the mines as before, but rather go to the land or do nothing, for they are not fond of work; and indeed most of our miners have become less diligent than formerly, and prefer to live without work.

"The duration of life among the miners is certainly on an average less than among other workmen. Partly their work is greater, but more particularly must be mentioned their constant remaining in an atmosphere which if not dangerous is still unwholesome (it is poor in oxygen, has more carbonic acid, decomposing matter, and such things). The long ladders too which must be descended and mounted are only part of the long road between the house and the work. On an average they work in the mines from 50 to 55 years of age, but many live from five to ten years afterwards, seldom more and often less. The life of other workmen is eight or ten years longer.

"The miners do not receive wood (he speaks of Freiberg), but they are firmly convinced that it is no crime to steal it in the forest; besides they and other poor persons are allowed, on certain days, to collect the dry wood (rather sticks) in the forest.

"It is not possible to give the exact numbers of the wounded, because small wounds are often never known, and because in the lists the wounded and sick are given together. I give the figures for a few years at Freiberg, and remark that all the labourers are real miners here spoken of.

—	Actual Miners.	Killed.	Wounded and sick.
1855	8,285	6	1,119
1856	8,355	4	2,092
1857	7,927	10	3,305
1858	7,877	8	3,751
1859	7,854	7	3,241
1860	7,915	12	3,740
1861	7,992	6	3,738

"The *steiger* (mounter) in German mines is the foreman of the hands. In large mines there is an *obersteiger* and *untersteiger* (overmounter and undermounter). These foremen have only a part of the work to examine, as every department has its own foreman, *i.e.*, the *untersteiger* is foreman of the mines proper; the *mauersteiger* is foreman of the builders; the *zimmersteiger* foreman of the carpenters; the *waschsteiger* foreman of the dressing, and so on. The *obersteiger* is over the whole, managing the whole mining process; over him is the *schichtmeister*, who with us is not a mere accountant, but chief technical director of the mine.

"The young enter the mine at the age of 15 at most (not 16), and rise gradually to be miners proper. At first they clean the mine, and then they proceed to the moving of the ore and the rock. The younger boys are employed outside as elsewhere mentioned.

"The allowance to the superannuated will keep a man in a strait, although it is seldom three shillings a week, but he generally earns something by his work; sometimes they are still so strong that the allowance is only a trifle to them.

"There are, properly speaking, almost no royal, that is, state mines and mine buildings. In former times the adits were royal, but were paid for by the gain on the mines; now, however, all are in possession of the revier, the united mines of the district. In all details of management royal and trading mines are alike.

"A workman may become a foreman (*untersteiger*) if he has the requisite knowledge, but to be *obersteiger* it is necessary to have passed the mining school; and this every miner can do who has the proper knowledge (reading, writing, and arithmetic must be learnt by every workman.) Education in the mining school is free, being paid for by the state and the mines."

There are questions arising from the above letter of great importance. The sons of the miners have lost their old enthusiasm for the work of their fathers, and the miners themselves work less cheerfully and powerfully. What is the reason of this? Is it because the work has become less remunerative, or is it because the men are actually deteriorating as a race? The higher wages of the land labourer may be one reason; but this does not explain the change.

The belief that the borer does not suffer more than the others does not agree with the Harz statistics. If dust and solid matter in the lungs were the only cause of disease this would be the result; but as the bad air must be considered one of the most important causes, the borer must have the largest share. Perhaps, however, he is less exposed to dust, in which

case his exposure to evil influence may become equal to that of the others.

Notes from Books.

Calvör* begins his history of mining machinery at once with engines for giving air, and a wonderfully full and rich collection of mining apparatus plates he gives, and in the department of ventilation one or two very interesting. The inventions of Bartels are especially dwelt on. He had a boring machine by which he made air holes for ventilation, but he then went on to pump out the foul air by means of a double pump, made of rectangular boxes simply, and having a large surface. His reasons for pumping are quoted by Calvör, and were given as part of a report to the directors of a mine in 1711. They are to be found quoted by Calvör, p. 10, and are entitled :

"*Some observations and speculations on mines and places in which bad weather, cold, damp, or foul air exists, and whether such can be removed otherwise than by blowing bellows, as hitherto.*"

In mines it is important to remark : 1. How and from what place the air enters and leaves the mine. 2. If such movement is constant. 3. If it changes, does it happen that in winter the air falls into the lower shafts, being drawn out of the higher ones ; on the other hand, if in summer it goes into the higher shafts, being drawn out of the lower, as happens in a gallery which has an air hole, or when two shafts communicate. By what means it happens that the air changes its course in winter and summer ; whether the air is at certain times of the year thicker or thinner, or pressed more to the earth or drawn from it ; or if the wind changes the draught, is not known to the learned.

4. If now the draught in spring and autumn changes, by which generally foul air is caused, we cannot wonder that this should occur, as each draught strives to obtain the upper hand, and neither will yield. As the air is brought by this struggle to a stand-still, and remains balanced, so the air in intermediate levels and cuttings is equally pressed and shut up so that it can move in no direction until one of the draughts has the upper hand, and breaks through, making a proper current ; such standing must cause bad weather.†

5. It is to be observed that the wood in those shafts, adits, and levels, especially when it is old and decayed, causes bad weather, so that in such places fresh air cannot be got.

6. But when a shaft is in the solid rock without much wood, or when the wood stands in wet and does not decay, and still there is bad air, this seems to me to be the only cause, viz. : that the air cannot at the same time go out and go in, as there is only one entrance but no exit.* When the vapours arising obstruct the entrance of the air, then the currents oppose each other, and the bad air must be found in the mine.

7. Nos. 5 and 6 show how this happens in a gallery or adit.

8. If shafts were united to each other by a gallery, so that the air had its proper draught, and if winzes stood under or near the shafts on the levels, and foul air still remained, the cause would be as mentioned in No. 6, because the air rushes through the communications, and cannot without blowing be brought into the lower parts.

9. When in old workings and pits which have lain many years bad air is found, and there is no cutting to stir it up by a draught, such a foul cold or heavy damp is difficult to lift out, even by blowing fresh air into it.

10. When fresh air is blown into such old workings, and the foul air is stirred and driven to the shaft, the bad becomes mixed with good and is then seized hold of by the blowing machines, and sent back down to its former place. And although the bad air might by constant blowing be taken out in this way, it is by no means a sure way. The bad air is moved, it is true, and sent over the whole mine, and although it is not equally oppressive to the candle and the workman, it is still hurtful.

11. That the blowing bellows are not sufficient is seen by the following : Let there be a shaft sunk from the surface ; let it contain bad air, and let fresh be driven in ; that which is at the bottom is certainly brought to the surface, but the fresh air is too weak, and only dilutes the foul air. When the foul air is driven up, it cannot come out, as the air which is trying to enter in a natural way obstructs it, beause it lies some fathoms deep in the pit. A similar opposition comes from the atmosphere above the pit.

12. The same objections are found when it is attempted to drive air into a long gallery.

13. Still less is it possible to succeed by blowing the deepest levels, sumps and close ends, as the air is much duller, and it seems to me like throwing in an ounce of perfume to drive away a hundredweight of stink, so that the weaker will overcome the stronger.

14. In mines that require good air, it is very insufficient to blow it in, as may be seen now at *Stuffenthals Glück*, where it is no easy thing to drive out the bad air from the old workings, and to this date it has not succeeded, being against nature.

15. If it is to be done well nature must be our teacher, and she points out that air hangs on air and follows it, be it good or bad, or of contrary nature, and this attachment is so constant that no man can break it. And even if air is drawn out of a place by the use of a power too great in proportion, the free air around would follow it, and even break the place in pieces to follow the air which was drawn out.

16. Now the foul air in the shafts is so bound up with the air of the firmament that it cannot be torn asunder, but the upper and lower must be torn out

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* Acta Historico-Chronologico-Mechanica circa Metallurgiam in Hercynia Superiori. Oder Historisch-Chronologische Nachricht und theoretische und practische Beschreibung des Maschinenwesens, und der Hülfsmittel bey dem Bergbau auf dem Oberharze, darin insbesondere gehandelt wird von denen Maschinen und Hülfsmitteln, wodurch der Bergbau befördert wird, als von dem Markscheiden, Schacht und Grubenbau, von Bohren und Schiessen, von den Maschinen und Vorrichtungen, das gewonnene Erz zu Tage zu bringen, von den Maschinen, wodurch das Erz zu Sand gestossen wird, oder von Puchwerken und der Pucharbeit, von den Maschinen in der Hütte, aus den Erzen Silber, Bley, Glätte und Kupfer zu Schmelzen, und von der gesammten Hütten-Arbeit nach einander, von den Münzmaschinen, das Silber fein zu brennen, und zu Geld zu vermünzen. Ausgefertiget von Henning Calvör. Braunschweig, im Verlag der Fürstl. Waysenhaus-Buchhandlung, 1763.

† The phrase "bad weather" appears to be used in England for bad air, but more generally in Germany.

* That is, there is only one passage to serve both for entrance and exit, I suppose.

together. How and in what way to lead the air to its natural movement is a most important question and speculation.

17. Without stirring the air does not go forward, but hangs together. But if motion comes it moves on hanging together, if there are no obstacles. This may be seen in those mines which have many communications, the air is seen to move, being sometimes clear, sometimes clouded, accordingly as it is mixed with powder smoke.

18. In pits with no communicating levels to the shafts the wind cannot make a movement, and one must be made, not a free one, but a short one, according to No. 10, which shows how the air becomes mixed. This must be done with a machine, in my opinion. When the bad air is once put in motion, whenever it is taken away fresh air must come in its place, as otherwise there would be a vacuum in an open place.

19. But it is not enough to put the bad air in motion, it must be put so far away from the shaft and held in motion until the air begins to come out freely.

20. As long as my fundamental opinion is not contradicted that the air hangs together, I remain in my fixed opinion that the air must be moved by a closed machine and drawn out of the shaft. An appropriate machine has been found, and I have not only announced this to your Excellency and the honourable body with all respect; but if they graciously resolve to pay the cost and try the machine, I am ready to make the preparations. As it never has been made, the expense cannot be known; but a single one ought not to cost above 50 dollars. When it has pumped one spot, it may be kept for further use, as it may be applied wherever there is machinery.

This pump is the mother of many similar. Calvör shows it to be before any of the plans of Friedwald, Sutton and Duhamel.

After this a pump was invented with leather sides, a cylindrical double leather pump, much like that which is shown at figure 1, as being used on a very small scale for emptying bottles of the air they contain so as to refill with the air of the place. Bartels, in the same book quoted, is said to have ventilated a coal pit with a fire and chimney in 1717, carrying out his principle of drawing air from the mines.

In making the deep adit at Clausthal six shafts called light holes were found necessary. "At the sinking of five of these, remarkable circumstances occurred in connexion with the air which are not yet explained. The first showed a want of air even at a little depth; this disappeared after sinking farther, although no communication was made with other parts. The fifth shaft exhibited a want of air at the depth of 27½ fathoms, which diminished by increasing depth in 1780; in 1781, when the deep adit was reached at 53 fathoms it disappeared. In the fourth the want of air appeared at 31½ fathoms and disappeared at 38. The third found a want of air at 19 fathoms' depth, and a duck engine was used, driven by the machinery; at 23 fathoms the want was not felt. The second showed a want of air at the depth of 31 fathoms, so that an air engine was used; but the want disappeared at the depth of 43⅞ fathoms. With the first the want was felt at 40½ fathoms, and a duck engine was used; but in 1781 it was not found necessary although the depth was 46¼ fathoms. In later times, although the galleries are extended far from the shafts, the want of air, properly speaking, has never been felt."*

It cannot, however, be said that the ventilation by machinery was amongst them undertaken to a great extent. The arrangements and expenses were small. In Trebra† we find only 69 dollars among 10,737; but these are for tubes only.

Becker‡ says, speaking of Wallachia, "It cannot be denied that the whole of this mining is kept up by two great powers, chance and necessity. Chance gives or takes the richest spots and leaves hope to be fulfilled or deceived. The rain and the flow of water are matters of accident, on which the district chiefly depends. The impossibility of obtaining other work keeps the men there, and compels them to bring up their children to mining to avoid worse; for I never have seen a poorer class of miners than the Wallachs in the rich gold district of Vôrôspatak. Shut up in a narrow circle, they can do nothing but bore, blast, stamp, and mash, and without the greatest diligence they could not compel nature to support them. I could not help asking if it would not be politically advantageous to do something for the welfare of these poor families, and not entirely remove from them the belief in the possibility of obtaining some little comfort by means of mining." Vol. ii., p. 178.

Becker says that by going forward with the levels, and making winzes between, it is possible to proceed horizontally 500 fathoms, and after that to 1,000 by the use of air machines. The use of many shafts is too expensive; the management of air in this way is best known in Hungary. This was in 1815.—Vol. i. p. 46.

§ "The danger and injury to the miners is various in kind, and terrible, and as health is always more important than gain, all the work should be so done that the workmen may work without danger. In some places the water is much colder and more hurtful to the tendons than in others, and so acts on the legs that in a few years they become stiff and lame.

"To prevent this, the miners ought to wear high water boots to keep their legs from the cold. On the other hand some departments are so dry that they have no water; in these the dust and stones fall upon the lungs, the men have lung disease, breathe with difficulty, and at last take consumption.

"At the Altenberg in Meissen there is found in the mines a black smoke which eats up wounds and ulcers to the bone and destroys the lungs and eyes; it destroys iron also, like the smoke from the smelting works at Zellerfeldt and Wildemann; besides this there is a kind of kobalt, which eats up the hands and feet of the hewers when they are wet.

"In Rammelsberg at Goslar, where the water drops out of clefts on to the clothes of the workmen, it eats them through, so that on account of the sharp water and great heat they must go nearly naked. For the

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* Bergmännische Bemerkungen ueber den merkwürdigsten Theil des Harzes, von Johann Carl Freiesleben. — Leipzig, 1795. (p. 303.)

† Erfahrungen vom Innern der Gebirge, nach Beobachtungen gesammelt und herausgegeben von Friedrich Wilhelm Heinrich von Trebra, folio, 1785.

‡ Journal einer Bergmännischen Reise durch Ungarn und Siebengebürgen, von Wilhelm Gottlob Ernst Becker. Freiberg, 1815.

§ Bericht von Bergwercken, durch G. E. Löhneiss, &c. &c.; folio. Stockholm und Hamburg, 1690 (p. 56).

same reason the hewers must protect themselves with great spectacles and with bladders, so that no dust may go into the lungs and eyes.

"Besides that, the *cold* (dampf) *damp* or bad air which cannot get changed, gives the workmen a heavy breath, so that they must blow air into the levels; besides this there is the heavy damp, Schwaden, which kills the men sometimes. This is found in the Zechen and Fellörter, where the rock is hard, and is fired weekly; in these the air is poisoned. There the veins and clefts have a subtle cold poison, which is drawn by the power of fire out of the veins and metals, like the furnace smoke where ore is smelted, and which is found on the walls and the refinery. When this smoke does not come out it falls on the water in the sumps, swims in them, and makes deadly poison, for where that water is stirred up by a little stone on other things the poison comes again out.

"When people draw this smoke or vapour by breathing they are poisoned, so that they lose all feeling and power of moving, as well as all sense and reason, and die without pain, and those who are overtaken by the bad air in shafts or on ladders fall down, and can neither move hands nor feet, but they think their hands and feet are quite round like balls; and even if they hold their mouth and nose, and flee away from this poison they appear afterwards white like a corpse; therefore no one should enter such pits until they are first plied with fire. Careful people never enter till Monday, for between Saturday and Monday the poisonous air goes away. Some places have this damp, and give it out of themselves. It escapes also from some druses; this may be known by holding a lighted candle to them; the light is put out. It can be no good air when this happens. In some places they put pipes in well closed, by which to draw out the bad air. It often happens that the workmen fall on the ladders and break their arms or legs, or even their necks, or fall into the sumps containing water, and are drowned. In such cases the (steiger) foreman of the pit is to blame, as he should have all the ways in the shaft in good order.

"The door of the mine-house or adit entrance should not open to the north-east, lest in winter the ladders be covered with ice, and the hands become stiff with cold, or slippery, so that they cannot hold. The men should also see that there is no carelessness in their going up and down. Sometimes the walls, the shaft, and the galleries fall in, and the people are smashed so that they become lame for life or die.

"It is said that in Rammelsberg, in one day, there were made 400 widows."

He then mentions various modes of removing foul air, and among others blowing fresh air in with a pair of bellows.

P. 60. On this it is added curiously:—"In the tubes which are made to reach into the foul air, there is found a kind of moss, which forms to such an extent that it chokes them up, and they must be cleaned out with a thick rag."

This volume gives oaths for each class of the mining community, and prayers for all their conditions. The oath defines the duty of each whilst it binds him to perform it.

"Schwaden is bad or poisonous air; on account of it, many mines lie idle.*

"To those who are rendered insensible they give vinegar and oil, and lay the head lower than the body, so as to induce them to eject the poison."* In Lancashire they hold people by the heels when they take them out of the water.

†"Door geheel Sina vind men een ontelbare meenigte van Mynen, die allerlei Metalen in grooten overvloet bezitten. Gout of zilver uit de Mynen, te graven is in Sina uit Kracht der Wetten verboden; dewyl de Sineezen voor vast gelooven dat de menschen, wiens leven veel meer dan het gout en zilver (daarom d'Europers d'ingewanden des Aardryks door snuffelen en outledigen, en devlakte des Aardryks van menschen ontblooten) van Keizeren en Koningen behoorde geacht te worden, doorgans in de mynen door de schadelyke witwaassemende dampen verstikken en om 't leven craken. Evenwel Staat eenen ieder vry gout aan d'oevers der Revieren te zoeken, dat ook aldaar in groote meenigte gevonden word, en daar meê de Sineezen veel meer koophandel dryven, als datze het zelve in betaling voor andere Waaren geven." This old Dutch is not easily read. I give the original.

"In the whole of China there is an innumerable quantity of mines, which possess metals of all kinds in abundance. It is forbidden to dig gold and silver from the mines in China, because the Chinese firmly believe that man's life ought to be taken care of by emperors and kings, as of more importance than gold or silver, for which, the Europeans have emptied the bowels of the earth, at the same time depriving the surface of its inhabitants; and generally in the mines lives are lost by the injurious and stifling vapours that issue."

In Rinman's (Swedish) Dictionary of Mining, 1788 the use of the candle, as a proof of the state of the air, is mentioned. Under the head Grubfvabyggnad (Mining), p. 681, the air is called bad, "dä et brinnande ljus däruti vil slockna," when a burning light will or is inclined to go out.

In the same Dictionary it is advised to draw up air rather than to press it down, and the mode mentioned as that adopted in England, namely, the use of fire-baskets, is recommended. It mentions also ventilators or fans, water-bellows, and pumps for air.

M. Brard, engineer to the Mines d'Alais, says in his "Elémens Pratiques d'Exploitation" that carbonic acid comes from every rock into the mines, but this has failed to receive proof; nor am I aware of anything

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* Herttwig, p. 359.—Neues and vollkommenes Berg-buch, bestehend in sehr vielen und raren Berg-Händeln und Berg-wercks-gebraüchen, absonderlich aber ueber 200, vorhin noch nicht edirten und ans Licht gegebenen Berg-urtheln und abschieden, mit grossem Fleiss and Mühe, dergestalt colligiret und abgefasset, dass bey nahe keine einzige Materia in Berg-Schmeltz- und Hammerwercks-Sachen, vorfallen mag, so nicht unter einer Rubric, der Nothdurfft nach, abgehandelt, und mit Allegirung gelehrter und bewährter Männer Schrifften, wie nicht weniger darzu gehörigen Kayserlichen, Königlichen Chur-und Fürstlichen Berg-Ordnungen, sowohl was deren Concordanz als auch Discrepanz betrifft, entschieden, und auf die leichteste Manier zu finden wäre, von Christoph Herttwig, J. W. Doctore, Stadt-Syndico auch des Raths und Berg-Schöppen-Stuhls zu Freiberg Assessore. Zweyte Auflage, Dresden und Leipsig—bey Joh. Christ. Zimmermann's sel. Erben, und J. N. Gerlachen. 1734.

† In the account of the embassy of the Dutch East India Company to China in 1655-57 by Joan Wienhof, "Het Gezandtschap der Neêrlandtsche Oost-Indische Compagnie, aan den grooten Tartarischen Cham, den tegenwoordigen Keizer van China," &c., door Joan Nieuhof toen eerste Hofmeester des Gezandtschaps, &c. Amsterdam. 1693. vol. ii. p. 114.

that can lead us to suppose that it would come from granite.

Mr. Brard says that carbonic acid is known in the mines when mixing with good air by a smell, like that of apples, and by a red flame to the lamps, the wick of which must be drawn up and enlarged. Even with this precaution, however, it often goes out with a slight movement. He says also that the nostrils become blackened in this atmosphere. This may arise from an imperfect combustion of the candle-smoke. "When the light does not go out suddenly, and only on making a movement, one may stay and even work in it; it is bad but not so charged with carbon as to cause asphyxia." (pp. 378 and 379.)

He adds, "When obliged to examine a gallery in which a light would not burn, I used glow worms to light the needle of my compass." In a similar case Mr. Ryan, the engineer, used phosphorus. In these cases it is necessary to have a rope round the waist.

"As the carbonic acid gas is heavier than air it always commences on the floor of the galleries, but it rises up gradually till within a small distance of the upper orifice. It is chiefly in hot and *stormy* days of summer that it rises in the pits, whilst it sinks and disappears completely in winter in cold nights or during great wind. I have observed the movements of the air for several years in a shaft at Lardin, department of Dordogne, where the air constantly became bad in the first few days of May." (pp. 379, 380.)

P. 386. "When the circulation is natural it is different in winter and summer. In summer the external air goes down the shaft and comes out by the horizontal galleries, as a liquid does; in winter the external air enters by the (adit or horizontal) gallery and escapes by the shaft."

M. Brard, who seems to have had great experience of miners of various countries, says, p. 499: "The Saxon miners are the best educated of all who come to France; they can all draw a little, and as they have been brought up in a country where, of all places in the world, mines have been best worked, they have good customs, excellent methods, and an enlightened practice."

M. Brard says that "Large iron nails which miners wear in their shoes destroys the ladders so rapidly that in England they have made the steps of iron; we tried them, but found the cold so great that they became covered with ice in winter, especially if put in an air shaft; oak steps last long enough not to render change too frequent."

Mr. Simmons, of Manchester, mentions another objection to iron ladders, that the foot rests on too small a space; men with very strong boots alone can use them. The same remark must apply to the hands, whilst the inclination to slip is not to be forgotten.

NOTES ON CLIMBING.

I requested Duncan J. Campbell, Esq., who lives near Ben Cruachan, at the top of Loch Awe, to give me his experience of the height which a man may walk daily when in good health, and in such a manner as to maintain his health. He wrote to me as follows:—

"As to the height which a man can climb daily as work, I may mention Ben Cruachan (3,669 feet from the level of the sea, from here perhaps above 3,300). The distance from here to the base will be a mile; from the base to the top not less than five miles. Now an ordinary shepherd will climb to the top of it and back for the summer six months twice in one day, and in the winter once a day, without much difficulty. This will be considered fair work for a man, taking the roughness of the ground into consideration. At the end of the time he will be in as good training as Heenan or King when they met at Tunbridge; that is to say, as regards the muscles of the legs and the expansion of the chest. The arms are not brought into action.

"The shepherd will go up in about two hours, and return in an hour and a half. I think it is the heart which is the cause of the difficulty of breathing, occasionally felt when walking too fast up a hill; it sends more blood to the lungs than they can sufficiently oxygenate. But shepherds are not often troubled with difficulty of breathing, unless they go very violently to work. At least I find it so with myself. But you must not forget to take into consideration the fine pure air we have, compared with miners.

"As to the distance a man will walk in a day up and down hill. When I had the farm in Glencoe, I used to walk across to this place 30 miles in 8 hours, up and down hill. A shepherd travelling the hill daily does not on an average go more than ten miles a day, as he is obliged to stand and look about him; whereas if he had nothing to do but go straight forward, he would walk three times the distance. Shepherds in general are very healthy. Rheumatism is their chief prevailing malady when they get old, caused by being exposed to wet and cold, but often brought upon themselves through carelessness in not changing their clothes, and sitting whole evenings in wet stockings.

"The feeding consists of porridge and milk for breakfast and supper, and broth and animal food for dinner; no grog allowed unless they are very hard at work shearing sheep.

"This is in a district with 144 inches of rainfall last year."

The height here ascended by those who go up Cruachan twice in a day is at least 6,400 feet. This is four times greater than the deepest mines, and the ascent is at a rate not quite double. At the same time the distance to be traversed is great. This is an additional but not demonstrative argument against the opinion that climbing alone is the great cause of the disease of miners. It is true that in this case there is no weight to support,—the shepherd leans on the earth,—and there is no force dragging him from his hold upon the spot on which he rests. To make up for this he walks six miles during the period, and goes at a speed at least a quarter greater than the miner, taking the perpendicular height into consideration. We might argue in this way: that the 3,200 feet are equal to only two miles on the surface, as we find the shepherd walks four miles on level ground. But this cannot be. We might also say that the six miles horizontal walk, and the half greater perpendicular height, were equal to the weight of the body sustained on the ladder. In this mode of argument we come nearer the truth; but another difficulty occurs as we find the one class of men so much stronger than the other. However, we may fairly conclude that there is nothing unwholesome in

climbing daily up steep places in pure air; and this is well known.

Still one does not require to be a physiologist to know that in the purest air of the hills, especially if elevated, climbing is often stopped by alarming beats of the heart.

At the same time all evidence shows that those who climb much in pure air gain by the exercise, and those who climb much in the air of shafts suffer less than those who work in the air of levels and ends, and indeed suffer little.

I requested Mr. Isaac Holden, architect, Manchester, and Mr. Simmons, builder, to give me their observations on the amount of work which could be performed by a bricklayer's labourer. Mr. Holden says, "I have had a man timed (he not being aware of it); the results are:—

"The usual or average work of a man up a ladder 30 feet high, and including a walk, say 10 to 20 yards, is 1,200-1,500 bricks per day; he goes up about 13 times per hour. Three minutes may be taken as the time for going up and down, leaving 1¼ minute for rest. With a building 45 feet high, the number of journeys was eight.

"The total height of these journeys, allowing 9½ hours per day, is, for every hour - - -	390 feet.
For the day - - - -	3,705 „

"Supposing there was no ascent to be made, the carriage of 94 lbs., besides the loading and unloading, is itself a laborious work.

"45 feet, at 8 times an hour, is equal to 360 = in 9½ hours 3,420 feet."

A miner will do the hour's work of mounting in about 20 minutes, but he will have no weight except himself, which may be taken at 150 lbs. With the hod there is nearly a cwt. more; but the amount of exertion will not be a simple proportionate quantity. The peculiar necessity of balancing the weight on the shoulder calls for a constant exertion of attention; it is an activity of the mind with the body in constant readiness.

Mr. Holden says: "I do not think there is any disease fairly attributable to such men, or indeed to any branch of the building operation, and above all to climbing ladders. From my own personal experience, and what I can learn from others, the action on the chest generally (in climbing ladders) is highly beneficial. The arms being constantly thrown upward, and the head of necessity thrown back, the chest is pushed forward, and the lungs are more fully inflated than by any other motion of the body. The only diseases which can, in my opinion, be fairly considered as connected with the building operations are such as are brought on by damp clothing and drunkenness, the two being too often brought into operation together. If a sober man becomes wet he prudently goes home and changes his clothing, as soon as his labour ceases. Whilst he works he seldom suffers."

Mr. Simmons, jun., builder in Manchester, has given me the following particulars concerning bricklayers' labourers:—

Hours of labour per day - - -	9½
Smallest amount of bricks carried	1,000
For thick walls sometimes 1,200 to 1,500.	
Average height climbed on the ladder, 30 feet.	
Average number of journeys up the ladder:—	
Of these there are, with bricks -	84
„ „ with mortar ½ =	42
	126
Weight of hod 10 lbs.	
„ 12 bricks at 7 lbs. - -	84 „
94	94
Weight of mortar -	68 lbs.
„ hod -	10 „
Weight of mortar loads -	78 „ 78
1,000 bricks, at 7 lbs. - -	7,000
42 hods mortar, at 68 lbs. - -	2,856
Add the weight of the hod up and down, 126 journeys - -	2,520
Total weight per day carried -	12,376

That is 84 journeys with bricks,
42 „ mortar,
and 126 back journeys with the hod only.
The height, 30 feet, has a step at every 9 inches - - - - 40 steps.
Distance of the building on an average 40 yards.

Here, with an average of 88·2 lbs., men travel up a ladder 3,780 feet or a mile every day, and come down with a load of 10 lbs. They also walk 5,040 yards or 2·32 miles, with a load of 82·2 lbs. on level ground, and 5,040 yards with a load of 10 lbs. Besides this they lift 9,856 lbs. into the hods; sometimes they lift this down, but frequently throw it.

Here is an amount of ladder climbing which is equalled by no class of miners in the world, but it goes on daily before our eyes unnoticed. The deepest of our mines are only half the depth of the hod carrier's ladders, and only a small portion of the miners are at such a great depth as even that. It is extremely probable that the amount of ladder climbing undergone by the hod carriers is somewhere between five and eight times the amount undergone by miners generally, and that too with a load of 88 lbs. upon their shoulders whilst the miners carry nothing.

In comparing the work of the miners and hod-carriers we are met with difficulties, as usual. But we see men whose chief labour is mounting, and that with a load; and if these do not suffer, the case against the ladder is imperfect. Do these men work as much as the miners? Let us take a miner who works at the depth of 900 feet. The hod carrier works the same number of hours, but he goes up four times the amount of ladder. Now all the time he is not climbing the ladder he is working hard. Again, although we say he mounts only four times the amount of ladderway, he actually does more, as there are two labours united to intensify the effort, and the strength required is greater when there is intensity as well as continuation; a man may break his back by lifting in one minute, a weight which might easily be raised in two minutes.

Mr. Simmons says that "The hod carriers' work is so hard that Englishmen will not face it; but if they do, they break down in a few months. The men have very strong boots with iron nails, as the ladders are of iron. (Carpenters, painters, &c. will not and

cannot stand on the iron ladders long, the weight is on too small a portion of the foot.) They smoke a great deal all through the day" (apparently required to keep up the action of the heart). "They take coffee and bread and butter for breakfast, although the butter often runs short by the end of the week. The same for dinner, with a piece of bacon, during half the week; for the other half a small chop, or one or two boiled eggs, sometimes raw onions and bread. We never hear of any dying of lung diseases. They are not men of full flesh, but are thin, muscular, and hard. As they live very roughly, they also die roughly, and in general very suddenly, from some great exposure to wet without any succeeding care."

The steiger in the German mines is an overlooker, not so high in most respects as a captain. He is called steiger, I suppose, from the fact that he is constantly going up and down superintending. Steiger means mounter. He is more in motion than the men, and does more than their share of climbing. Still even the under-steiger is longer lived, according to Brockmann, than the workmen. His exertion on the ladders is actually greater than the workman's; but the exertion in the worse air of the levels and ends is not so great, nor is the time which he spends in the worse parts of the air so great. Labour in bad air must be more injurious than rest. In air with little oxygen we are inclined to rest; it is equal to sleep. It lessens the amount of force. If a man who breathes 20 times a minute in good air falls asleep, or becomes very sleepy, his breathing goes down to 12. If he enters air which gives him so little oxygen as to be equal to a smaller amount of breathing, he becomes proportionably sleepy.

If in this condition he makes an exertion, he draws upon some power which physicians must explain; at least it seems at this stage not yet to be in the power of the chemist.

Prof. Forbes (Phil. Magazine for 1837, p. 261,) asys: "From the observation of Borda, who accompanied me in ascending the Peak of Teneriffe, the ascensional effort was 1,225 English feet per hour, continued for 8 hours in a day. This estimate does not differ much from that of the guides at Chamouni. My own experience would give results somewhat greater, and the *constant* must, of course, be determined by each individual for himself. For heights not exceeding 5,000 or 6,000 feet I find 1,500 feet per hour to correspond to the most moderate sustained muscular effect, and which might be long kept up; the only kind of observation of any value, since excessive exertion puts all calculations at defiance.

"For inclinations greater than 25° there is a deficiency of directly comparable results. Coulomb could not persuade a labourer to ascend a stair cut in a rock, through a height of 9,000 feet in a day, at the usual wages. The angle may be supposed to be 30° or 35°."

After speaking of the treadmill, Professor Forbes, now Principal of the University of St. Andrew's says: "In want of decisive observations we shall assume 1,100 feet per hour as the ascensional effect when the ascent is vertical or the horizontal exponent null, being two thirds of the maximum effect." This is explained to be "the amount of labour which may be continued for eight hours a day at least, and for many days together."

Angle of Ascent.	Space described in an hour.	Height ascended in an hour.
0	21800 feet	0 feet
5	10872	984
10	7202	1251
15	5348	1384
20	4198	1436
25	3462	1463
30	2913	1456
50	1706	1307
70	1215	1142
90	1107	1107

From these results it would appear that the actual climbing of the ladder is not a great grievance if performed with moderate speed, but great speed will increase the exhaustion at a very rapid ratio. A horse will take a mail coach at a rapid rate ten miles an hour once a day, but it will drag it 20 miles, not in two hours, but in ten. We may know the amount of force, but we do not know the amount of exhaustion, when a man increases his speed at a given ratio; and who will calculate the effort and anxiety of the miner to get up the ladder and go to his home after his work is done. When we come to this last and most important point of comparison between miners and others who climb we are compelled to confess with Prof. Forbes that "excessive exertion puts all calculation at defiance." These notes are therefore very imperfect, but may be found useful for those who wish to advance farther.

In doing the analytical work of this Report several assistants have been occasionally occupied, but I must especially thank Dr. Reissig, who has now an unusual experience in gas analysis, for the interest he has shewn in carrying out my views during the greater part of the enquiry.

R. A. SMITH.

VI.

REPORT ON THE AIR OF MINES.

By Dr. A. J. Bernays.

At the request of Lord Kinnaird, Chairman of the Mines Commission, I undertook to examine into the condition of the air in certain mines in Cornwall; and I also examined specimens of air which had been collected in other mines in the North. I have in former years had considerable experience of the mines in Derbyshire.

The great cause of impurity here is carbonic acid. The normal amount of carbonic acid in air is 0·035 per cent.; and the generally received opinion among scientific men is, that any atmosphere containing more than three times that proportion, is decidedly injurious to health. I was, therefore, in the early stages of this enquiry, greatly surprised to meet with specimens of air from mines containing 1 and 2 per cent. of carbonic acid which was breathed without fatal results for many hours at a time.

I have further been struck, in the course of my investigations, with the great difference in one's personal sensations of comfort or distress in breathing in different atmospheres containing carbonic acid in the same or scarcely appreciably different proportions. This marked difference, which, so far as I am aware, has not hitherto attracted that notice which it deserves, is due, in my opinion, to the different proportions of organic matter in the air in different places. In other words, the source of the carbonic acid, whether from the exhalations of living beings or from inorganic matters, constitutes the difference. Simple carbonic acid mixed with the air may be breathed with far greater impunity, and therefore in larger proportion, than carbonic acid mixed with organic impurities, as it necessarily is when originating from the respiration or the cutaneous exhalations of living beings. It is not, perhaps, to be wondered at that this effect of the influence of organic matter in aggravating the evil effects of the inspiration of carbonic acid should hitherto have escaped the notice of scientific investigators; for till Dr. Angus Smith introduced his mode of analysis by means of permanganate of potash a few years ago, there was absolutely no method known among chemists of estimating the quantity of organic matter in air. Even now we have much to learn before any investigation into this point can be rendered perfect. We can ascertain the proportion of organic matter, but not its precise nature. We cannot tell what is the difference between the exhalations of different persons; why, for example, a man may continue to breathe without distress a confined space of air so long as it is contaminated solely by his own breath, while he could not, without great disgust, enter an atmosphere rendered foul by the respiration of others, though not more highly loaded with carbonic acid. But however imperfect may be the means of estimating the organic matter, the reality of its influence is unquestionable, and may be easily attested. I found, for example, that in places where water was dripping from the roof, and so constantly percolating the atmosphere of the mine, respiration was far freer than in other parts, the difference depending on the abstraction by the water of the organic matter in the air; and I have repeatedly found that the foul atmosphere was rendered far more endurable by the diffusion of the fumes of chlorine, doubtless owing to the destruction thereby of the organic miasma. Again, I have repeatedly found the air of a crowded assembly room almost unbearable, though containing not more than 0·1 per cent. of CO_2.

I dwell specially on this point, because the conditions of mines in relation to the sources of carbonic acid vary greatly. In coal mines there is a constant source of carbonic acid in the coal itself, and in them an atmosphere can be tolerated more highly charged with carbonic acid than in others, where the sole sources of contamination are combustion and animal exhalation.

The following analyses of air from various mines prove conclusively that in all cases the amount of carbonic acid is far in excess of a normal proportion, and, except in the cases of coal mines, the effects of this excess are aggravated by the proportionately large admixture of organic matter.

With the exception of the airs which I collected myself in different mines, my information as to the exact sources of the different samples of air analysed by me was of the most meagre kind, and did not convey even the remotest idea as to the condition of the mine. Even now, reference must be made to the reports of the mining engineers if the facts which I now record are to be allowed their proper value. All the samples of air which I received in 1862 were forwarded to me by Mr. Rowe. They were contained in large wine bottles of green glass, and carefully sealed. The quantities of carbonic acid require no comment. Whenever it was found in unusual large proportion, a confirmative experiment was always made.

Carbonic acid at barometer 30″, thermometer 60° F.:—

a. Sample of air (A) from the Brentfield lead mine, Sept. 1862; temperature of the mine 60°; contained no less than 2·238 per cent. by volume.

b. Sample of air (E) from Coal Cleugh lead mines. West Allen River, Cumberland; from a rise in west end of low level; temperature of the air where the sample was taken 67°; barometer 28·32″; contained 1·111 per cent. of carbonic acid.

Another sample (F), from another rise further eastward, at a place where the temperature was 70°, contained 1·257 per cent.

A third sample (I), also from a rise above low level, with thermometer at 65°, and barometer at 27·98″, contained 1·078 per cent.

Yet one more sample from the same mine, described as J, driving on the sunflats, with thermometer at 60°, and barometer at 28·1″, contained 1·093 per cent.

All these samples are very bad indeed, and highly injurious. Whether they are fair specimens of the air in a "rise" in these mines, I have no means of deciding; but they indicate an almost absolute want of ventilation. I could discover no sulphur compounds; and if organic matter was present at the time of collecting the samples, it had become decomposed. This decomposition of animal matter would itself account for a certain small proportion of the carbonic acid

found; and for this reason the most reliable experiments are always those made on the spot.

c. Samples of air from Derwent lead mines, Northumberland:—

One (K) from 95 fathom level, west of Jeffries shaft, where the temperature was 66°, and barometer 29·4″, contained 0·596 per cent. of carbonic acid.

The other (L) from 50 fathoms east of Taylor's shaft, where the temperature was 65°, and barometer 29·12″, contained 0·434 per cent.

d. Rodney Fell lead mines. Two specimens.

The one (B) from the bottom of engine shaft. Temperature of the mine 57°; barometer 28·78″. Carbonic acid only 0·084 per cent.

The second sample (C), from low level end west. Thermometer in mine 61°; barometer 28·66″. Carbonic acid 0·597 per cent. (N.B.—From an accident in weighing before the operation was quite complete, I cannot be certain of the figures in this case; they must be regarded as approximative only.)

e. Dowpot Syke lead mine, two miles south-east of Alston. Only one sample (R) from this mine, with thermometer at 56°, and barometer 28·78″. Carbonic acid, 0·405.

f. Nenthead lead mine. Three specimens.—One sample (W 62°, and 28·5″ barometer,) contained 0·352 per cent. of carbonic acid.

A second sample (X, 66°, and 28·56″ barometer,) contained 0·132 per cent. of carbonic acid.

The third sample (Y, 66°, and 28·58″ barometer,) contained 0·147 per cent.

g. Nattrass lead mine. One sample (Z), with thermometer at 62°, and barometer at 28·84″, contained only 0·044 per cent. of carbonic acid.

h. Honey Bee lead mine (A A, barometer 28·7″, thermometer 60°,) contained 0·206 per cent. of carbonic acid.

i. Lady Vein lead mine. (O, barometer 28·42″, thermometer 53°.) Carbonic acid as much as 1·5 per cent.

j. White Lee lead mine, two miles south-east of Alston. (B B, barometer 28·78″; thermometer 56°.) Carbonic acid, 0·344 per cent.

k. Clargill Burn lead mine. (C C, barometer 28·78″; thermometer 59°.) Carbonic acid, 0·401 per cent.

l. Fellgrove mine. (D D, thermometer 51°.) Carbonic acid, 0·165 per cent.

m. Crossgill lead mine. (E E, thermometer 52°.) Carbonic acid, 0·071 per cent.

n. Arkendale lead mines in Yorkshire. Five specimens:—

F F. Danby level. Temperature 55° in the mine. Carbonic acid, 0·223 per cent.

G G. Danby low level. Barometer 27·5″; thermometer 50° in mine. Carbonic acid, 0·213 per cent.

H H. Stang. Barometer 27·3″; thermometer 55° in mine. Carbonic acid, 1·458 per cent.

I I. Stang. Thermometer 55°. Carbonic acid, 1·112 per cent.

O O. Fell End. Thermometer 56°. Carbonic acid, 0·206 per cent.

o. Queen's Level or Hurst. (W W, temperature 55°.) Carbonic acid, 0·209 per cent.

p. Bromley Hill lead mine. Two samples:—

S, barometer 28·64″; thermometer 56°. Carbonic acid only 0·073 per cent.—V, barometer 28·84″; thermometer 60°. Carbonic acid, 0·547 per cent.

q. Stow Craig lead mine. (N, barometer 28·84″; thermometer 56°.) Carbonic acid, 0·503 per cent.

These twenty-seven samples are for the most part bad; some very bad. If they are representative specimens of the mines in the north of England, they show that the ventilation of "rises" and "ends" must in most cases be highly defective and injurious to human life, and calls for amendment. As regards the specimen from Bentfield mine, it must surely have arisen under exceptional circumstances, as men could not work long in such an atmosphere.

The rest of the specimens of air have been collected chiefly by Mr. Twite. As my information* with reference to them is very meagre, I shall give the results with equal brevity.

The samples are all from Cornwall.

a a. Huel Kitty, St. Agnes. Two samples.—A, at 110 fathoms. Temperature of the mine 69°. Carbonic acid, 0·65 per cent.—B, at 100 fathoms, 15 fathoms in an end. Carbonic acid, 0·846 per cent.

b b. North Dolcoath, Camborne. Two samples.—C, 47 fathoms deep. End 18 fathoms from shaft; rise 7 feet high, 3 feet wide. Temperature 67°. Two men. Wet. Carbonic acid, 0·325 per cent.—E, an end worked by two men, and about the same distance from shaft. Temperature 67°. Carbonic acid, 0·584 per cent.

c c. Ding Dong, Penzance. H, 60 fathoms deep. Temperature of the mine, 72°. 20 fathoms from air sollar. Carbonic acid, 0·214 per cent.

d d. Bedford United. Three samples.—1. $\bar{1}\bar{1}5$ fathoms deep. Temperature, 70°. End 30 fathoms in. Ventilation by a machine. Carbonic acid, 0·452 per cent.—7. Same level close to the shaft. Carbonic acid, 0·142 per cent.—9. 47 fathoms deep. 170 fathoms from the shaft. Temperature, 71°. Machine ventilated.

e e. Kingston United; Tin mine. Three specimens.—3. 85 fathoms deep. Temperature 64°. End ten fathoms from air. Carbonic acid, 0·447 per cent.—20. 110 fathoms deep. Temperature, 65°. End nine fathoms from air. Carbonic acid, 0·954 per cent.—21. 100 fathoms deep. Temperature 64° in current. Carbonic acid, 0·067 per cent.

f f. Drake Walls; Tin mine. Two specimens.—10. 70 fathoms deep. Temperature 64° in an end. Carbonic acid, 0·477 per cent.—19. 90 fathoms deep. Temperature 64°, stopes. Carbonic acid, 0·285 per cent.

g g. Par Consols. The specimens from these mines were collected by Mr. Pearce, of Truro, in March of the present year. Four specimens.—*α.* 150 fathoms, stopes. 4 men at work. Temperature 77°. Blast two hours previously. Carbonic acid, 0·115 per cent.—*β.* 100 fathoms; cross-cut. 4 men. 50 fathoms from rise. Carbonic acid, 0·088 per cent.—*γ.* 80 fathoms level. Thermometer 70°, one quarter of an hour after blast. Carbonic acid, 0·096 per cent.—*δ.* 180 fathoms, end. Temperature, 84°. Six men. Five hours after blast. Carbonic acid, 0·088 per cent.

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* The information was given to me in January of the present year; the analyses were made in the winter of 1862.

h h. Fowey Consols. Four specimens.—Stopes from 270 on south lode. Temperature 82°. Carbonic acid, 0·089 per cent.—Again 270 ; stopes. Temperature, 81°. Carbonic acid, 0·09 per cent.—220 ; stopes. Temperature 74°. Carbonic acid, 0·184 per cent.—280 end ; bottom. Temperature 86°. Carbonic acid, 0·195 per cent.

i i. Clifford amalgamated. The heat of this mine seems to be owing to hot springs ; and the great discomfort experienced is much more owing to heat than to impurity of air. The mine is 275 fathoms deep. The specimens were three in number, and were collected by Mr. Pearce. 220 fathom ; cross-cut to Garland's shaft. Thermometer 85°. Carbonic acid, 0·072 per cent.—Same level. Cross-cut east of Garland's shaft. Stopping place for men. Temperature, 86°. Carbonic acid, 0·068 per cent.—230 fathoms, East. Two fathoms from winze, and 20 fathoms from shaft. Temperature 105°. Carbonic acid, 0·103 per cent.

j j. Phœnix mine. This mine I have to a certain extent examined myself. It is 206 fathoms deep, the last 20 fathoms of which are under water. The mine is entered by the eastern shaft, which is 75 fathoms from the old engine shaft. At the 170 fathom level, the thermometer indicated 64°, and the barometer 29·2″ on Monday, 28th December 1863. I made some experiments in an end about 40 fathoms from a winze on this level. The air, for a mine, was remarkably pure. In two experiments, each with a gallon of air, the quantity of carbonic acid was respectively 0·061 and 0·068 per cent. There was a remarkable freedom from organic matter, as judged by Dr. Angus Smith's air test. Although I perceived in many parts of this mine the most beautiful fungoid growth wherever there was decaying timber, there was no appearance of such in the absence of wood. The fungus seemed identical with that which grows so luxuriantly in the wine-cellars of the London Docks.

In order further to test the air, with reference especially to organic matter, I allowed a quantity of ice to melt at an end where men were at work. The moisture condensed from the air against the vessel containing the ice was collected and carefully examined at the laboratory of St. Thomas's Hospital. It was faintly alkaline, and contained only a very small but appreciable quantity of organic matter.

k k. South Caradon mine. This mine I did not personally examine underground, but obtained samples of air from Messrs. Twite and Pearce. Two specimens were obtained.—*α*, from the stopes between the 70 and 84 fathom level, at the back of the 80 fathom. Carbonic acid, 0·203 per cent.—*β*, rise end of 96 fathom level on Caunter lode, 4½ fathoms high. Carbonic acid, 0·411 per cent.

l l. Dolcoath mine. In this mine Messrs. Twite, Pearce, and myself spent the working portion of three days. It is impossible for me to speak too highly of the extraordinary kindness and attention exhibited by the captains of this mine. They afforded me every facility for studying its character, and assisted not only in person, but by the loan of trustworthy men who watched certain experiments by night and by day. With their aid and that of the Messrs. Twite and Pearce, I was enabled to make many observations, some of which I will now record.

The descent into the mine is generally effected by the man-engine, and this mode of conveyance is not at all unpleasant. It is indeed so far less fatiguing than by ladders, that with proper care it must prove a great boon to the men. The air at the 254 fathom level (or more properly 284 fathom) is remarkably good, and shows the efficiency of the ventilation by a down and upcast shaft upon the syphon principle, the greater length of the upcast shaft assisting greatly in good ventilation. The variation of temperature during three days was only half a degree, from 70° to 70½°.

I record five experiments made in the mine, each with a gallon of air :—

Carbonic acid on first day -	0·053 per cent.
Carbonic acid on second day -	0·044 per cent.
Do. do. (2d experiment)	0·049 per cent.
Carbonic acid on third day -	0·056 per cent.
Do. do. (2d experiment after blasting),	0·068 per cent.

Here then we have an average of only 0·054 per cent. of carbonic acid, an amount so little in excess of the normal proportion as to speak highly for the goodness of the arrangements for ventilation. The effect of direct communication between shaft and shaft, even at considerable distances from each other, and at so great a depth, is well shown in this mine.

But this very perfection of the ventilation in the galleries only serves to bring into more striking relief its imperfection in the "levels" and "rises," as the following analyses of samples collected in the Dolcoath mines, and analyzed in London, will demonstrate.

I. At 254-fathom level, west of the cross-cut. Temperature 68°. Carbonic acid 0·101 per cent. —II. At same level. End east, 25 fathoms east of new east shaft. Temperature 79°. The men had left about two hours. Carbonic acid 0·064 per cent. —III. East end of same level, 30 fathoms from shaft. Six men. Carbonic acid 0·254 per cent.—IV. Stopes, eight fathoms below 254 level. Thermometer 69½°. Carbonic acid 0·177 per cent.—V. Bottom of winze in 266-fathom level, one hour after two holes had been fired. Temperature 77°. Carbonic acid 0·22 per cent.—VI. 266-fathom, west end. 50 fathoms in from air. Temperature 82°. 6 men. 20 minutes after blast, the air having completely cleared. Carbonic acid 0·12 per cent.—VII. 266 end, six fathoms from winze, 10 fathoms from shaft. 12 men. Thermometer 80°. Carbonic acid 0·3 per cent.—VIII. 278-fathom level. End east. Temperature 78½°. Carbonic acid 0·208 per cent.—IX. Same place and same level, two hours later. Carbonic acid 0·388 per cent. —X. An end near the lowest working level. Carbonic acid 0·272 per cent.—XI. An end at lowest working level, 284 fathom. Carbonic acid 0·324 per cent. — XII. An end somewhere between 266 and 278-fathom level. Carbonic acid 0·527 per cent.

Although some of these ends are badly ventilated, and notably and exceptionally the last, the general arrangements of the mine are such that very simple mechanical remedies would suffice to free them from impure air. In a large mine like this of Dolcoath, with no fewer than six shafts, change of air in the levels is easily attainable, but there are very few ends and rises which do not require artificial ventilation.

In endeavouring to estimate the impurity of an atmosphere, and the effects of such impurity on the health of those subjected to its continued influence,

it is not enough to point out merely the amount of carbonic acid it contains. I have already in this report insisted strongly on the great part played by organic impurities in aggravating the pernicious effects of an atmosphere charged with carbonic acid. A comparatively small proportion of organic matter will render the air far less endurable than a much larger proportion of carbonic acid not so tainted, Thus in coal mines, as I before mentioned, where carbonic acid is disengaged from the coal, an atmosphere containing above 1 per cent. is far more tolerable than one containing $\frac{1}{4}$ per cent. derived from respiration. And the fact that where several men are aggregated they must breathe each other's exhalations, aggravates still more, in my opinion, the effects of deficient ventilation.

Being fully satisfied of the importance of this point, I of course directed considerable attention, in all cases where it was practicable, to the amount of organic matter in the air of the mines. For this purpose I adopted two modes of analyses. I analyzed the air by Dr. Angus Smith's method, and I also condensed (by means of iced vessels) the moisture from the air, and examined the liquid so collected. Several of these experiments required 24 hours for their completion.

These experiments fully coincided with the results I had previously arrived at from an estimate of the carbonic acid. Thus, in a gallery in the Dolcoath mine, at 254 fathoms depth, I could detect scarcely any organic matter. It was even less than that ordinarily to be found in the air of an inhabited room; and less than I have found in the air of the Surrey Gardens on a foggy day, after making due allowance for the presence of sulphurous acid in the latter.

The largest quantity of organic matter and carbonic acid I found at an "end" in 284 fathoms level. But the character of this was greatly changed by keeping. The organic matter was diminished by oxidation, with, of course, increase of the carbonic acid.

It is certain that the worst effects of carbonic acid and accumululated organic impurity are found in "ends" and "stopes," and in these ventilation by air machines should never be neglected. As it is, the principal current of air in these places results from the blasting operations, which, in so far, are undoubtedly highly beneficial. Blasting, doubtless, adds certain impurities of its own to the air; for, besides an excess of carbonic acid, sulphuretted hydrogen, sulphide of potassium, and nitrite of potash are generated and volatilized by it, and may be detected in the water condensed from the atmosphere. Some arsenical compound, recognizable by the odour of garlic, is also produced in many mines. A certain time is requisite for the dispersion of these impurities. But if this interval were allowed before the return of the workmen to the spot, the effects of blasting in causing movements of the air would be highly beneficial.

The above arsenical compounds may sometimes be detected in the air where no blasting has been carried on, the arsenic in the ore being ignited by sparks from the workmen's picks.

Besides the amount of organic impurities there are three other circumstances which modify the effects of an accumulation of carbonic acid in the air. They are temperature, moisture, and barometric pressure. It is unnecessary to enter at length into the consideration of all their possible variations. It will be sufficient to observe that the most injurious, as it is undoubtedly the most unpleasant condition of atmosphere, is one frequently encountered in mines, where a high temperature is accompanied with excessive barometric pressure and great humidity. The great condensation of the air enabling a larger inhalation of oxygen with each breath, is supposed to give a compensating advantage; but probably this is more than counterbalanced by the general distress induced by greatly increased barometric pressure, amounting as it does in Dolcoath mine to $1\frac{1}{2}''$.

I have but one more observation to make on the chemical character of the air. Increase of carbonic acid implies diminution of oxygen, and to this diminution has sometimes been ascribed much of the deleterious effects of the polluted air. But that this is an error is apparent from this (besides other reasons), that, whatever the source of the carbonic acid, the air is rendered far more endurable by the presence of water, even where the normal amount of oxygen is diminished, manifestly because the water removes both carbonic acid and organic matter.

Having thus considered at length the chemical condition of the air as evidence of the defective ventilation of mines, I will endeavour briefly to point out the effects upon the health of the miners of this and other deleterious influences to which they are habitually exposed.

1. The effects of bad ventilation are two-fold. *a*. It affects the health and the duration of life. *b*. It also directly diminishes the working power of the individual.

There is no greater proof of its effects upon the duration of life than the distressing fact which thrusts itself upon the notice of the observer in all mining districts, that almost all of the male sex are cut off in comparatively early life. The ordinary limit of life among them is from 40 to 45; it is rare to see a man of the age of 50. I may refer to the Registrar's reports for evidence of the extreme frequency among them of diseases of the lungs, contenting myself with one observation which has been brought specially under my own notice. It is well known that miners are subject to a peculiar disease, in which the lung becomes charged with a black deposit. The nature of this deposit has given rise to considerable discussion, but I have proved it beyond doubt to consist of finely divided particles of carbon. Now, in my experiments I found the air abounding most in such floating particles in the immediate neighbourhood of burning candles, and my attention was accordingly directed to the wretchedly bad candles employed. I believe that the miners suffer far more from the finely divided carbon from these candles with their flaring wicks than from the blasts of gunpowder.

b. That bad air incapacitates from work will be admitted by all physiologists. Nothing is more certain than that under its influence both the nervous energy and the power of the muscles themselves are greatly diminished.

2. Next to the bad ventilation, the most serious trial of the miner is an insufficiency of animal food, the supply of which in the majority of instances does not amount to more than 3 or 4 oz. a day; and even this miserable allowance cannot be turned to the best account, for want, in most cases, of proper appliances for cooking. It is scarcely necessary to observe that

such an insufficiency of diet renders the men more amenable to the deleterious influences of the air they breathe. Perhaps, too, the excessive water-drinking to which they give way during work has a debilitating effect, which might be to a certain extent obviated by the substitution of cold weak tea.

3. A third very trying circumstance to which miners are exposed is the rapid change of temperature and pressure in passing from the surface to the depths of the mine, or, still worse, from the depths to the surface. The effects of this sudden change would be reduced to a minimum, were the changing houses close to the mouths of the shafts, and abundantly supplied with the necessary appliances for washing. As it is, these houses are frequently at so great a distance from the shafts, and so deficient in proper arrangements for cleansing, that many of the men find it more convenient to walk home to their own houses, exposing themselves in their unchanged clothes to the chilling influence of the outer air ; the evil effects of which exposure are by no means imaginary.

4. The mode of descent, viz. by ladders, into many mines, especially those of Cornwall and Devonshire, is needlessly laborious. Much fatigue might be avoided, and consequent saving of health effected, by the more extensive introduction of the man-engine.

5. The above are conditions affecting the health of the miner while at work ; all of which may be met by special arrangements. There remains one important question, of a totally different character, viz., at what age such work should be commenced. There can be no doubt that throughout the mining districts it is the custom to set boys to this very severe labour at far too early an age ; before the chest is properly developed, and before the limbs are knit ; thus laying the foundation specially for disease of the lungs.

It is easy now to see in what direction, specially, improvements are loudly called for :—

1st. All "ends" and "stopes" which cannot share in the general ventilation of the mine should be ventilated by special apparatus ; not by pressing fresh air into them, but by exhausting the foul, special care being taken that the current of fresh air so drawn in be derived from a pure source.

2nd. The character of the men's diet must be improved, and opportunities for cooking should be supplied, as at South Caradon mine.

3rd. Changing houses should be provided at the mouths of the shafts, furnished with every reasonable accommodation, and with some organised assistance by attendants.

4th. Some limits of age should be fixed before which employment as a miner should be prohibited.

Finally, I cannot altogether omit to notice the innumerable accidents to which miners are constantly liable. What with imperfections in ladders, and other means of descent and ascent, pitfalls on all sides left unprotected, through a miserable economy, when a trifling expense would provide the means of defence, and the want of any adequate supervision, the miner's life may be truly said to be constantly trembling in the balance. He is compelled from morning to night to exercise an amount of vigilance with which it is unfair to tax him, but a momentary failure of which may cost him his life. In such matters, a far greater responsibility ought be laid upon the owners of mines than is the case at present.

A. J. BERNAYS.

VII.

GENERAL REPORT

By C. Twite, Esq., M.E.

On Mines visited by the Commissioners.

Camborne,
My Lord, 1st January 1864.

I beg to submit this my general report upon the mines of England and Wales, visited by me under the direction of your lordship during the years 1862–63.

I append reports upon mines visited, and from which samples of air were taken, since the time of my last report dated 3rd August 1863.

By the various reports I have furnished it will be seen that I have visited and examined the workings of the principal metallic mines in Cornwall, Devonshire, North of England, Wales, Isle of Man, and, in company with Dr. Smith, several of the largest and most important mines of Saxony. If we take the money value of the produce of the metallic mines for the year 1862 to represent the extent of mining in this country, then the value of the mines visited will show the relation of proportion they bear to the whole.

Mr. Hunt's statistics give this value for the whole to be £13,443,550, and from the same source we find the value of those visited and examined to be £8,682,028.

Again, if we take the number of men employed as the test, we find that out of 81,223, the total number of miners, there were visited the number of 48,702, and this is independent of those mines visited and reported upon by Captain Rowe.

The metallic mines of this country divide themselves into two great classes, which may for convenience be named the deep mines and the shallow mines. Under the first class may be comprised the mines of Cornwall, Devonshire, South Wales, and the Isle of Man. They are all found in kindred rocks of Granite or Devonian, are worked to great depths, reaching in some cases to above 300 fathoms. The form of the deposits of ore is similar in character, and the modes of working assimilate themselves very much, differing only according as the enterprise and skill of the manager has led him to open out and work the property entrusted to him with greater judgment and attended with greater success. The other mining districts of North Wales and the North of England, comprising the mines of Alston Moor, Allenheads, Yorkshire, &c., forming the second class, differ from the preceding division, inasmuch as that as a rule they are comparatively shallow, in few cases being more than 50 fathoms deep, are found in beds belonging to the Carboniferous period, and from generally being found in rising ground are mostly worked by a system of adit levels, or galleries driven in the sides of hills, thus rendering unnecessary the expensive sinkings and essential machinery requisite for working the deeper mines of the first class.

The points to which your lordship directed my attention were, 1st, the ventilation of mines, 2ndly, the means of access to and egress from the mines, and, 3rdly, the surface arrangements for the comfort and convenience of the miners, when they come up from their labour, in the form of changing houses, and lodging houses in those cases where the men residing a long distance from the mine in uninhabited districts, involve the necessity of their spending several nights of each week in the mine; and, lastly, the arrangements for the protection of the persons employed on the surface in the operations of dressing the ores.

I shall proceed, first, to consider the ventilation. This is really the most important of the subjects to be inquired into, and at the same time the most difficult about which to arrive at a correct conclusion.

When we consider the large number of men employed daily in the bowels of the earth, dependent upon the systems of ventilation adopted for the due supply of that air necessary to their existence, and when we further consider the fatal consequences which are sure to follow if this supply be at all limited in quantity or poor in quality, we shall be duly impressed with the importance of the subject, and if we call to remembrance the necessary various differences in the detail of workings in metallic mines, the difficulties attending all attempts to get any practical tests to bear upon the question, and the necessity of visiting so large a number of the underground workings under every variety of circumstance, relating either to district of deposit, place of working in the mine, time of working, and detail of working, an idea of the complicate and difficult nature of the inquiry will at once be arrived at.

But these difficulties, while they presented themselves very forcibly when the inquiry was first entrusted to my hands, have to a great extent been dispelled by the fact, that the question of the quality of the air has been referred to the eminent chemists, Drs. Taylor, Angus Smith, and Bernays, leaving to me only the inquiry into the methods of ventilation employed, and the furnishing of these gentlemen with such samples of air as should enable them to arrive at a fair conclusion as to the quality and condition of the air to be met with, and to be breathed in the underground workings of the mines.

With this object in view, I have visited the various mines referred to in the several reports I have had the honour of submitting to your lordship on several previous occasions, and have taken from them specimens of air, from about 350 working places in the mines, all of which have been forwarded to the gentlemen referred to above.

Your lordship will at once readily see that it was impossible to visit every mine, or to take samples of air from every working place in those mines which were visited, the considerations of time and expense rendering this impossible. Neither was it necessary. The plan adopted has been to make a judicious selection of such as may be considered as typical mines, and then again to select such places in these mines in which to take the samples as should give air which should also in itself be typical of a great class.

These samples were taken in various ways:—

1st, in bottles filled with fine dry sand before taken into the mine, and, being emptied of the sand, became filled with the air, were then corked with carefully selected corks, and securely sealed.

2d, in bottles carefully cleaned and dried, and filled by the method of exhaustion by an air pump contrived by Dr. Smith for that purpose, and corked and sealed in the place.

3rd, in bottles so made that they might be hermetically sealed in the place where the sample was taken. These were also contrived by Dr. Smith, and were the ones most generally used. In all cases care was taken that the circumstances, as far as regarded the number of men breathing, and the number of candles burning, should remain the same while the bottles were being filled as they existed in the course of working.

These bottles were sent to the chemists employed in most cases without any descriptions of the places in which they were taken, while full descriptions of these were forwarded to your lordship from time to time.

These samples will therefore:—

1st. Embrace air from every kind and place of working to be found in metallic mines.

2d. Give the true characters of the nature and quality of the air inhaled by the men in the place of working in which it was taken.

3rd. Those taken from any one mine would together give a fair average of the general state of the air in the workings of that particular mine, and

4th. The whole of the samples taken together will give a fair, truly impartial, and in every way a correct view of the condition of the air existing in the metal mines of England and Wales.

Your lordship will be better able to judge of this from the fact of your having accompanied me in so many cases underground and seen both the manner in which the selection was made, as well as the manner in which the samples were taken.

In addition to this, both Dr. Smith and Dr. Bernays have visited Cornwall, and accompanied me through the workings of several of the most important mines of that district. I have thus had the benefit of their skilled judgment to assist me in my selection of places.

The System of Ventilation adopted in the metallic mines is that known as natural ventilation. This in its simplest form, consists of two shafts with a communication between them, when it will be found that a current of air passes down one shaft, through the level, and up the other. It is by no means certain which of these two shafts shall be the upcast or which the downcast; they are found to vary according to the direction of the wind and other accidental circumstances; neither can the velocity with which the air shall pass through, and consequently the quantity, be relied upon, this varying with the relative heights of the shafts and with the state of the external atmosphere. The same results take place when there is one shaft and an adit or day level, and are attended with the same uncertainties.

When the workings extend beyond this primary state, a series of levels are driven one under the other between these shafts, and smaller shafts, known as winzes or sumps, are

unk from one to the other. It is in driving these levels, and in the sinking of these sumps, and in putting up rises, as these smaller shafts are called when commenced from below, that the great difficulties of ventilation are met with. Again, when the workings are extended beyond these shafts, the same means are adopted to ventilate, and the same difficulties met with. This will be rendered more clear from the various sections of mines accompanying this report.

Again, when several lodes are known or believed to be running parallel to the one being worked upon, or in cases where a perpendicular shaft is sunk, and in consequence of the underlie the lode at certain depths is some distance from it, levels are driven to cut these lodes, and are called crop cuts. These again present difficulties in ventilation.

The length these levels can be driven beyond a shaft or winze before having recourse to assistance in ventilation varies very much, and depends mainly on the nature of the ground, whether it be hard or soft, dry or wet, and the size of the level.

Besides these drivings, sinkings, or risings, which are simply for the purpose of opening out the ground, there are the various methods of working away the mineral, in the stopes or pitches. These are all fully described in other places.

Thus it will be seen that the system of natural ventilation ensures, under favourable circumstances, a circulation of air between the shafts and even beyond the shafts, if openings are made between the various levels communicating with the shaft.

Having now described the method of natural ventilation, I will proceed to explain the various methods adopted for assisting ventilation in such cases where the natural ventilation has failed. The first method is that of,

Furnace Ventilation.—To be seen at the Allenheads and Burtree Pasture mines, and in the Cleveland district.

The first, of which I append drawings, is to be seen at Plantation shaft on Henry's vein. The workings on this vein are very extensive, and at certain seasons the ventilation had been so feeble that the men were obliged to leave their work for days at a time. To prevent this a furnace was erected, which ensures at all times the circulation of a good current of air through the mine, which can be distributed to all the working places. The furnace is erected at the top of the shaft, for convenience of attending to it. The shaft is 25 feet higher than the other shafts, and communicates with the workings of all the mines in the district.

The fire grate is 4 feet 3 inches by 3 feet.

The chimney is 40 feet high from the foundation, or 35 feet above the fire. This height was necessary from its being built close to the road.

A drift is carried from the shaft about 8 feet from the top to the furnace, having a section of 5 feet by 3 feet 6 inches. The top of the shaft is closed by airtight doors.

The expense for one year of this furnace was 170*l.* This includes 10 per cent. on the cost of building, 25*s.* per week for attendance. The price of coal on the mine is 13*s.* 6*d.* per ton, and the quantity burned about 140 tons per annum.

The second furnace is upon the workings at Burtree Pasture shaft. I also append drawings of it. This furnace is placed at the top of a surface shaft, about 500 feet above the highest and upwards of 1,400 feet above the lowest workings in the Burtree pasture vein. This shaft is situated 350 fathoms west of the present easternmost forehead in the vein, and 1,100 fathoms east of the principal winding shaft. It may, therefore, be considered to, at any rate, ventilate a mile in length of vein workings, allowing that a portion of the total length is ventilated by the engine, or winding, and other shafts, but I have no doubt its influence is felt over the entire workings. It is placed at the N.W. corner of the workings.

In the heart of the walls on each side of the furnace there is put in a course of ashes, which being compressible, allow of the expansion of the inner course of bricks, without bulging the external face of the walls. The fire bars rest on metal plates built into the walls, with a little projection.

I am indebted to Mr. Sopwith for these drawings, which make further description unnecessary.

(*See Drawings, App. A, pp.* 15–16.)

The third case in which a furnace is used is in the ironstone mines in the neighbourhood of Redcar. These are placed at the bottom of the shafts, as in coal mines.

Water Jets.—The next method of assisting ventilation is that of water jets or blasts. These are most commonly met with in the North of England, where long cross cuts are driven without any communication with the surface above. They are simple in construction and present little variety in form. Those to be found at Rampgill, Long Cleough, and Fletcheras mines may be fairly taken as affording a good description of this kind of appliance.

I have reported fully on these machines. In each of these cases the pressure from a column of water is the motive power. In the first two, the power thus obtained is applied to a fan while in the other case the velocity of the jet of water is applied to increase the velocity of the air in the small air course, that is, the air pipe, and so to increase very largely the quantity of air entering the end or working place per minute.

The quantity of air supplied in the first case was about 30 cubic feet per minute, in the second 20, while in the third case it amounted to 38, while the distances the air was carried in the first and second was 90 fathoms, in the third it was 190.

The quality of the air supplied is good in these respects. It is cooled from the contact of the water, and to a great measure purified, if the air be supplied from the mine itself.

The jet as used by Captain Williams at Charleston United mine, near St. Austle, may complete my description of these. Captain Williams estimates it as being capable of sending a quantity of air equal to 2,039 cubic feet per minute into the place; he has applied it with a fall of 80 fathoms, and drives it a distance of 65 fathoms.

(*See Drawing ,App.A.p.*17..)

The next plan adopted is that of pumping machines, generally known as duck machines. These are either single or double in construction, and worked either by hand or by being attached to the pumping rods.

Fans are next to be described. They consist of a number of vanes, varying from 6 to 8 or 10, forming the radii of a wheel which revolves rapidly in a circular box provided with two holes, through one of which the air is drawn in, and driven out through the other. These fans, like the duck machines, are worked by hand labour, though sometimes small water wheels are used for the purpose.

Besides the appliances now described, in many cases where a strong current passes through a level, a door is put up, and pipes arranged to carry the air into such adjacent parts as seem to require it. Various plans and descriptions of these will be found in other parts of my reports.

In some mines the precaution is adopted of laying down a flooring of planks raised some 6 to 12 inches above the bottom of the level on which the broken ground rests, thus ensuring a passage for the water, and to some extent for the air.

Having described the means adopted for ventilating the mines, the next thing to which I would direct your lordship's attention is the efficiency of these methods in securing good air in the working places of the mine. This will of course show itself in the results of the analyses now being made; but at the same time I should not consider my report complete if it did not contain my views on this point. How far they may coincide with these results I am of course unable to say. This opinion is formed, not from any practical tests by which, having established a standard, any difference therefrom may be seen, measured, and reported, but rather from an intuitive feeling, a sensation of oppression, or otherwise, the result of much practice in the mines, which enables one to judge when the air becomes very bad.

The common test amongst the miners of trusting to the effect upon the burning of a candle as showing the condition or the air is a most fallacious and dangerous one, as shown from the fact that many cases where the burning of the candle is not sensibly affected, the air has proved itself to be quite unfitted for human respiration.

In some cases, as where explosions have recently taken place, the presence of the results of combustion are detected by their odour.

When a mine is generally badly ventilated the effect shows itself upon the system, affecting to a greater or less extent the health. This, as experienced by me on several occasions, has been a feeling of exhaustion quite incompatible with the amount of muscular exertion undergone and the state of fatigue naturally to be supposed to be experienced therefrom, followed by great languor and general debility, attended with a much greater disposition of catching cold on exposure than at ordinary times.

The places where the feeling of bad air was most experienced were those in which the following tubes were filled, viz.:

Nos. 5, 9, 13, 19, 21, 23, 27, 39, 50, 51, 54, 56, 60, 65, 72, 73, 80, 103, 113, 116, 125.

E. 3, 5, 6, 8, 9, 19, 25, 31, 33, 34, 36.
W. 1, 4, 5, 6, 7, 8, 12, 22, 29, 30, 42, 43, 46, 47, 52, 67, 67, 69, 70, 71, 72, 73, 74, 78, 83, 85, 87, 91, 92, 97.

Full descriptions of these places appear in the reports, so that your lordship can examine the circumstances affecting each, and from the analyses learn the chemical causes.

It will be seen that the principal causes of this defective ventilation are,—

1. The distance which the ends are driven beyond a winze. No general statement can be made as to how far it is safe to carry these ends, so much depending upon the nature of the rock, in its composition and hardness, the size the level is driven, the amount of water met with, and the number of men working per 24 hours in it. The most favourable circumstances of course being a moderately hard rock, requiring on the one hand small charges of powder for blasting it, and no timber to support it, while from its composition no deleterious gas should be evolved. Even with these things favourable, it has been too often found that excessive distances occur between the last winze and the end, while in other cases without these favourable features the distance is not lessened.

2. These remarks apply with even greater force in the case of rises and sumps. It will be found to be generally the case that these are only commenced when the air in the ends is getting or has got bad. It is therefore easily to be seen that the ventilation of these, especially when some distance above or below the level, will be as a rule bad also.

3. A great cause of evil is to be found in the heaps of broken ground allowed to remain in the levels, which narrows the air passage very materially, and checks to a very considerable degree the circulation of air.

4. The next vitiating cause is the amount of gunpowder used in blasting, the smoke of which at the periods of blasting fills and remains for hours circulating through the mine; and this leads to the consideration of:

5. The uncertainty both with regard to the amount and direction of the air entering the mine by the system of natural ventilation. This I have referred to at length in another place.

6. The general want of attention to the condition of the pipes in those cases where the various kinds of machines are used to assist the ventilation. In many cases the joints were found to be defective, the pipes themselves battered, leaky, and in some instances quite choked; while in others no regular person was employed to work the machine, the men preferring either to work in bad air, or occasionally to send one of the party to blow, rather than suffer what they imagine would be a diminution of their wages if they paid a regular blower.

To sum up therefore shortly, I would say that the system of ventilation as found practised in the metallic mines provides only for those workings between the shafts, and is uncertain in quantity; while it fails in providing good air for the workings beyond those openings, and in workings situated above or below the main levels of circulation.

I now proceed to the second subject, that of the mode of access to and egress from the mines.

The first and most general method is that of climbing by ladders, a most unsatisfactory one, as it entails great loss of valuable time, and inflicts upon the men, when in a condition the least able to bear it, after an exhaustive period of labour, an enormous amount of muscular exertion, and reduces them by the time they arrive at surface to such an exhausted and overheated state as to render them more than ordinarily subject to the influence of sudden exposure to cold, and is a great existing cause of the general prevalence of bronchial and kindred diseases among the miners.

The ladders are generally of wooden sides with staves of wood or iron. The latter are becoming more general.

During the last few years great attention has been paid to this subject by the mining community, and with considerable benefit. The result is, that the number of mines where decidedly bad ladders are to be found is reduced very considerably, so that they may be considered upon the whole to be well made, firmly secured, and so far safe.

From the various reports submitted from time to time to your lordship upon this subject, you will be able to see the particular condition of the ladder road in every mine visited. I may therefore very shortly summarize.

1. *Places in which the ladders are fixed.*—These are generally in the shafts. There is always a set of ladders in the pumping shaft, near to the pump rods, and quite open, placed there primarily for the use of the men whose special duty it is to look after this portion of the machinery. This roadway is generally the most direct one to the bottom of the mine; but owing to the pump rods working so near the ladders, in some cases actually grazing the men upon them, and where a break occurs in them, it being often necessary to dodge the pumps to avoid being caught by them, it is not a very safe one for general purposes, yet it will be seen that it is in very many cases the one appropriated and used.

Ladders are also in many cases placed in the shafts in which the mineral is raised, sometimes separated entirely by a casing or partition of wood, in other cases only partially, while in some instances it is quite open.

In the places where the mineral is raised by means of iron chains and kibbles swinging loosely in the shaft, the placing of ladders alongside, even with a partition between, is attended with considerable danger, from the liability of the chains to break, and the great havoc committed by a falling kibble, acknowledged in most cases by the existing rule that the men stand in a level until the kibble has passed them.

Where there is no complete casing, in addition to this danger, there men are also exposed to the danger of pieces of ore falling upon them, and also to the dangers of an open shaft.

In places where the winding is done by skips running in guides, the danger to the men climbing in the same shaft is considerably lessened, in case the chain breaks the skip being confined to its course, and going down to the bottom.

In some few cases, special shafts originally used for pumping or winding purposes are appropriated for footways. Where this is the case, the shaft is generally divided into lengths of from three to five fathoms in length, by platforms of wood called sollars, which fill the whole area of the shaft with the exception of a small space large enough for a man to pass through, which is called the man hole. The ladders rest upon these sollars.

These footways are very comfortable and safe. The ladders are of easy lengths, generally inclined at an easy angle for climbing; the shaft being large affords plenty of air to the men, and is much cooler, while the sollars lessen very considerably the danger to be apprehended should a man fall away. It is much to be regretted that such provision is not more general in the large mines.

The more general arrangement is using the ladders in the engine shaft to reach the adit, and then to the bottom by means of ladders placed in winzes, as near the ends of the mine as is practicable. This is a very safe way, as the winzes being upon an average only 20 fathoms deep, this is the greatest depth a man can fall, while generally this distance is divided into two or sometime three stages.

Where the lode is narrow (upon which the winze is sunk), and not inclining much, these winzes are narrow and the ladders steep, occasioning much greater fatigue to the men.

2. *Inclination of the ladders.*—Upon the inclination of a ladder, depends in a great measure the ease with which it can be climbed. Formerly, very little attention was paid to this, and the ladders were very often to be found quite perpendicular, and even now some remains of these are stil to be found.

In shafts and winzes sunk upon the course of the lode, and therefore always with some degree of underlay, the ladders being placed upon the foot wall have at least that angle of inclination; where this is not enough, if there be sufficient room, it can be increased by giving the ladder a base of a few feet.

In those cases where the angle is large the ladders are too flat for easy climbing, and are nearly as objectionable as when they are too steep.

The point to be obtained in fixing a ladder should be, that a line drawn from the centre of gravity in the man upon it should fall upon the round of the ladder between his feet. When this occurs, the effort of climbing is equally divided between the arms and legs; but, if a deviation of only a few degrees takes place, greater strain is thrown upon one or the other of these members, much to its distress and discomfort. This is illustrated by the accompanying sketch.

The angle most generally applicable has been found to be from 15° to 18° from the perpendicular, giving an underlay of 1·8 feet per fathom.

The distances between the staves vary from 10 to 11 or 12 inches. At an angle of 18° 10 inch staves are very comfortable, but as the angle increases, the distance may also increase.

In many cases where the angle is very great a handrail by the side of the ladder would be a great convenience enabling the men to retain an upright or nearly upright position while climbing instead of a nearly horizontal one.

In the lead mines of the North, the men are not subjected to the fatigue of ladder climbing, their work being

reached from the adit or day level. This is oftentime of great length, even 2 miles long, and is generally wet.

In Alston Moor and Allenhead, some of the larger mines provide small waggons on which the men and tools of each core side, one of the number pushing it along from behind, and riding occasionally, when the momentum acquired renders more force unnecessary to ensure locomotion.

But while ladders are the most general means of gaining access to the mines, there are several instances in which machinery has been applied to this purpose, which I will now consider.

Man-Engine.

There are eight mines, all of them deep ones, in which the men are lowered and raised by the man-engine. Its origin in Cornwall is owing to an effort made by Mr. C. Fox, in connection with the Royal Polytechnic Society in 1834, by whose exertions a large pecuniary reward was offered to the engineer who devised and to the mine which should erect it, and which were gained by Mr. Loam and Tresavean mine in 1842.

The machine erected here was of the same kind as the German *Fahrkunst*, and consisted of two wooden rods, with alternative reciprocal motion, on which wooden platforms were fixed 12 feet apart, on which the miner stood, passing from rod to rod alternately. This machine is not in use now, but one on the same principle is working at the United Mines, Gwennap.

The plan adopted in the other mines where the man-engine is to be found, is that of the single rod: where there is only one rod in the shaft, provided with platforms 12 feet apart, while a series of platforms or sollars are placed a similar distance apart in the shaft on each side of the rod, in such a position as to correspond with the levels of the platform at the end of each stroke. The miner on leaving the platform at the end of the up or down stroke, waits upon this sollar until the next up or down platform comes to him. The men ascending keeping to the sollars on one side of the shaft, while the descending stream keeps to the other.

The mines with this form of man-engine are Levant, Dolcoath, Carn Brea, Par Consols, Fowey Consols, Huel Reeth, and Cook's Kitchen.

The following table shows the depth to which each engine extends, particulars of motive power working it, the relative number of strokes made by the motive-engine for one of the man-engine rods, the rate at which the rods moves the duration of the journey, and the velocity of the miner.

Mines	Depth of Engines.	Particulars of Motive Engine.			Relative No. of Strokes.	Rate of Man-Engine.		
		Size of Piston.	Length of Stroke.	No. of Strokes.		No. of Strokes.	Journey.	Velocity.
	s.	′	′ ″	Per. Min.		Per Min.	Min.	Per Min.
1. United Mines, double rods	210	32	6 0	18	6	3	17¼	72
2. Levant single	200	20	3 8	40	10	4	25	48
3. Dolcoath „	220	20¼	5 0	42	12	3½	30	42
4. Carn Brea „	132	26	6 0	16	4	4	16	48
5. Par Consols „	220	24	6 0	25–30	5	5–6	20	68
6. Huel Reeth „	188	30	9 0	5–6	1	5–6	16¼	68
7. Fowey Consols „	280	Water-wheel, 30 × 6.				5–6	25	68
8. Cook's Kitchen „	190	„ 52 × 3.				3½	27	42

At Fowey Consols and the United Mine, the shafts are perpendicular the whole way. At Levant, the shaft underlays 15 inches per fathom in an easterly direction, till it reaches 130 when it changes to a westerly direction. At Dolcoath, it underlies from 18″ to 2′ per fathom after the first 50 fathoms which are perpendicular. At Carn Brea, it underlies below the 80, about one foot in a fathom, changing in direction. Cook's Kitchen underlays two feet per fathom.

Rods.—These are of the same construction as the pump rods, of Norway pine, of an average length of 36 feet, and varying in size from 8 inches square to 6½ inches. They are strapped together by wrought iron strapping plates, about 1 inch thick, 5 inches wide, and from 10 to 12 feet long: these are screwed two and two together, with 1½ inch bolts, 18 inches apart, so that each rod is held by 8 bolts.

Platforms of deal, 1½″ thick, always horizontal, and of varying size, from 18 inches wide by 15 deep, at the United Mines, to 16 inches square at Dolcoath, and 12 inches square at Fowey. They are fixed to the rods either by bar iron or angle iron. Handles about two feet long are placed on the rod, about four feet above the platform.

To keep the rods working truly in their places, guides are placed in the shaft in which the rods work, and cast iron sheaves are used in the inclined part of the shaft. The accompanying sketch will illustrate the man-engine.

Catch pieces are also used to prevent in case of breakage a greater fall than 12 feet. They are placed at intervals of about 40 fathoms, and are composed of six pieces of timber, each 8″ square, forming a support four feet deep. Behind the catch pieces another longitudinal retaining piece, 18 feet long and 8 inches square, is securely strapped and bolted by iron strapping plates at the top and bottom to the man-engine rod, leaving an intervening space of 12 feet long by 11 inches wide.

The weight of the rods with iron work complete is about 12½ tons per 100 fathoms. This is as nearly balanced as possible by means of balance bobs.

The rods are put into motion by single rotary engines or water wheels, the men stepping on and off during the time the rod is at rest, during the dead points of the engine; the number of strokes per minute varies from 3 to 6, and the velocity from 40 to 70 feet per minute.

The only danger attending the use of the man-engine, will be the chances of a man slipping when stepping on or off the platforms, or from his head or shoulders coming into contact with the sollars above.

These dangers are lessened by using small platforms on the rod, compelling the men to stand close to the rod, and upright, and by placing sloping boards, called shoulder boards, under the sollars.

It is satisfactory to know that the number of accidents in connexion with the man-engines has been very small indeed, only one death having been caused during the period of this inquiry.

The other machinery used is that known as skips.

The mines where they are employed are Botallack, South Francis, and Dyliffe, for the men generally; and East Pool, Balleswidden, and Condurrow, for the agents and men occasionally.

The arrangements at Botallack having been fully reported upon in my report to Mr. Wylie, dated 22nd April 1863, need not to be again described, only remarking that since that deplorable accident wire rope has been substituted for iron chain.

The skips employed at the other mines are of one construction, being long rectangular boxes of iron from 18 inches to 2 feet square, and from 4½ to 6 feet deep. It has a bow, oval or rectangular in form, to which is a short length of iron chain, serving as connector between the wire rope and the skip.

The shaft at East Pool is perpendicular the whole way. At South Francis it is perpendicular to the 54 fathoms level, then underlies for 6 fathoms, is then perpendicular to the 84 fathoms, and then again underlies to the bottom, 116 fathoms deep. At Balleswidden there is a regular underlie of 18 inches per fathom, while the section upon the shaft, given in the report upon Condurrow, will show at once the character of the shaft at that mine.

At the places where changes occur in the line of direction of the shaft, or of the rate of underlie, cast iron sheaves are placed to prevent the rope rubbing against the rock.

The skips are provided with cast iron wheels, which run upon wooden rails, four to six inches square, placed in the shafts, and are prevented from having the rails either by cast iron bars projecting behind the rails, called rubbers, or by placing two sets of guides, so that the wheels run *between* them, instead of *upon* one set, or two sets of wheels working on each side of the rail. In each case, a safety catch is fixed to the skip, so that in case of the breakage of rope the skip is stopped in its downward progress, and held firmly in the guides.

The arrangement at Dyliffe is fully described in the report of that mine. I consider the whole of the winding machinery in use there to be the most perfect to be found in the metallic mines visited.

These are the modes at present in use for preventing the men from climbing so much in the mines.

Considerable discussion has arisen amongst the miners as to which means is the best under all circumstances, the man-engine or skip. On the one hand, it is contended that the man-engine is safer; that after it is once fixed in its place it will send down or take up a larger number of men in less time than can be accomplished by any other means; and the great facility it affords the men of getting upon the machine, at any level in the mine, without the interference of any other person, is considered a great advantage. On the other hand, it is urged by the advocates of skips that the great expense attending the erection of a man-engine, and the extra space so often required, renders it generally inapplicable; and that the system of sending men down in skips used for drawing the ore in by wire ropes can be made *reasonbly* safe, and if generally applied might be very much improved from what it is now, to the great advantage of the men and to the mines.

It is also generally contended that the men themselves object to riding in skips. Many do, but from personal observation, I found that in all cases where the men were allowed to do so they eagerly rode up, and expressed themselves as very much pleased and very much relieved by the favour.

In riding in the skips the dangers to be apprehended are those arising from the breakage of the rope, drawing by iron chain being of course inadmissible. This will always present itself, but is I think, greatly exaggerated by the objectors to this system. The sudden breakage of a wire rope in the case of those mines using them is very rare indeed, so that good supervision reduces this danger almost to a minimum, while the use of *self-acting* safety catches prevents any serious results even in case such an accident should occur. Another danger is likely to arise from the timbering of the shafts, pieces may become loose, project out, and the men or skips strike against them. Supervision ought to be a sufficient protection from this. The third danger is from overwinding, a case of which occurred at East Pool, 8th April 1863. This can be prevented by giving greater height to the poppet heads, and by affixing disconnecting hooks to the ropes.

So that a method of raising the men in *all mines* by the machinery which should be found on the mine presents itself, and is recommended from its great *economy* and from its safety.

The *underground* travelling ways are, as a rule, not so well looked after as they should be. These comprise many of the levels along which the men have to walk, the ladders leading to the places of working, and various substitutes for them in places where they are not applicable.

The levels are frequently allowed to be, to a more or less extent, flooded, causing the men to get their feet wet going to their work. The matter of wet feet is looked upon with very little concern by the miners themselves; indeed it is no uncommon occurrence for them to soak their shoes in water before putting them on to make them soft. In other places large excavations are made in the bottom of the levels, over which planks are placed for the men to pass upon. These are often very narrow, and without any side protection. A slip of the foot, or a slight deviation from the path, may cause the miner to be precipitated, 40, 60, or even a greater number of feet, while the danger is not at all lessened by the fact that many of these holes are are filled with water.

The ladders are generally conveniently placed, but the substitutes for these are not always so. The most general one in use is a chain if for climbing above the level. By taking a firm hold of it with both hands, digging the toes into any roughnesses of the rock which may present themselves on one side, and keeping the back firmly fixed against the other, the miner contrives to raise himself oftentimes very considerable heights. This method is often necessary for short distances, but from inattention is often persisted in long after the necessity has gone. For descending sumps, chain ladders, or a rope and windlass is used. By the latter, the man places one foot in a loop at the end of the rope, or places one leg into it, holds fast by both hands, and uses the free leg to keep himself from rubbing against the rock.

The shafts passing through the various levels are in many cases quite open, and are a great source of danger. They might be very easily secured by a light gate, or even a chain draw across them.

The subject of changing Houses comes next.

Cornwall is the only district where these are provided.

In Wales and the North of England, except in such places as where the men sleep on the mine, the men go to and from their work in the clothes worn underground.

Dyliffe mines present the only exception met with. While it is admitted by all the miners in Cornwall that changing houses should exist, in many cases those provided are very defective. Very many of them are too small very dark, dirty, and badly ventilated, the floors thick with dirt, and an atmosphere always charged with dust and effluvia arising from a number of men's clothes saturated with perspiration drying over the fire tubes.

The flannels and clothes worn by the men when underground are very rarely washed, making it the more necessary that they should be dried in a well ventilated room, that they might be a little sweetened as well as dried.

These houses are also deficient in washing accommodation for the men.

In too many cases the men are allowed to change over the boilers, from want of proper accommodation being provided. The danger of this needs no remarking upon.

There are several mines where changing houses of a very superior description are provided, presenting very favourable contrasts to those before alluded to; and it is very satisfactory to know that the men avail themselves to the greatest exent possible of all conveniences provided for their comfort. Where water is supplied they furnish themselves, and make good use of soap and towels.

These houses are in most cases a considerable distance from the climbing shaft, necessitating on the part of the men, the walking of this distance in all states of the weather, and while in a very heated condition. It would be a very great boon if an underground communication could be made with the changing house, and so do away with the necessity of the men exposing themselves until after they have washed and changed. This was formerly the case at Dolcoath, and might easily be adopted in a very great many instances.

Lodging Houses provided in many places in the North of England. They are great conveniences to the men saving them walking many miles when tired with work. They were in many cases wanting in ventilation.

I now come to the last part of the subject, the arrangement of the floors. It will be seen that the workers are mostly females, and the cases where they are entirely enclosed is very few, while the cases where they are quite exposed is very few also. They work generally under sheds, so they are protected from above while exposed at the sides.

In many mines in Cornwall, dining houses are provided to which the male and female dressers retire at certain times of the day for refreshment. They are provided with ovens to warm the pasty, the universal dinner, and hot water for the making of tea and coffee. Where such houses are not provided, the carpenters' or smiths' shops are used, and in some cases even the changing houses.

The dressing floors in the North of England are very much scattered about the mine, and are rarely covered in. The dressing is done by boys and men.

These remarks, with the various reports of mines appended, will afford your lordships and the Commissions, all the information I have gathered on the subjects referred to me.

Respectfully submitting the same to your Lordship,

I am, my Lord,

Your Lordship's obedient Servant,

C. TWITE.

Mining Engineer.

Lecturer to the Miners' Association of Cornwall and Devon.

The Right Hon.
Lord Kinnaird, K.T.,
Chairman of Royal Mines Commission, 1864.

Report on Mines in Cornwall. By C. Twite, Esq.

Camborne, Cornwall.
31 Dec. 1863.

My Lord,

I beg to submit the enclosed reports upon mines visited in Cornwall according to your lordship's directions.

I am, &c.

Right Hon. Lord Kinnaird, K.T.
Chairman Royal Mines Commission.

C. Twite.

Dolcoath Mine.

This is the largest tin mine in Cornwall, and is very well provided with suitable accommodation for the comforts of the people.

Changing house is about 25 fathoms from the man engine shaft. It is 80 feet long by 22 feet wide, and 20 feet (13 wall, 17 roof) high. It has 11 windows, glazed and capable of being opened. There is also a large ventilator in the roof formed by raising a portion 17 feet in length about 6 or 8 inches. This is always open. A gallery runs round three sides. It has a wooden floor. It is warmed by a fire and tube 41 feet long. Around the ground floor are the men's lockers, each being 2 feet 2 inches long 1 foot 10 inches wide, and 1 foot 6 inches deep. Before the man-engine was employed the footway shaft opened into this changing house. The number of men changing here is about 350. These are divided into several corps, some commencing work at 6 o'clock, others at 7, others again at 2, and the night corps at 10 p.m., so that the number changing at any one time will be rarely more than 70 or 80.

Sump houses, for men engaged in the shafts.

No. 1 is 12 feet 6 by 12 feet 5, for 9 sump men. One window; fire and tube.

No. 2 is 14 feet by 13 feet, for 11 men and 3 boys, and 2 assistant pitmen; fire and tube.

Timberman's house is 11 feet by 25 feet; fire and tube. Pitman's house same as the last.

It is to be noticed that the sump houses and timberman's house are not kept in that nice and clean state which the other changing and drying houses are. This is the more surprising, as each house is used by a small number of men, and these men have often to spend several hours in them.

Dressing floors: these are very large, giving employment to 570 persons. Of this number 260 are girls. The operations are mostly carried on in large yards enclosed and roofed in.

There are 4 houses set apart for these dressers to dine in. For each house a woman is hired, whose duty it is to keep it clean, have the kettles boiling, and everything ready for the employed when they leave work at 10 and 12 o'clock for refreshments.

No. 1., 53 feet long by 16 feet 4 inches wide, is provided with a fire place of the kind known as a "slab," which is a stove with boiler for hot water on one side of the fire and an oven on the other. Two other ovens are above the fire, and provided with shelves. The general dinner is a potato and meat pasty which is cooked at home, but warmed in these ovens. Tea, coffee, or cocoa is provided by each one. The smoke and heated air is carried away by means of a tube which runs through the greater length of the house. There is a good supply of forms and tables. There are 3 windows in this house each 4 feet by 3 feet 9 inches, opening at top and bottom.

No. 2; this house is a comfortable building, 44 feet 6 inches long by 12 feet 6 inches wide, and 10 feet high. The heating arrangement is similar to that described in No. 1. There are two windows, each 3 feet × 2 feet 8 inches, open top and bottom. It is provided with forms and tables.

No. 3 is 48 feet long by 13 feet wide, and 11 feet high. This house has a wooden roof. Tables, forms, and heating apparatus as in Nos. 1 and 2.

No. 4 is 64 feet long by 17 feet 6 inches wide. This is for the largest number of people. It has 3 glass skylights and no windows. Forms and tables and heating apparatus as in the other houses, the ovens being a little larger.

Samples of air taken as follows:—

No. 111, taken from the bottom of the new shaft in the 278 fathom level, 314 fathoms from surface.

There were 8 men and 4 boys working in 4 shifts set to drive a X cut from this shaft to cut the north lode. The driving 8 feet high; temperature 84°.

E. 1, taken some weeks after the above when the lode had been cut, and a winze brought down from the level above. The end was now 5 fathoms beyond winze and 13 fathoms from shaft; temperature 82°.

E. 2, from a winze in the 268 fathom level, 4 fathoms deep; 2 men in 2 shifts of 12 hours, 20 fathoms east of sump shaft.

E. 3, From the level at mouth of the above winze.

E. 4, from the 266 fathom level eastern end; 25 fathoms from sump shaft; and 10 fathoms east of stopes, temperature 84°, 6 men in 2 shifts of 12 hours.

E. 5, From the stopes between the 242 and 254 fathom levels, between the old and new sump shafts. The stopes full of smoke.

Huel Reeth Mine.

A large tin mine at St. Ives, under the management of Captain Stevens. It is 220 fathoms deep, in granite. There are two shafts from surface about 100 fathoms apart, one going to the 190 fathom level, the other to the bottom. The workings are extended west of Frederick's shaft, 130 fathoms at the 180 fathom level, and east of Stevens' shaft 170 fathoms.

Took samples of air as follows:—

E. 6, from the eastern end of the 130 fathom level on the south lode, 25 fathoms beyond a rise; 1 man and boy working in the end. There were 3 pitches between rise and end. The rise was open to the 110 level. There was a pile of stuff in the end. The ground wet. Temperature 72°. Size of level 7′×3′.

E. 7, from the eastern end of the 190 fathom level, driving by 3 men and 3 boys in 3 shifts. This end is about 90 fathoms beyond the 170 end, and 20 fathoms beyond 190 end. A pair of men are sinking towards the 190, which will, when that level is brought forward; communicate in some months time. The candles burned badly 2 other pairs of men were working in the back of this level. Temperature 75°. Size of level 7′×3′.

E. 8, from the eastern end of the 190 fathom level in dry ground. This level was wider, being intended for a tramroad, driving by 3 men and 3 boys in 3 cores, about 20 fathoms from rise, a communication will in time be opened from this end to the 180. Temperature 76°.

E. 9, from a level driving west from winze below the 190 to meet the 200 fathom level driving east, 9 men in 3 parties. Ground dry, 77° F.

The levels in this mine are narrow, about 3 feet wide; a very great advantage would be gained if they were driven wider.

The ladders in the engine shaft were good, and, as far as the 120 fathom level, divided off from the pumping rods. The winding is done by skips drawn by chains. There is a man-engine in this mine, by which the men can ride to the 150 fathom level. It is a single-rod engine.

I notice here as is to be noticed in nearly every mine the absence of anything approaching protection at the ends of shafts in the different levels. They are left quite open with nothing to prevent a man from walking directly into them. In many cases the men have to walk directly in front of the shaft or on a single plank over it, which cannot but be attended with danger.

Boilers.—Main engine boiler, provided with feed gauge cocks. Steam whin boiler provided with feed gauge cocks. There were 40 men changing over the boiler. Pumping engine boilers. There were 2 boilers connected. The safety valve leaking; 30 men changing over these boilers.

Steam stamps boiler.—Safety valve leaking.

Changing house, 40 feet long by 10 feet; and 10 feet high. A fire and tube in the house. It was very dirty and devoid of ventilation. The tutwork men only change here. The tributers changing over the boilers as referred to above.

The floors were mostly shedded.

St. Ives Consols.

Samples of air were taken as follows:

E. 10. From the 167 fathom level eastern end on the counter lode, driving by 2 men. 200 fathoms from the nearest shaft, 15 fathoms from a rise, and 45 fathoms from a winze. The air passing from the winze up to the rise. Ground dry. About 1½ hours after shot when ½lb. of powder had been fired. Level driven 7 feet high by four feet wide. Not much stuff in the end. Temperature 80°.

E. 11. From the eastern end of the 177 fathoms level. Two shafts from surface on this level, besides common scaling with workings on Daniel's lode, on which also shafts open to surface, This cross cut 60 fathoms from end. Temperature 77°.

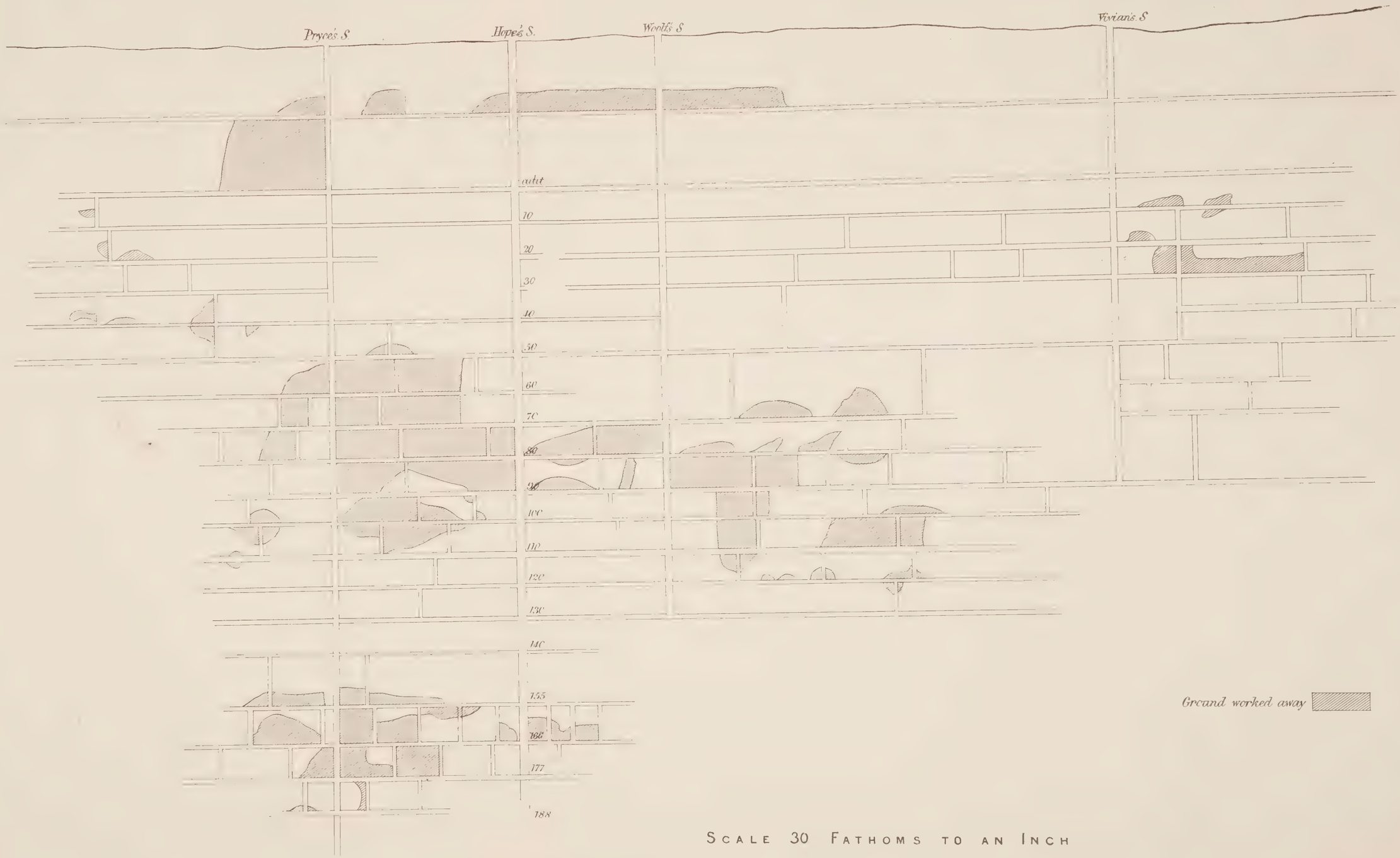
E. 12. From the 147 fathom level eastern end on Daniel's lode; 4 men in 2 shafts. Hard dry ground. 30 fathoms further from rise, and 20 fathoms from winze. Temperature 75°.

E. 13. From Carbona on the Daniel's lode in 117 fathoms level. This is a large opening 70 feet long and from 20 to 40 feet wide and open from the 90 to 130 fathom levels. Temperature 72°.

REFORM CLUB
PALL MALL

SECTION SHEWING WORKINGS ON THE MAIN LODE

CONDURROW MINE CAMBORNE 1863



Ground worked away

SCALE 30 FATHOMS TO AN INCH

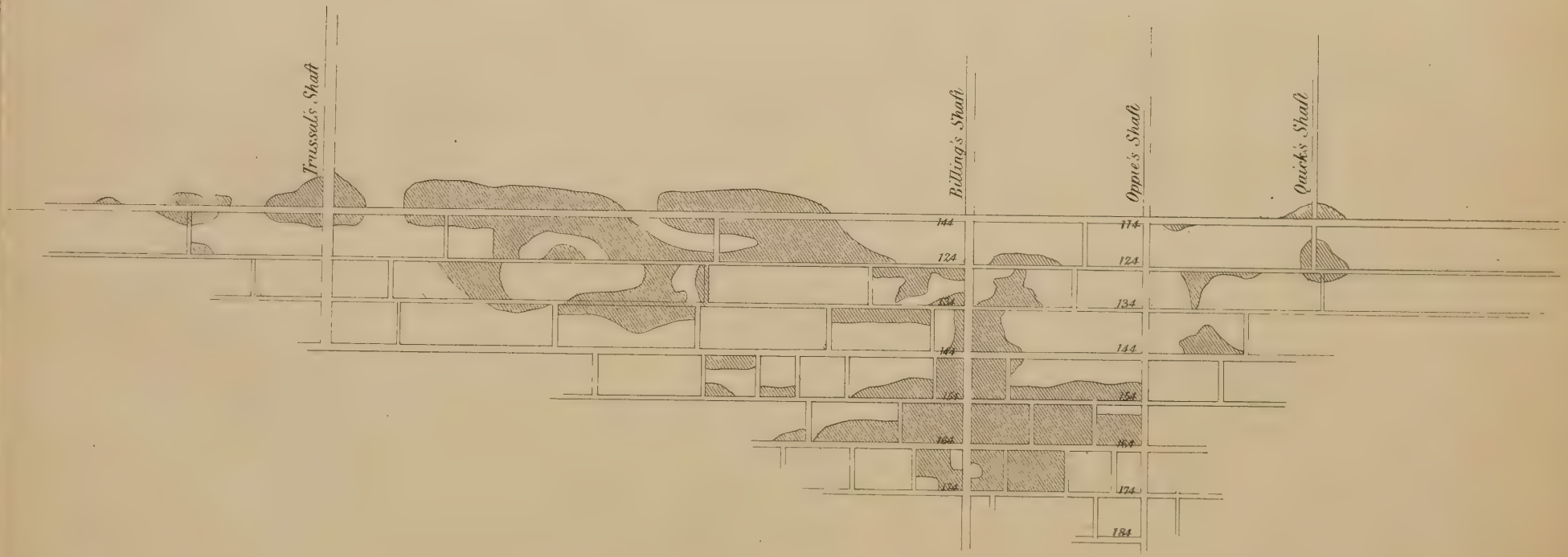
Day & Son Lith to the Queen

REFORM CLUB
PALL MALL

SECTION SHEWING WORKINGS ON THE TIN LODE

ST DAY UNITED MINE SCORRIER

below the 114 (149) Fms Level



SCALE 30 FMS TO AN INCH

E. 14. From the western end of the 87 fathom level on the North lode. 130 fathoms from shaft; but just over a winze up which the air was coming. The air was taken on the eastern side of winze as showing the air coming into this level from the lower workings. Temperature 65°.

Carn Brea.

This is a very large mine, there being 582 underground, and 153 boys and 237 girls on the floors. It is worked in two parts, Carn Brea and Burncoose each having its own changing house. The house for Carn Brea is an old one, and is low and narrow, while at Burncoose being a new one, is of good height, well lighted and ventilated.

The accomodation for the surface hands is very good. All the dressers work under cover.

1. *Copper Floor.*—About 51 persons engaged. There are two houses for dining &c. in each, being about 15 feet square, and furnished with an oven and fire.

2. *Burning House Floors.*—About 80 persons here. Dining house 43 feet long and 11 wide, with fire, ovens, and pipe, well supplied with boiling water. A woman to attend to this house.

3. The third floors, with 300 persons at work. Dining house 66 feet long and 20 wide, has 8 windows, fire, and ovens; and a woman to attend.

There is a man-engine employed at this mine. Comfortable houses are also provided for the working engineers, (6.) and for the carpenters.

Samples of air were taken as follows:

E. 15 was taken from the 155 fathom level on Highbarrow lode, close to to Highbarrow western shaft; some were stoping close by and other places in close proximity. Temperature 64°.

E. 16. From the eastern end of the 175 fathom level on Highbarrow lode driving east of Highbarrow, western shaft 6 fathoms from winze communicating with large stopes. 6 men, in 3 shifts. Wet, hard ground. Temperature 70°.

E. 17. From the 197 fathom level, on Teague's lode driving east of old engine shaft, 50 fathoms from shaft, 17 from rise, and 20 from winze. Ground hard and wet. A great deal of stuff in the level. Temperature 77°.

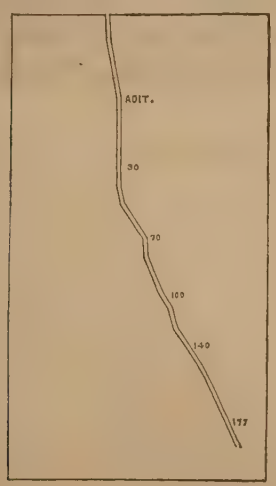
A winze coming down from level above 4 fathoms from this end. At present rate of sinking this will be through in 5 months.

Condurrow Mine.

This is one one of the few mines where a skip, provided with safety catches, for the men to ride in up and down, has been introduced.

Engine Shaft is 168 fathoms below the adit, which is 50 fathoms deep. It is perpendicular for 30 fathoms surface, and is then sunk upon the course of the lode, its underlay varying both in direction and in its amount. It is still being sunk. It is 14 feet by 6 large, used as engine and winding shaft. The winding done by a single skip which is 4½ feet deep by 2 feet square; and drawn by a wire rope 1½″ size. The skipp is provided with Bennett's Safety Catches, which consist of a series of levers acted upon by a spring in such a manner that directly the rope breaks the levers press against and are driven into the wooden guides and so hold the skip.

Transverse Section, shewing Engine Shaft on Main Lode, Condurrow Mine, Camborne.



The men frequently ride up in this. It is contrary to the laws of the mine, on account of the quantities of ore to be raised; and the mine not being well provided with drawing machinery. Three men ride at a time.

Hope's Shaft.—Is 150 fathoms below the adit which is 50 fathoms deep. It is perpendicular for about 20 fathoms, and then underlays at a varying rate. It is 10 feet long and 3 to 5 feet wide. This shaft is entirely devoted to winding; has a double skip way. Each skip 5 ft. long, and 2 feet by 1 ft 9 inches large, is provided with safety catches, and is drawn by 1½-inch wire rope. The men will be allowed to ride in these.

Woolf's Shaft is another winding shaft, 130 fathoms below the adit (50). Kibbles and chains are employed here. This shaft is not often used.

Smith's Shaft is also provided with a winding shaft, 90 fathoms below adit; provided with chains and kibbles.

Footway Shaft is a special shaft only 7 or 8 fathoms deep. Then the ladders are placed in winzes which underlay with the lode about 2 feet per fathom. The staves are 10 inches apart.

Changing House is a very clean comfortable house, 75 feet long, 18 wide and (10+8) 18 feet high. It has a good-sized ventilator in the roof, and 3 glass windows. A large fire tube runs half way through which is heated from the sump house. It contains a large trough, filled with warm water from the engine, and which is continually flowing through it, for the men to wash in.

There are 120 men working underground. The number changing at one time would be about 50.

A good sump house; 8 sump men.

There are some dressing sheds; but more are required. The girls are allowed to dine in the assaying house.

The levels were remarkably clear of stuff, owing to every pair of men tramming for themselves; the levels all driven 7½ feet high by 4½ feet wide.

In consequence of the pumping engine being stopped, a good stream of water was coming down the engine shaft, and bringing with it an increased volume of air.

Took samples of air as follows:

E. 18. From the eastern end of the 140 fathom, level, 18 fathoms from shaft, driving by 2 men, working 8 hours. Taken 1½ hour after shot. Temperature 68°.

E. 19. From the eastern end of the 155 fathom level driving by 4 men; in two cores. 20 fathoms from winze. No shot had been fired. Temperature 71°. End dry.

E. 20. From the stopes in the back of 166 fathoms level, east of Hope's Shaft in which 10 men were working in 2 cores. Stopes 10 fathoms long and 10 feet wide in widest part. A winze passes through these stopes. Temperature 66°.

E. 21. From the eastern end of the 165 fathoms level, driving by 4 men in 2 cores. 28 fathoms from winze.

E. 22. From the eastern end of the 177 fathom level driving by 4 men in 2 cores. 22 fathoms from shaft. Temperature 73°. End choked with stuff.

E. 23. From bottom of Hope's Shaft, sinking by 9 men in 3 cores about 3 fathoms below the 177 fathom level.

E. 24. From the eastern end of the 188 fathom level, driving by 8 men in 4 cores. Temperature 70°.

The accompanying section will show the present operations of the mine, and the way in which it is ventilated.

(*See lithograph.*)

East Pool.

The workings are upon two parallel lodes, on each of which one shaft has been sunk. The workings at each level are, however, connected by cross-cuts.

Visited the workings on the north lode, sketch of which is added, and took samples of air, as follows:—

E. 25. From the western end of the 150 fathom level, driving by 6 men in 3 cores, 10 fathoms beyond a rise; stuff in end. Driven 7 feet high by 5 feet wide. Taken half an hour after firing. Temperature 75°.

E. 26. From under the rise just at the end before visited. Lode here large, and being stoped away by 4 men. Place 15 feet high and 12 feet wide. Temperature 68° F.

E. 27. From the stopes in the back of the 140 fathom level; the men had left work. Temperature 66° F.

(*See lithograph.*)

West Chiverton.

A lead mine near Truro, 80 fathoms deep, with about 130 men working underground. In the upper levels there is only one lode, but in the deeper one there are three. These are being worked upon by levels, connected to each other by cross-cuts.

There are two shafts open, and a third one now being sunk. The ground is killas, and of a very soft nature, requiring very heavy timbering.

The air in the ends gets close, when but small distances from winzes, and the same is the case when sinking or rising.

Samples taken:—

E. 28. From stope a little west of winding shaft, 8 feet high by 5 feet wide; 2 hours after shot, with 4 men working in two cores. Temperature 64° F.

E. 29. From the western end of the 70 fathom Williams lode, 20 fathoms from air; 4 men. Temperature 68°. No shot.

A rise, only 6 fathoms high, in fair ground, not requiring powder, with 2 men working, and open at each end; had a temperature 75° F. Air circulating below.

A winze, about 8 fathoms deep, with water at the bottom, had an atmosphere in which a candle would not burn.

There are two shafts open to the bottom levels, and two others open to the 134. The ground is killas, and, as will be seen, the temperature rises high.

St. Day United Mines.

Tin mines near St. Day. All the operations now going forward in these mines are in the bottom levels, and are shown in the accompanying section.

(*See lithograph.*)

Samples of air were taken as follows:—

E. 30. From the 154 fathom level, driving west on lode, by 6 men, in dry killas ground; 7 feet high and 5 to 7 feet wide. Taken ½ hour after shot. Temperature 77° F.

E. 31. From the western end of the 174 fathom level, driving by 3 cores of 2 men, 2 fathoms from winze, but the level choked with stuff. Temperature 82° F.

E. 32. From the bottom of winze in the eastern part of the 174 fathoms level, 5 fathoms deep; 6 men in 3 cores. Temperature 88° F.

E. 33. From the stopes in the back of the 174. Temperature 86° F.

The ladder road is remarkably good, being in a large shaft, specially kept for that purpose, and having ladders with a good inclination and moderate length. The sollars extend over the whole width of the shaft.

West Basset Mine.

Copper mine near Redruth, under the management of Captain Roberts.

There are four shafts upon a length of 1,530 fathoms of workings. There are—

1. *Thomas Shaft*, 110 fathoms fromt ne eastern end down to the 154 fathoms level, at which place levels are commenced to be driven. It is an engine and drawing shaft, 13 feet long, 27 feet wide. It is perpendicular to the 60; then underlays 18 inches per fathom to the 104, and is then perpendicular to the bottom. Engine and drawing. Double skip, drawn by flat hemp rope.

2. *New Shaft*, 750 fathoms west, perpendicular on the cross-course to the 114 fathom level. It is 8 feet long by 5 feet wide. Drawing by double skip and flat hemp rope.

3. *Percy's Shaft*, 120 fathoms west, now sinking below the 114 fathom level, 8 feet by 5. Perpendicular tothe 65, and then underlays 16 inches per fathom to the bottom. Drawing by double skip and chain.

4. *Grenville, East Shaft*, now down to the 134 fathom level, where a cross-cut is being driven to cut the lode. Perpendicular to the 94 fathom level, then underlays 16 inches per fathom to the bottom. Engine and drawing shaft. Double skip and chain. Size of chain $\frac{1}{16}$ths on case, with $\frac{10}{16}$ths and $\frac{9}{16}$ths in shaft.

Visited and took samples of air, as follows:—

E. 34. From the end of the cross-cut in the 75 fathom level, driving by two men in dry granite, 7 feet high by 4 feet wide, 105 fathoms from level. A very strong current passing through this level to shaft close by.

E. 35. Taken from the mouth of the cross-cut near the shaft.

E. 36. From the 85 fathom level east of Grenville shaft, 20 fathoms from winze; 4 men in one core.

E. 37. From the western end of the 94 fathom level, west foom Grenville's; by 4 men. 15 fathoms from rise. Dry.

This mine possesses one of the best changing houses in Cornwall. Is large, light, well ventilated, and kept scrupulously clean. A constant supply of warm water is circulating through a large trough in the floor, which is taken the greatest advantage of by the men when changing their clothes, after their underground labours are over.

North Dalcoath.

Two examples of air were taken from the 47 fathom level.

There is one shaft to this level, but two others sunk to the shallower workings.

Bottle C. was from the eastern end, which was being driven by 2 men; 7 feet high by 3 feet wide. Temperature 67°. Very wet, 18 fathoms from shaft.

Bottle E., from western end, about the same distance from the shaft, same size, only blocked with heaps of broken ground. Temperature 68°.

Huel Kitty, St. Agnes.

Visited this mine in company with Lord Kinnaird to take samples of air from the 54 fathom level. There are three shafts.

1. *Engine Shaft.*—110 fathoms below adit (45). It is perpendicular to the 50, and then underlays at the rate of 1 oft to the fathom. It is 11 feet by 6. The footway in the perpendicular part is in 3 to 4 fathoms lengths, with 3 to 4 feet base. In the inclined portion no ladders required; the men walk down. Winding single skip and chain employed.

2. *Holgate's Shaft.*—100 fathoms below the adit, and still in process of sinking. It is perpendicular to the 24, and then underlays the same as Engine shaft. This is the general footway. The ladders are in 3 fathom lengths, with 3 feet base, and the staves 11 inches apart. No ladders in the inclined portion. There is no division between the part where the men walk down and the part used for drawing.

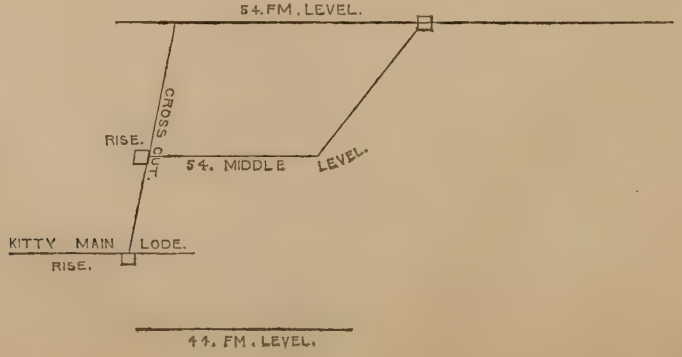
This shaft is 50 fathoms from the changing house.

3. *Sunny Corner.*—Perpendicular to 10 above the adit. It then takes the same lode as the other shafts, and is carried down on the same underlay. Winding by single skip.

The dressing operations are mostly under sheds. The men change in the boiler house; but a dry is being built.

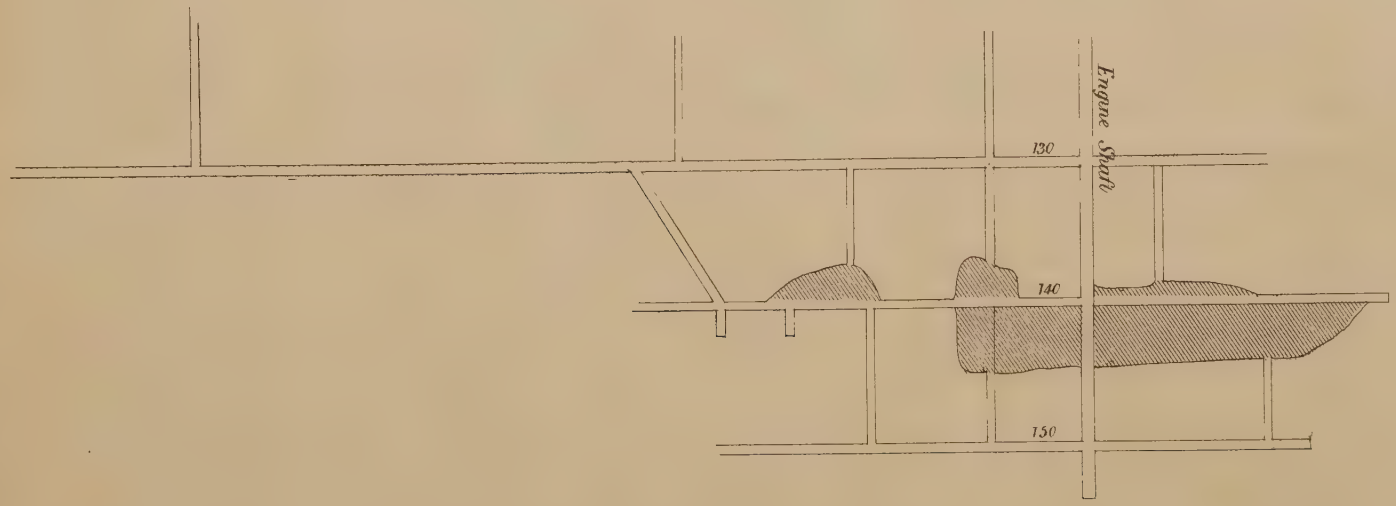
From the 54 fathoms level a cross-cut is driven south 25 fathoms to the Huel Kitty main lode, and a level is being driven upon this lode east and west, the ends being 6 and 12 fathoms from cross-cut. The eastern end was close, it being 100 fathoms from shaft, but only about 15 fathoms from rise, going up to the 54 middle level. At the mouth of cross cut a rise was being put up towards the 44 fathom level, and men were driving that level towards it.

Visited it at the time of the second shift of men entering. A fan was placed in the cross-cut under the winze, worked by hand, which was blowing air through pipes into this end and up the rise. After the smoke had been blowed out Bottle *B* was filled. Temperature 70°.



SECTION OF WORKINGS AT EAST POOL MINE ON MAIN LODE

BELOW THE 130 FATHOM LEVEL



SCALE 30 FMS TO AN INCH

Bottle *A* was filled in the middle level as the air was coming from the middle level through the cross-cut, the 54 fathom level. Temperature 67°.

Bedford United Mine.

In the Gunnislake district, under the management of Captain Phillips.

This mine is worked by three shafts.

1. *Inclined Shaft*, 148 fathoms deep, with an inclination of 4 feet per fathom. It is 14 feet long by 5 feet wide. It is used as a winding shaft, the ore being raised in waggons running upon rails, two in number, and drawn by chains.

2. *Marquis' Engine Shaft*, 115 fathoms deep and perpendicular. It is 9 feet long by 6 feet wide. Ore is also raised in this shaft by two kibbles. There is a ladder-way in the shaft for the use of the shaft men, securely cased off from the kibble-way.

3. *New Western Shaft*, 130 fathoms deep, also perpendicular. Used for winding only; two kibbles used. The shaft is 10 feet long by 7 feet wide.

The general footway for the men is through the inclined shaft to the 24 fathom level, after that through the winzes. Ladders generally in 5 fathom lengths, and incline from 18 to 20 inches per fathom.

Air was taken in bottles as follows:—

No. 7. From the 115 fathom level at the New Western shaft.

No. 1. From the end of the 115 fathom level, driving west 30 fathoms from draught. No shot had been fired. The level was 6 feet high by 5 feet wide. The end was ventilated by a duck machine fixed and worked by the pump rods, which exhausted the air in the pipes. They were within 20 fathoms of the end. Size of pipe 5 inches square. Velocity of air in mouth of pipe 260 feet per minute. Number of strokes 5 per minute. Temperature 70°. End very wet.

No. 9. From 47 fathom level, driving from cross-cut, going south from inclined shaft. The cross-cut is 115 fathoms long, and the level 55 fathoms long. There are no levels above or below. Ventilated by duck machine as in the 115 end. Temperature 71°. End very wet.

It is proposed that a shaft be sunk upon this lode from surface.

Fowey Consols.

Formerly one of the most extensive mines in the county at one time returning 140 tons of copper per month, but now reduced to about 30; consequently the number of men employed is very much smaller than formerly. It is very deep, but the men in the eastern part are raised and lowered by the man-engine. In the western part the men use the adder.

Examined 14 July 1862, taking bottles of air from different levels, noticing the temperature.

Bottle 14, 50 fathom level, north of Pedlar's Shaft driving east,—the end is driven 2 fathoms beyond a rise from the 60, and averages 6 feet by 4. It had been stopped for a month. Temperature 74° F.

Bottle 16, 90 fathoms level, north of Pedlar's Shaft, driving east,—this level has not been worked at all during the last 10 years. Bottle filled about 20 fathoms from shaft in main draught. Temperature 69° F.

Bottle 11, 140 fathom level, west of Ray's Shaft on Footwall lode;—this level is driven 30 fathoms beyond a rise without any winze at present down to the 150, although one is now being sank. It averages 7 feet by 4. An air-pipe 8 inches square is carried in. Two holes had been fired about half an hour previous to visiting, using about 1 lb. of powder. Temperature 79° F.

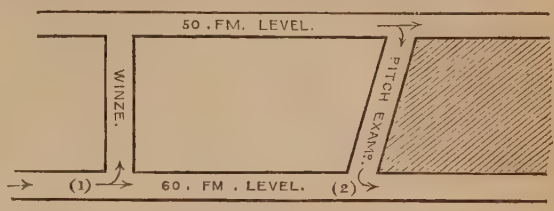
Bottle 13, 180 fathom level, west of Pound's Shaft,—this end is being driven, branching from the main level at a distance of 200 fathoms from the shaft, and is in about 7 or 8 fathoms from the level. A winze is down about 10 fathoms from the mouth of the end. The level is carried 7½ feet by 4. Temperature 84° F.

Bottle 2, 240 fathom level, south-east of Pedlar's Shaft;—this is the hottest level of the mine, and is 50 fathoms long. No men working. Air-pipes 8 inches square connected with a hand fan for ventilating when worked. Air taken 25 fathoms from shaft. Temperature 96° F.

6. 260 fathom level, east of Bottrall's Shaft on Bottrall's Lode,—is driven 250 fathoms from the shaft, and is 20 fathoms from a winze. Temperature 88° F.

7. 270 fathom level;—this the bottom level. The end is 26 fathoms from draught, and is being driven. A winze is being sunk from the 260, which will cut the 270 about 2 fathoms east of present end. This will ventilate the end. Temperatnre 94° F.

8. 60 fathom level, examined 16 July, surface temperature 64° F.,—cross-cut between western and Pedlar's Shaft supplies air. Examined particularly a pitch in the back.



The air comes from the shaft and ascends the winze at a velocity of 272 feet per minute; it then passes along the 50 fathom level, and down through the pitch, entering the level again at a rate of 96 feet per minute. Filled bottle No. 12. Temperature 72° F.

Changing and drying houses. In the eastern part ther is one changing house, a dry, and two runs of barracks. The change is a stone building 42 feet long, 16 feet wide, and 7 feet high, with a spring roof of 6 feet, making a clear height in the centre of 13 feet. The roof is a good slate one, plastered inside. There are two openings on each about 2½ feet square, furnished with shutters; and also a doorway 5½×3 feet, but no door. There is no roof ventilation. The floor, I imagine, is a stone or earthen one, but there are several inches of dirt and accumulated rubbish upon it so that it cannot be seen. The roof and all parts of the woodwork covered thickly with accumulated dirt. There is no provision made for the men to wash themselves, any more than a stream of water running along outside. About 30 men use this house. The men stand upon their hutches while changing.

The dry is about 30 feet long by 12 wide. It is warmed by means of a fire, the smoke and heat of which pass through a series of three pipes before entering the stack. The men's clothes are dried on these pipes. The shutters of the windows are studiously kept closed to prevent loss of heat, there is no roof ventilation, therefore the house is most offensively close, and the clothes instead of being sweetened to some extent by a circulation of warm, dry resh air, are simply dried, and retain all the offensive matter given off by the men while at work. This is a point of some considerable importance, as I am told that the men rarely, if ever, wash their flannels. A man is kept to look after the dry.

The sump men and pitmen have each a changing and drying house to themselves.

The floor is covered to some thickness with dirt so that there is a continual stirring up of dust every time a number of men enter the house, which of course falls upon and is retained by the wet clothes of the miners.

The changing house in the tutwork part of the mines is of very good size, being 55 feet long, 24 feet wide, and 17 feet high. It is provided with six windows and a large doorway. The floor, as in other cases, is dirty in the extreme, and the walls and ledges covered with dirt. The men change standing on their hutches. There is no fire, nor a supply of water.

The dry is 54 feet long by 15 wide. This is much better than the eastern dry, having a better floor and a small ventilator in the roof. It is warmed by a fire and pipes. It has also a large oven in which the men can warm their dinners, &c.

The men generally change here in the winter.

The barracks are merely long runs of low sheds, of stone and slate roofs, built for changes when the mine employed larger numbers of men. They are devoted now to the men for store houses.

The greater number of the females employed on the surface work in the open air. There are some sheds, but as they are only provided with roofs, without any sides, there is such a strong draught of air through, that the girls prefer being out of them. In case of wet weather, inasmuch as the mine is not working very extensively, the females stop work, they being able to dress all the ore in fine weather. There is a good house in the eastern part, of same size as the changing house, which is used for dressing purposes in wet weather.

During the summer the females eat their dinners, &c. sitting about where they can, there being no place appropriated for them; in the winter a house is provided for them.

Par Consols.

Examined 15 July. Bottles of air from different levels, noticing the temperature.

1. The 100 fathom level, eastern end from underlay shaft is driven 45 fathoms beyond a winze; it is driven 7 feet by 4. There is no level above or below this end. Temperature at winze 66° F., at the end 68° F. Visited it about half an hour after a shot. About ½ lb. of Davey's powder used. Smoke well cleared off. Bottle No. 15 filled.

2. 120 fathom level, north from main engine shaft. The end is 32 fathoms beyond a winze. Temperature at winze 71° F., in the end 77° F. Visited half an hour after a blast. Bottle No. 8. Air pipes 6 inches square, connected with hand-fan carried in from winze.

3. 165 fathom level, west from main engine shaft. The end 5 feet square, driven 26 fathoms in from draught. Temperature 84° F. Bottle No. 4.

4. 200 fathom level, east of underlay shaft. One bottle of air taken (No. 18) at the winze supplying air to the end, and another (No. 17) taken from the end, 35 fathoms in, one hour after a shot. The end is driven 6 feet × 5½. Temperature of end 87° F.

5. 180 fathom level,—End 52 fathoms in. Temperature 86° F. Bottle No. 6. This end is ventilated by 6-inch air pipes connected with a water jet having a fall of 15 fathoms.

Changing Houses.

There are three parts of this mine, each having a change and dry.

1. *For the man-engine.* The change and dry all in one building—a stone house 48 feet long by 14 wide. A rough flooring of planks placed upon transverse beams about 6 feet from the ground forms the division, below being the dry, and warmed by a cylinder connected with the boilers, together with a fire. The floor of this part very dirty. There are two windows, the shutters of which are kept closed; no convenience for washing; no roof ventilator. This house is about 100 fathoms from man-engine.

Three corps, of from 50 to 60 men each, dry and change here, besides a number of tutworkers.

2. *Western part.* The change and dry all in one as before. About 60 feet long and 15 wide. A length of 12 feet is partitioned off for the sump men and provided with a fire. The change is above the dry, a rough flooring separating it, warmed by a fire and pipe. There appeared to be only one window in the house and that closed, with no roof ventilation. The men go out to the engine pool very near and wash.

The houses about 20 fathoms from footway.

3. A run of *barracks*, about 15 fathoms from another footway. These are about 120 feet long and 12 feet wide, with a height in the centre of 9 feet (7 feet wall × 2 feet spring of roof). The dry is about 50 feet long and warmed by a fire and pipe. Old men are allowed to change here.

The change is the remainder of the building; very dirty and dark. The men stand upon their hutches to change.

Besides these some few men (principally trammers) change in the boiler house.

Drake Walls.

A large tin mine in Gunnislake, under the management of Captain Gregory.

The tin occurring in a number of small strings running side by side renders it necessary to remove a large quantity of ground, having large openings underground which are spoken of as "gunnisses" in this district.

The mode of working is similar to that in other mines sinking shafts or driving levels, with this difference, that all the mineral is worked from below the workmen, this, under the peculiar circumstances, being the safest mode of working.

There are seven shafts sunk below the "*adit*," which, at the western extremity, is 25 fathoms below the surface, and from which point this adit is extended eastward 272 fathoms before emptying itself at the "*adit's mouth*."

1. Sunk to adit level which is only extended four fathoms west of shaft.

2. *Brunton's Shaft*, which is nine fathoms apart, in an east direction, and is sunk 100 fathoms below surface.

3. *Machine Shaft* next, in same direction, sunk 80 fathoms below adit, which last, at this point, is 20 fathoms from surface.

4. *Foot-way Shaft*, in same direction, 80 fathoms apart from last, or "*Machine Shaft*." Depth of adit at "*Foot-way Shaft*" 15 fathoms, and depth of shaft below adit 92 fathoms.

5. *Webb's Shaft*, in same direction, distant from last 18 fathoms. Depth of adit here 18 fathoms, and of shaft 40 fathoms below adit.

6. *Matthews's Shaft*, in same direction, apart from last 23 fathoms. Depth of adit 12 fathoms, and of shaft beneath 92 fathoms.

7. *Stamps' Shaft*, 17 fathoms apart from last. Adit here seven fathoms deep, and sunk beneath nine fathoms.

In the 30 fathom level the gunnis was 12 feet wide, and temperature 61°.

In the 50 fathom level two men were driving west of Brunton's shaft. Level seven feet wide, six feet high. Between shaft and end gunnis seven fathoms deep. Bottle No. 10 filled in the end. Temperature 64°.

In the 70 fathom level five pairs of men were stoping the ground from the shaft eastward. The height of opening near the shaft was nine fathoms. Length of stopes 11 fathoms. Bottle No. 19. Temperature 64°.

Hingston Downs.

Under the management of Captain T. Richards. Has three shafts, but no adit.

1. *Morriss' Engine Shaft*, 130 fathoms deep. It is perpendicular for 35 fathoms depth, and then underlays two feet in a fathom. It is 12 feet long and six feet wide. Used for pumping and drawing. One kibble drawn by chain used.

2. *Hitchen's Engine Shaft*, 75 fathoms deep, sunk on the south lode. 12 × 6 feet. Used for pumping and drawing. One kibble.

3. *Bailey's Shaft*, a new one sinking. It is 35 fathoms deep. Used for winding, and, when completed, for pumping the water below the 110 fathom level.

The general footway is through Hitchen's shaft, and through the winzes. Ladders five fathoms long. Staves one yard apart. In the shaft they are cased off from kibble-way.

Bottles of air were taken as follows:—

No. 3, from the western end of the 85 fathom level, 10 fathoms beyond a winze. End seven feet high, five wide. Two men. Temperature 64°. Between the winze and shaft there was a very brisk current 600 feet per minute, ground hard.

No. 21, from the 100 fathom level, where air was passing at the rate of 660 feet per minute.

No. 20, from the eastern end of the 110 fathom level, nine fathoms from draught. There was a brisk current in the level, but a heap of stuff in the end rendered it a little close. Temperature 65°.

Changing houses.—There are three houses for this purpose. The first is 50 feet long, 10 feet wide, and wall six feet high. Neither window nor ventilator. Warmed by tube from fire in a smaller house adjoining, which is appropriated to men working in very wet places. The third house is by the side of the whinn boiler.

Dressing floors are closed in, and provided with fires. A fire in sampling house. The dressers dine either there or at their working places.

The engines provided with steam gauges.

Botallack Mine.

Samples of air were taken as follows:—

I. *Crown Lode.*

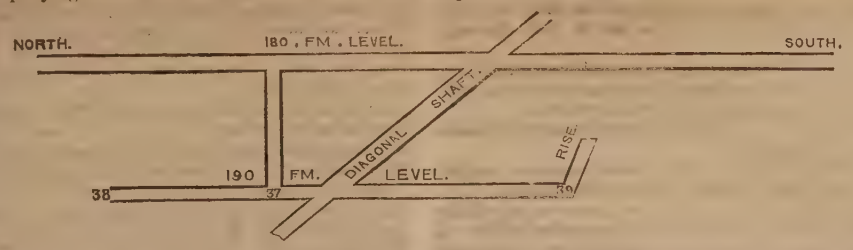
No. 37, temperature 75° F., at surface 53°. From the 190 fathom level immediately under the rise communicating with the 180 fathom level. There were no men working here except a filler, but three pairs of men were deriving their air from this place. The air was coming down the diagonal shaft, and going up this rise, but, owing to the 180 fathom level being partially choked, there was but a very slight current.

No shot had been fired in this part of the mine for four hours.

No. 38 was taken from the northern end of this level, about 10 fathoms from rise, by three men. Seven feet high. Country a mixture of granite, greenstone, and killas. Temperature 78°.

No. 39 was taken from the south end, driven 14 fathoms from the rise. A rise is being driven here to meet a winze coming down from the level above. Temperature 80°.

The accompanying sketch section will show where these samples were taken.



In each of these places there are three cores of men.

No. 40, from stopes in the 160 fathom level. Three men taking away the lode. Place 80 fathoms from shaft, but between it and a winze to the 180. This winze was stopped up with dead (temporarily), so the current was dead. Temperature at shaft 71° F., at stope 77° F.

II. *Huel Cock.* Surface temperature 56° F.

No. 41, in the 95 fathom level. Stopes immediately over a rise, 120 fathoms east of engine shaft. Stope nine feet high by four feet wide. Temperature 69° F.

No. 42, stopes in the 112 fathom level. In direct current six men. Temperature 70° F. The smoke from the lower levels passed through here.

No. 44, end of 150 fathom level, 30 fathoms beyond rise, and 80 fathoms from shaft. This is the closest place in this mine. Temperature 76° F. Two men.

No. 43 was taken immediately under the rise, so that these two samples will show the difference in the quality of the air.

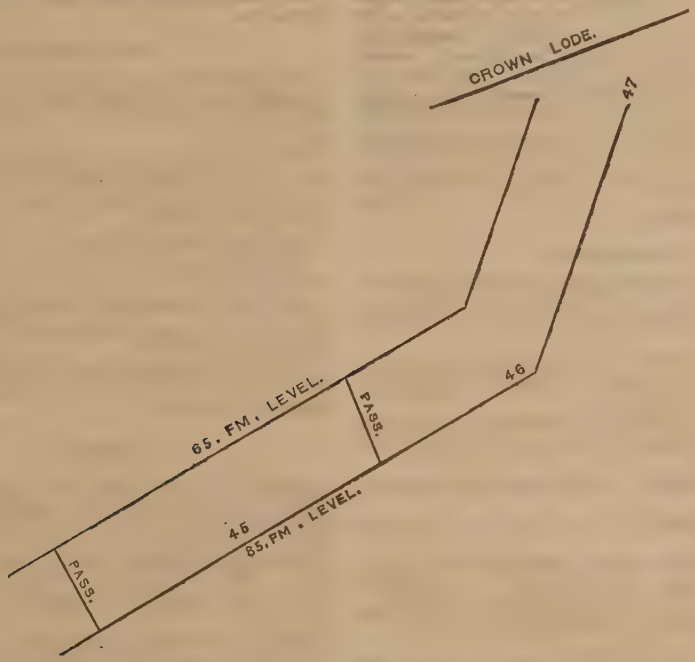
III. *Huel Hazard.* Surface temperature.

No. 45, from the 85 fathom level. Only one shaft to this level, but several rises to levels above. This sample taken in direct current, between a shaft and a rise. Temperature 62° F.

No. 46, about 20 fathoms beyond rise towards the end. Temperature 67° F.

No. 47 from the end driving towards Crown's Guide lode, and 60 fathoms beyond rise. This end is being driven by one man. Temp. 65° F., thus cooler than No. 46, arising from the end being wet. The level is driven 6 feet high and 2½ feet wide.

The accompanying sketch plan will explain the e samples.



The same circumstances occur in the 65 fathom level.

When these levels cut the Crown lode, a winze will be cut between them, and thus restore the ventilation.

Huel Call.

Samples of air taken as follows:

No. 48, from the south end of the 30 fathom level, 7 fathoms beyond a rise; driven by one man in hard granite; 6 feet high by 2½ wide.

No. 49, from the north end of the 85 fathom level, driven under the sea; 7 fathoms beyond stopes, opening to levels above; in hard granite; very dry; two men; 6 feet by 2½ feet.

Huel Owles Mines, St. Just.

Under these adventurers there are working five distinct mines:

1. Buzza and Parknoweth.
2. Hl Owles and Cargatha.
3. Hl Boys and Grouse.
4. Hl Drea.
5. Hl Gendall.

Visited the Buzza Mine, which is worked by two shafts.

1. Skip shaft; 130 fathoms below adit, which is 50 fathoms deep; it is 10 feet long by 4 wide; perpendicular for 18 fathoms, then underlies on the lode 18″ to 20″ per fathom.

Double skip.

Ladderway eased off to the 80, after then ladders through winzes; ladders in 5 fathom lengths.

Buzza skip shaft is worked by Parknoweth steam whin-engine, 26¼″ cylinder, 2¾″ piston rod, with 4 feet stroke equal beam; fly wheel 15 feet, making 2½ revolutions to 1 of the cage; number of strokes from 10 to 60 per minute.

Calculation of cost of winding.

Drawing from the 90=140. In 7½ hours drew 432 sacks = 48 tons 12 cwt. 14½ skips per hour.

Cost:—	s.	d.
Coal, 4½ cwt. at 10*d.*	3	9
Oil and tallow	0	9
Wear and tear of chain and shaft	3	0
Landers, fillers, driver	7	9
	15	3

or 3¾*d.* per ton.

Higher Buzza Shaft. To adit (50) 2 kibbles and ladder way. Shaft 9′ × 4′. Ladder way 4½′ × 4′. Ladders incline about 1 foot per fathom.

A cross-cut comes in at the 80 from Parknoweth mine.

Samples of air taken from the upper workings in Buzza Mine:—

No. 50. From the south end of the adit level driving in the granite, in very wet ground, 80 fathoms from winze.

The level just behind where the men were working was nearly filled with accumulated stuff, so that there was only an opening of 2 feet left for the air to pass through. Temp. 63° F.

No. 51. About 10 fathoms from the end described above, a cross-cut is driven in about 8 feet; sample taken here. Temp. 63° F. Ground wet. Air was very dead.

No. 52. From end of Corpus Christi lode, 16 fathoms from winze. Temp. 60° F.

Boilers at Huel Owles.—Huel Owles pumpine engine. 2 boilers, each 6 tons. Safety valve loaded to 50lbs.

The ladder way for Huel Owles close to this boiler house. The men change here to the number of 30. A pool of warm water under a roof provided here for the men to wash in.

Huel Owles Whim.—1 boiler, 7 tons. Engine driver 16 years of age. Been driving it 3 years.

Parknoweth.—Pumping engine, two boilers. Two drivers one 51 years old, the other 24. Each of these work continuously for 24 hours, and rest 24 hours. This is the case for pumping engines, but in whim engines they work eight hour cores.

Whim boiler, 4½ tons. Surface men change over this boiler.

None of the boilers are provided with water or feed gauges, or steam gauges, they being only furnished with the ordinary water cocks. In every case the feed was very good.

Sweeping floors.—About 260 working on the floors, all of whom with but slight exceptions are in good sheds.

Changing house for Parknoweth.—A new house, stone walls and slate roof. Walls 40 feet long, 16 wide, and 10 high, with a roof having a spring of 3 feet. Ventilated by six windows, and ventilator placed in the roof. Heated by a tube of hot water, with a fire below. To prevent accidents from explosion, the boiler is provided with a safety valve and feed cocks. The tube is 30 feet long, and 3½ feet diameter. It has a wooden floor, and the men's chests are arranged all round. A trough of warm water 5½ × 4, fed from the engine pool stands close to the building, but is not covered in. This is a thing requiring to be done. About 120 men change here.

Levant Mine.

1. *Engine Shaft* to the 230 under sea level; 10′ × 4½′. Pumps and ladder way. The ladders are about 5 fathoms long, with stones 10″ apart, and inclining from 15 to 18 inches per fathom.

2. *Skip shaft* to the 230; the same size as engine shaft; double skip road. Hemp rope used. Ladder-way cased off. These two shafts 5 fathoms apart.

3. *Batten's Shaft.*—12 fathoms north of No. 2, to the 242, which is the bottom of the mine. 9′ × 4′. Not used, but kept open.

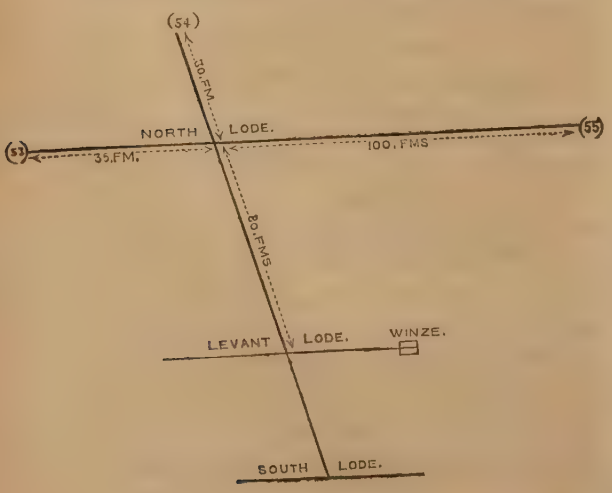
4. *Augwin's.*—16 fathoms, north to the 130. Not used, bnt kept open.

5. *Phillip's*, to the 230. Not used, but open for ventilation. 12′ × 4½′.

6. *Man-engine shaft*, to the 170. This shaft is 80 fathoms east of No. 1. It inclines 15″ per fathom. At the 130 the underlay changes from north to south, so that the platforms are reversed. Backboards and shoulder boards.

Samples of air taken as follows:

53, from the western end of the North lode in the 150 fathom level. Sketch of the 150 fathom level workings.



This end was being driven by two men, working only in the morning core, 7 feet high by 3 feet wide, through dry killas, moderately hard. It was supplied with air from the workings on the Levant lode, which were 115 fathoms from the end. Temperature 75°. Taken one hour after firing two holes.

54, from the end of the slide in 150 fathom level, driving by a man and a boy, working only morning core, and 8 feet high by 3½ feet wide, 110 fathoms from Levant lode. Temperature 73° F. No shot had been fired.

55, from the eastern end of the North lode of the 150 fathom level driving by a man and a boy, working one core. End 8 feet high by 3½ wide. No shot had been fired. Temperature 78°. This end would be 180 fathoms from the Levant lode.

56, from the stopes in the bank of the 170 fathom level on the North lode in which eight men were working. Winze 30 fathoms from end of stope. Temperature 82°.

57, from the eastern end of 170 fathom level on the North lode, driving by four men in two cores, 9 feet high by 5 wide, 90 fathoms from winze to 190. Taken two hours after two holes had been fired. Temperature 83°.

58, from the stopes in the middle lode in the 170 fathom level, two men 8 fathoms from ventilation. Temperature 73°.

Drying and changing houses.—A large stone building devoted to this purpose, the lower portion being for drying purposes, the upper for the men to change in. The house is 70 feet long and 14 feet wide. It is well lighted, ventilated, and kept very clean. A continuous stream of warm water passes through the house, in which the men wash themselves.

Balleswidden.

The ladder road in the engine shaft is not protected from the pump rods. In many cases owing to to the irregular form of the shaft, the person on the ladder quite rubs against the rods.

The winding is done by two skips in one shaft, which has a regular under-lay of 18 inches per fathom. The skips are provided with Bennett's safety catches. Three men ride together in the skip.

Samples of air taken as follows:—

59. From stopes in the back of the 130 fathom level. Stopes 6 fathoms long and 6 feet high. Temperature 72°.

60. From the western end of the 140 fathom level, driving by 4 men in 2 cores. Size of end 7′ × 4′. The end not clear. Temperature 73°.

61. From a rise going from the 140 to 130 fathom level, about 6 feet high, just holed through to party sinking above. Temperature 73°.

South Francis.

Sample 101. Taken from the western end of the 104 fathom level, 50 fathoms west of Pascoe's shaft, and 15 fathoms beyond a ladder winze. There is no communication between this level and the one below it, on the western side of Pascoe's shaft. 4 men were working here in two shifts of 8 hours each. The end was 7 feet high and 4 feet wide. Quite dry, driving in granite. No hole had been fired.

Sample 102. From tribute pitch about 2 fathoms high; 2 men working granite rock. The place was between 2 and 3 feet wide.

Sample 103. Taken from the western end of the 114 fathom level, 30 fathoms from the shaft. There is no communication other than the shaft with the level above or the level below. The end was driving by four men working in two shifts of 8 hours. Rock granite, and dry. The size of the end, seven feet by four.

Sample 104. Taken from the western end of the 124 fathom level, driving on the south lode, which is in 20 fathoms from a winze, going to the 134, but having no communication with the 114 beyond Marriott's shaft, which is 120 fathoms east. Four men working in two shifts. Granite. Wet here.

Visited the 134 fathom level west, which is carried upon the same lode as the east. The end is 35 fathoms from ladder winze, but within five fathoms of a rise going to the 124. No men working here.

Visited the 144 fathom level, west, which is driven 24 fathoms beyond a ladder winze, and three fathom beyond a rise.

This rise had been just holed through; the driving of the end had been suspended.

Sample 145. Taken from the north part of the mine in the 50 fathom level east of Pascoe's shaft. The end was driven 30 fathoms from the shaft. Two men had commenced sink-

ing a winze close to the end, and another pair of men was rising. The rise up 2½ fathoms.

Only one shift of men work here.

The level was choked with stuff.

Sample 106. Taken from the 60 fathom level, west of Pascoe's shaft. The end is 60 fathoms from the shaft, 15 fathoms beyond a rise. A winze is now sinking about nine fathoms east of the rise, which is down five fathoms. The end is set to be driven 7 feet high by 3½ feet wide. No shot had been fired.

Sample 107. Taken from the 70 fathom level, from a level driven on a branch about two fathoms in from main level.

Working by two men. Two holes had been fired about 1½ hours before visiting.

Sample 108. Taken from the 80 fathom level, 20 fathoms beyond a winze. Four men in two shifts. Two hours after a shot.

Sample 109. Taken from the 94 fathom, west, from a driving on Bassett's lode, seven fathoms in, from a cross cut from main level.

Men not at work.

Sample 110. Taken from the end of the 94 cross-cut, which is being driven by six men, working in three shifts of eight hours. This end is ventilated by a double duck machine placed under a rise, 50 fathoms from the end.

The supply pipe is seven inches square.

Two holes had been fired about 1½ hours before visiting.

Huel Harriet.

Engine shaft is 127 fathoms below the adit, which is 40 fathoms deep. It is sank perpendicular to the 80, then underlays for 15 fathoms at the rate of 1½ feet, and afterwards at the rate of 3 feet. It is 12 feet by 5 in size. It is used as an engine and a drawing shaft. A length of 4 feet is cased off for drawing; chains and two kibbles employed. The ladder-way for the men is through this shaft to the 30; the ladders in 20 feet lengths, with 6 inches per fathom under-lay, and 10-inch staves. From the 20 the men go through winzes which have an average under-lay of 1 foot per fathom. Is is above 100 fathoms from the changing house.

Eastern Shaft Winding down to the 10 below adit, but not worked below adit. It is 6 feet by 4. Underlays 1½ foot per fathom. One kibble, driven by steam.

Alexander's Shaft. A new shaft now being sunk, it is down to the adit, and is 8 feet long by 4 wide, on the under-lay of the lode, which is 2 feet 10 inches per fathom. A foot-way put in. Ladders 20 feet long, with 10 inches under-lay and-10 inch staves.

Samples of air were taken as follows:—

No. 112, from the 130 fathom level, driving east of the engine shaft. The end is 6 fathoms from shaft, and is being driven by six men working in two shifts of 12 hours each. Hard granite, 7×5 feet.

No. 113, from end of cross-cut, 65 fathoms long. A winze within 3 fathoms, but it was full of stuff. Sample taken soon after a shot.

No. 114, from stopes in the tin ground above the 100 fathom level, 5 feet wide, 16 men at work. Air was taken from the middle part. A winze at one end of the stope, but full of stuff.

No. 116, taken from end of cross-cut in the eastern part of the mine from Alexander's shaft, driven about 40 fathoms. Ventilated by a fan, driven by a boy who is paid by the miners, six men in three cores, but no boy for night core.

Changing house. The men do not dry their clothes in this house, a separate place being provided. This is a very good arrangement, the changing house being kept free from dust and that close smell always to be experienced where a number of men's clothes are drying.

The house is 36 feet long by 18 wide, and 12 high, and has a good large ventilator in the roof, made by raising a portion of the roof 6 inches higher than the other part. It has a wooden floor, glass windows, and a washing trough, through which a constant stream of warm water is flowing.

Drying house was formerly the changing house. It is a long, narrow, and dark house, warmed by tubes passing through it from the *Sump house*, which has a good fire and oven. There are nine sump men, working in three corps.

There are not many dressers, most of them under cover. They all live in the adjoining village of Beacon, and go home to dinner.

Carn Camborne.

Samples of air were taken as follows:—

No. 116, from the eastern end of the 13 fathom level, 35 fathoms beyond shaft and 25 fathoms beyond a winze. 4 men in 2 shifts. Granite. No shot had been fired. A place where the smoke hangs a long time.

No. 117, from the western end of the same level, 6 fathoms from a rise, driven by 4 men, 7 feet high and 4 wide.

No. 118, south end of the adit level, 5 fathoms from winze. 2 men. Dry granite. Level, 7 feet by 5.

No. 119, from a tribute pitch 3 fathoms above back of the adit level, 2 men. Granite. There was a fan in level below, with pipes to this place, but no regular boy to work it. The men, after firing a shot, would work the machine to clear the place of smoke.

Tolcarne.

Samples of air taken as follows:—

No. 121, from the west part of the 40 fathom level, from the end driving north on cross course, 13 fathoms from shaft; 3 men and 3 boys working in 3 shifts of 8 hours each.

No. 122, from the eastern part of the 40 fathom level; the lode is very loose. The end is about 40 fathoms from engine, and is ventilated by 4-inch air pipes connected with waterfall from the 30 fathom level. Level driven 7×4 feet by 2 men and 2 boys.

No. 123, from the 30 fathom level, 10 fathoms from a winze; 2 men and 2 boys.

No. 124, from eastern end of 30 fathom level, 10 fathoms from a winze which was just holed through; 33 fathoms from shaft.

No. 125, from 30 fathom level from cross-cut driving from Field's lode to the New North lode; 21 fathoms in. Dry granite.

No. 126, from the 30 fathom level eastern north lode, 13 fathoms in. Granite, dry; 1 man and a boy. Level choked.

No. 127, from the 20 fathom level, west, on the N. lode, 20 fathoms beyond winze; 1 man and a boy. Dry.

No. 128, from the east part of 20 fathom level, 6 fathoms beyond winze.

No. 129, from the 20 fathom level on Field's lode; 10 fathoms from winze; 2 men.

No. 130, from the eastern part of the 10 fathom level, 24 fathoms from winze; 1 man. Ventilated by handfan.

No. 131, from a crosscut gang, south from adit level. A distance of 40 fathoms. There was a very brisk current in the adit level, and a fan was placed at mouth of cross-cut to drive the air into the end; 2 men.

MINES VISITED BUT NO SAMPLES OF AIR TAKEN.

West Caradon Mine (Copper).

A very old and extensive mine.

Operations are carried on from four shafts. Two of these are old ones, the other two quite modern.

Shafts.

1. *Fox's Shaft.*—An old engine shaft. It is called a downright or perpendicular to the 80 fathom level below the adit, which being 26 fathoms from surface, makes a depth of 106 fathoms, but there are several alterations in its course. From the 80 to 140 it is carried down on the course of the lode, and underlies from 2 to 2½ feet per fathom.

Winding is carried on by means of a kibble and chain.

The shaft is very old and much word.

2. *Elliot's Shaft.*—Perpendicular to the 150 (below adit). From the top to the 50 it is 4½ feet by 5 feet inside the timbering; below it is 6 inches longer each way. Two kibbles are used in this shaft if winding below the 50, so that they always meet below there; if above the 50, only one employed. Flat hempen rope, 6 inches by 1½, used.

3. *Hallet's Shaft.*—This is a new shaft, now in course of sinking. After a depth of 3 fathoms it is carried on a regular underlay of 2½ feet per fathom. It is down to the 27 fathom below the adit, which is 20 fathoms deep, and is still being sunk.

A double skip way will be laid in.

4. *Pryor's Shaft.*—Another new one down to the 30 fathom with a regular underlay of 2½ feet. Still sinking. All these shafts are on different lodes, but have communication one with the other.

Drying and Changing Houses.—There are two buildings provided for the men to dry and change in. The first a stone building 60 fet long, 18 wide, and 18 high, provided with two windows on each side, and a ventilator in the roof; but these were all closed up. The floor is covered for several feet with a fine dust; many of the men's boxes being ¾ buried in it. There were about 300 men's clothes drying here. This house is warmed by a large fire and a tube running through it.

The other changing house adjoins and is about 50 feet long; without any fire. Very few men change here.

It is to be noticed that the men object very much against having the windows opened, on accouut of the draught.

The mine appears to be well provided with roofed sheds for the females to work under, but there is not a house set part for them to use during their dinner hour.

South Caradon Mine (Copper).

A very old extensive and rich mine. The management for a number of years has been in the hands of one man.

There are two principal winding shafts now in use, and two new ones in course of sinking in the eastern part where the principal operations are now being and will continue to be carried on. These are,—

1. *Jopes Shaft.*—Perpendicular to the 80 below adit (18 fathoms); then underlies at the rate of 2½ feet to the 140. Winding carried on by two kibbles and chains.

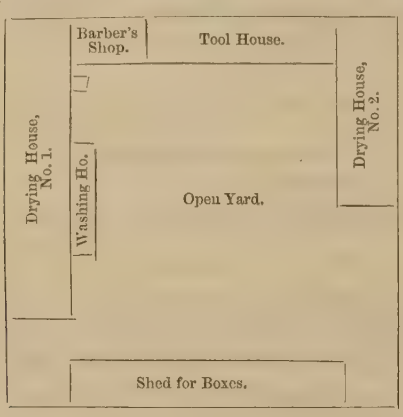
2. *Kitto's Shafts.*—It is ¾ of a mile from Jopes, but communicates by levels. It is down to the 180, underlying at the rate of 4 feet per fathom.

3. *New Shaft* adjoining Kitto's. To be used as an engine and a drawing shaft. It is perpendicular to the 80 (adit about 20 fathoms). At the 30 another shaft cut away, underlaying north, at the rate of 2½ feet per fathom to the 120. This shaft is 12 feet by 7 and will be used as an engine and drawing shaft. A roadway is laid down for the use of skips, but at present kibbles drawn by chains are employed.

4. *Rule's Shaft.*—This is the other new shaft, and will be used as an engine, and drawing shaft. It is sunk from surface to the 84 with a regular underlay of 2½ feet per fathom. It is 12 by 5 feet inside timbering. Skips with wheels will be employed to be drawn by chains.

Drying and Changing Houses.

These are most admirably adapted to meet the comforts and requirements of the men. They form the two sides of a rectangular yard, the upper and lower ends being appropriated for tool houses, and sheds for men's boxes.



Drying and Changing House No. 1 is 100 feet long, 22 feet wide, and 20 feet high. It is well lighted by means of glass skylights in the slate roof, and well ventilated by means of roof ventilators.

The floor is good. Benches are placed around the sides of the house, with boards below for the use of men when changing. The house is warmed by a fire and tube: provision is made for warming the men's dinners. The whole is kept remarkably clean, two men being kept to look after the drys, and it is a special part of their duty to thoroughly clean them out at least twice a week.

Adjoining this dry is a washing house, in which is a long rectangular washing trough, filled with warm water, a small stream constantly running through it. Here all the men wash before leaving the mine, many providing themselves with soap and towels.

Drying House No. 2, is similarly arranged to No. 1, only being smaller. It is 60 feet long, by 18 wide. About 200 men change here, but there is room for 500.

A comfortable house is provided for the barbers' shop, where the men get shaved &c., with a good supply of warm water.

The footways are respectively 30 and 50 fathoms from the changing houses. There is a good roadway from each. The site of the changing houses was the only spot available at the time.

There is a good supply of roofed sheds for the dressers to work under; but no adequate provision made for them during resting time. The manager is alive to this, and at an early period such accommodation will be furnished.

This mine was visited at a later period of the enquiry, and samples of air taken by Dr. Bernays, who reports upon them.

East Phœnix Mine (Copper).

This is comparatively a new mine, the operations being confined to exploration.

There is only one shaft. It is perpendicular for 72 fathoms, it then passes through the lode which is underlaying 42° south, and is then carried on under the lode at that rate of inclination.

It is 14 feet by 7 in size, and used as an engine drawing and footway shaft.

A kibble with chain used for winding.

The ladders in the perpendicular part are in 22 feet lengths, with an inclination of 1 in 12.

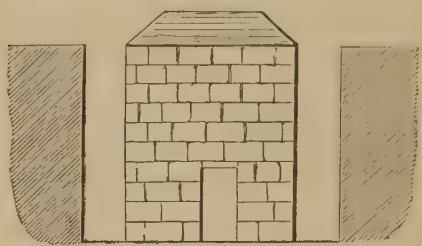
In the inclined part the ladder way continuous.

The ladder bars are 10 inches apart.

The men change and dry in the boiler house. There is a fine space of ground left for building a dry upon; and as the carpenters' and smiths' shops are good, high, and well ventilated buildings, it is to be hoped a correspondingly good dry will soon be added.

Powder Magazine.—This is a stone building quite away from all the other mine buildings. It is built in an excavated space, so that all the powder shall be under the evel of the adjoining ground.

No tin canisters are used, they are all of copper.



North Phœnix Mine (Copper).

This is quite a new mine. It has only one shaft.

The shaft is perpendicular to the 70. It is then carried down upon the course of the lode at an angle of inclination of 43° to the 140. The operations are confined to sinking, and driving at the 100 and 120.

This shaft acts as engine, drawing, and footway shaft.

The ladder way in the perpendicular part is in 12 feet lengths. In the inclined part they are continuous.

A very easy ladder way.

There are 15 men employed underground. There is a small changing house 15 by 10 feet provided, with a good fire.

West Sharp Tor (Copper).

Shaft perpendicular to the 60, then to the 162 underlying 5 feet in a fathom. The ladder way appeared an easy one.

The men change in boiler house.

The operations confined to exploring.

South Phœnix (Copper).

A new mine. Exploring operations.

There is only one shaft sunk any depth. It is an inclined shaft from surface. To the 50 it is inclined at an angle of 45°, from there to the 100 at an angle of 35°, then to the 126 at an angle of 20°, and then to the bottom 166 at an angle of 45°.

It is used as an engine, drawing, and footway shaft.

The drawing is performed by a tram waggon.

The ladder way is continuous from the 20. From the 100 to the 126 the men walk down the incline.

There are 24 men working underground, all of whom change in the boiler house.

An air shaft is sunk down 15 fathoms, in which are placed two 20-inch plunger air machines, which exhaust at the rate of 400 cubic feet per minute.

Huel Mary Ann Mine (Lead).

This is one of the old established mines of the district.

There are principal shafts, each of which is used as an engine and drawing shaft.

1. *Pollard's Shaft.*—This is a perpendicular shaft, and is down 205 fathoms from surface. It is 10 feet by 14. The engine part being 10×8, the whin part 10×6.

2. *Clymo's Shaft.*—Also a perpendicular one, about 72 fathoms from Pollard's. It is 11 feet by 15. Engine part 11×8. Whin 11×7. It is down 205 fathoms from surface, and has communication with Pollard's.

In both shafts skips are employed and flat hemp ropes.

The ladder way in each shaft, for shaft and pitmen is put in 3 fathom lengths with a base of 4 feet.

Footway for Men.—A special shaft for this purpose to the adit. A small house over it to keep rain out. It is perpendicular for 6 fathoms, with the ladder dipping 2½ feet per fathom, from there to adit upon course of the lode inclining 4 feet per fathom. From the adit to the 90, an old shaft (Barrett's), is kept clear as a ladder way, sunk on the course of the lode, and dipping at the rate of 4 feet per fathom. From the 90 the men go through special winzes.

Drying and Changing House.—A good sized house, 52 feet long, 18 feet wide, and 20 feet high. It has two windows and a ventilator in the roof. It is warmed by a fire and tube. From 70 to 80 men change here, and it is about 60 fathoms from the footway.

About 30 men change in the boiler house which is very roomy, and well provided with windows. The fillers, landers, and trammers change in the whim boiler house.

There is a change for pitmen, and two houses for shaftmen.

All the dressing operations are carried on under sheds, most of which are provided with moveable hanging sides to protect the dressers against wind and rain.

One shed is completely boarded in, and provided with a fire and seats. This is for the women and girls to dine, &c. in. During the summer the kettles are boiled in the smith's shop.

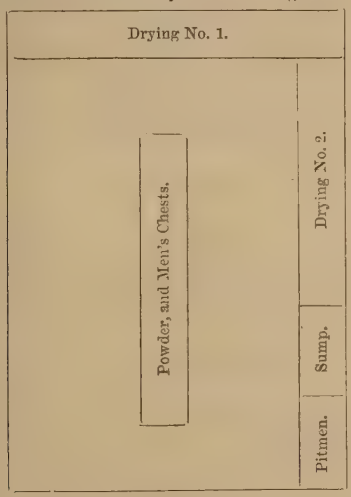
Huel Trelawney Mine (Lead).

This is another old established lead mine, working in two principal parts.

There is one large shaft used as an engine and drawing shaft, and two other drawing shafts.

Trelawney's Shaft.—Engine and drawing, perpendicular, and 170 fathoms deep. Two kibbles used, with chains.

The other drawing shafts are respectively 160 and 180 fathoms deep, underlaying 1 foot per fathom. These have one kibble in each, worked by the same engine.



There are two ladder ways for the men. The ladders are in 4 to 5 fathom lengths, underlaying 20 inches per fathom

The drying and changing houses form the end and side of a rectangular yard. In the centre is a shed with lockers built in a wall for holding the powder, and containing the men's chests.

No. 1 is 50 feet long, 15 wide, and 14 feet high. It has one fixed glass window, one open one, and a ventilator in the roof. It is warmed by means of a fire and tube. An aperture is formed round the fire for warming dinners. There are raised planks for the men to stand upon while changing. About 100 men and boys change here.

In winter the females eat their dinners here.

No. 2 is 30 feet long, 12 wide, and 12 high. No roof ventilator. It is warmed by a tube passing from the fire to the sump house.

The sump house is for the shaftmen; good fire.

Pitmen and timbermen's house very comfortable. It has a wooden floor and good fire.

The dressing mostly carried on under roofed sheds.

In the north part of the mine the dressing also under sheds, but no provision for girls to warm their dinners, &c., other than engine house.

Huel Treweatha (Lead).

The old mine abandoned, and a newer part being worked.

A perpendicular shaft is sunk to the 30, and the operations confined now to driving upon that. There are about 30 underground men. In the old mine skips were employed, and the new shaft is sunk with that object in view.

A separate ladder way is carried down on the course of the lode underlaying 1½ feet per fathom.

There is a small drying and changing house, though most of the men change in the boiler house.

About seven persons employed dressing the ores. All under cover.

West Fowey.

Changing and drying house is 30 feet long by 12 feet wide. There is one window, but no roof ventilation. The house is built at the end of the boiler house, and is warmed by a flue passing from the boilers.

Sump men and pitmen have changing houses to themselves.

Some of the underground men, the fillers, and the landers change over the boilers.

1. *Deeble's Shaft.*—124 fathoms below the adit (11) is an engine and drawing shaft, and is perpendicular to the bottom. It is 12 feet by 7. Two kibbles are used drawn by chains. Footway for shaftmen. Ladders in 3 fathoms lengths, with from 3 to 4 feet base, the staves 12 inches apart.

2. *Protection Shaft.*—100 fathoms below the adit (24). From the 35 it underlays at the rate of 3½ feet per fathom. It is 10 feet by 5 feet. The ordinary ladder-way for the men. It is cased off, and is 4 by 5 feet. Down to the 35 the ladders are in 4 fathom lengths, with from 2½ to 3 feet base, and staves 12 inches apart. I went down to the adit, ladder way very good. Below the 35 the ladders continuous on the course of the underlay.

This shaft 60 fathoms from changing house.

The mine very well supplied with sheds.

East Crinnis.

This mine has been a very extensive one. It is now very nearly abandoned. The operations confined to clearing up.

Changing House is 40 feet long by 18 wide, and 20 high. Provided with a fire and tube. A sump house by the side. It has 7 windows. There is a very good roof but no ventilators. There were 73 men using it.

1. *Thomas's Shaft.*—Formerly a whim shaft, but now especially kept for footway shaft. It is 4 feet by 2. It is perpendicular to the 40, the ladders in 4 fathom lengths, with 3 feet base and 10 inch staves. The shaft below the 40 underlays at the rate of 2½ feet per fathom. The ladders here continuous from level to level, a distance of 10 fathoms, 140 fathoms from change.

2. *Daney's Shaft.*—Also a footway to the 30, underlaying 3 feet in a fathom. From the 30 the men go through winzes. This shaft not used by many men. It is about ¼ mile from change.

The dressing operations are very much scattered about, with but few under sheds.

No house for females to dine in.

West Par.

Engine Shaft.—An inclined shaft from surface, 65 fathoms in length. From surface down to the 45 it is 8 feet by 6. Below that depth it is 9 × 6. The underlay is 6 feet in a fathom. A footway for shaftmen. Ladders continuous. A tramway laid down for waggons. The waggon employed is 5 feet long, 5½ feet high, and 2 feet 10 inches wide, running on four wheels 20 inches high, and made of ¼ inch plate. Single waggon way. Chains employed.

Winding Shaft down to the 65. The same underlay as engine shaft. It is 6 feet by 5 down to the 20. Below that 7 × 5. Tram waggon and tramway as at engine shaft. Drawn by 1¼ inch wire rope.

Footway Shaft.—Special one for the purpose. The same underlay as the other shafts. Ladders continuous. It is 60 fathoms from changing house.

Charleston United.

This is a very extensive mine, employing a large number of hands.

1. *Barker's Engine Shaft* is 140 fathoms below the adit (22 fathoms), and is perpendicular. It is 8½ feet by 8 one end and 7 the other. Ladder way for shaftmen.

2. *Barker's Whim Shaft*, close by, and to the same depth as No. 1. Kibble and chain employed.

3. *Middlemore's Whim Shaft*, 100 fathoms below the adit (22) is 7 by 4 feet, and worked with chain and kibble.

4. *Annie's Whim Shaft*, 80 fathoms deep, is 7 by 4 feet. Worked with single skip running with a chain guides, and drawn by hemp ropes.

A footway for 46 fathoms. Ladders in 4 fathom lengths with 6 feet base. From the 46 the men go through winzes. This shaft is 90 fathoms from changing house.

5. *Worthey's Whim Shaft.*—Perpendicular for 85 fathoms, then underlays for 30 more at the rate of 5 feet per fathom. Kibble and hemp rope. It is 7×4 feet.

6. *Buckler's Footway Shaft.*—Perpendicular to the adit (22). Then the men go through winzes underlaying 5 feet per fathom. A good size wooden shed, with closed sides erected over this shaft.

Changing House.—This, with a run of barracks, form the side of an enclosed rectangular yard. The changing house is 60 feet long, 18 wide, and 15 high. There are 7 glass windows. No roof ventilation. It is warmed by a fire and tube. There are seats all round the house. About 200 men changing here.

A house is now being built adjoining the change which will be supplied with warm water for washing purposes.

A large number of the men changing in the barracks.

The mine well provided with sheds. 150 out of 170 hands under cover.

A very comfortable house provided for the girls to dine in. Wooden floor. Glass windows.

There is a good arrangement of water ventilation employed.

It consists of a 1½ inch pipe running from the 40 to the 124 fathom levels, which is turned sharply round, enters another pipe 14 inches diameter and tapering off to 8 inches on a length of 3 feet. The small pipe terminates with a rose, and is supplied with a stop cock to regulate the supply of water. The water in issuing from the rose causes a current of air to enter the large pipe with a velocity of from 2 to 300 feet per minute. The air carried any length by means of pipes fitting on.

Boscundle Mine.

This mine has been extensively worked. It is worked now to a much less extent.

1. *Anna Maria's Shaft.*—A perpendicular shaft and 102 fathoms deep. It is 11 feet long, 6 feet wide one end and 5 the other. Engine and whim shaft. A double skip way with wooden guides. The skips have no wheels, only running plates. The skips are 2 feet by 1′ 10″ on the top, and 4½ feet deep. Ladder way for shaftmen. Ladders in 4 fathom lengths underlaying 1 foot per fathom.

2. *Matthew's Whim Shaft*, 75 fathoms below adit (15) is 7 by 3½ feet, and with kibble and chain guides.

3. *Engine Shaft.*—Perpendicular to the 20 below adit. It then underlays to the 75 at the rate of 20 inches per fathom. It is 10 by 7 feet.

4. *Footway Shaft* to the adit. Perpendicular, with ladders in 4 fathom lengths, underlaying a foot per fathom. Only 7 or 8 fathoms from changing house. From the adit, the ladder way is through special winzes.

Changing House is 42 feet long, 16 wide, and 12 high. Provided with fire and tube. There are 9 windows. No roof ventilation. No night corps in the mine.

The dressers very well protected with sheds. The burning house, not often used, is appropriated for the girls to dine in, &c. Comfortably provided with seats, a table, fire, and kettle.

Cuddra Mine.

Tickle's Shaft is 100 fathoms deep. After a perpendicular course to the 90 it underlays at the rate of 4 feet in fathom. It is 10 feet by 6; and is engine, drawing, and footway. The drawing done by a horse whim and double kibbles.

Walker's Shaft is 75 fathoms deep. Perpendicular to the 65, and then takes the same underlay as Tickle's. A steam whim and a single kibble. It is also an engine shaft from the 75 to the 60.

The general footway is in this shaft; and is cased off. The ladders are in 4 fathom lengths, with from 3 to 4 feet base, and staves 12 inches apart.

The men change in a loft over the smith's shop.

The dressing frames are all under cover. There are only three boys and three girls exposed. Sheds for these are being built.

North Roskear.

Changing Houses.—No. 1 is in the smith's shop. This shop is 71½ feet long by 26½ wide, and 24 feet 3 inches high. A portion of this, 44 feet 9 inches long, and 10 feet 3 inches broad, is taken from the smith's shop, with a stone wall partition, for a changing house. This has a wooden floor, with a rough sunk in it running the whole length, through which a stream of warm water is constantly flowing. It has two glass windows. A gallery runs round two sides of this, and opens into a gallery running round three sides of the smith's shop.

There are five forges in this shop, three working a very large ventilator in the roof. This house is 40 fathoms from the footway.

No. 2. Is in the smith's shop, and in its arrangement is similar to No. 1. The shop is 42½ feet long, 25 feet wide and 26 feet high. A portion partitioned off, 25 feet long and 10½ wide. This has wooden floor and a stream of warm water. In addition to the forges, a fire and tube provided in smith's shops for drying the clothes. This house is 25 fathoms from the footway shaft.

Dressing Floors.—All the dressers on the tin floors, and nearly all on the copper floors, are under cover. There are 200 persons engaged in dressing operations, 160 of whom are girls.

There is good provision made for the comfort of the people. There are six dining houses on the floors. This prevents a large number congregating together.

These houses have, in each of them, an open fire, and also an oven with shelves in it for warming the dinners.

Half an hour before the bell rings for the hands to leave work, one of the girls for each house goes in, prepares the fire, boils the kettle, makes the tea, puts the pasties in the oven, &c., so that when the bell rings and the dressers go in, they can sit down to a warm meal at once.

Many of the girls are being taught to write by the clerk of the mine, under the auspices of the manager, who gives prizes monthly for the best copy book, and best reading.

West Condurrow.

Engine Shaft is 37 fathoms below the adit, which is 23 fathoms deep. It is perpendicular to the adit, and then underlays at a rate varying from 2½ to 3 feet per fathom. It is 6 by 12 feet.

Purser's Shaft is 23 fathoms below the adit, which is 27 fathoms deep. It is perpendicular for 20 fathoms and then underlays about 3 feet per fathom.

The footway is through the engine shaft to the adit and and then through purser's shaft. The ladders are in 3 to 5 fathoms length, with staves 10 inches apart. In engine shaft 3 feet base given to each ladder.

The men change over the boilers. A wooden pipe is fixed over the safety valve to carry off the waste steam. The number of men working underground is 29.

The floors are not yet laid out, only one shed being erected, and only five girls and a boy working.

Tincroft Mine.

Shafts.

1. *Engine* is 184 fathoms below adit, which is 25 fathoms deep, and is still being sunk. It is perpendicular for 70 fathoms, and then underlays north to the 130 at a rate of 2 feet in a fathom, and then to the bottom in a south direction at the rate of 2 feet 3 inches per fathom. It is 10 feet by 5, and is a whim shaft as well as an engine shaft. Winding by single kibble. Ladder way for shaftmen.

2. *Martin's East* is down to the 184, and is perpendicular to the 58, then underlays north to 135 at the rate of 2 feet per fathom, and then to the bottom underlays south at the rate of 1 foot 9 inches per fathom. From the 58 a new perpendicular shaft has been sunk to the 142, which is 6 by 4 feet for winding purposes. Winding in the old shaft by kibble. The new one not used yet.

3. *Martin's West* is down to the 160. It is perpendicular to the 100 and then underlays south at the rate of 2 feet per fathom. It is 7 feet by 4 and used for winding 2 kibbles.

4. *Tyries Shaft* is down to the 154. It is perpendicular to the 48 and then underlays north to the bottom, at the rate of 2 feet 3 inches per fathom. Whim shaft. A footway cased off. Ladders in 3 fathom lengths underlaying a foot in a fathom in perpendicular part. About 100 fathoms from changing house.

5. *Blight's Shaft*, is a special footway to the 58. The ladders are in 3½ fathom lengths with bases of 3 feet, and staves 10 inches apart. From the 58 the men go through winzes on the underlay of the lode. This shaft is 50 fathoms from changing house.

This shaft is now down to the 100. Levels are being driven towards and under it, at each level below, to the 140. These will be communicated, and then a man-engine will be placed in this shaft.

Changing House is 70 feet long by 20 wide, and 16 high (wall). It has 10 windows and good roof ventilation. It is

warmed by a fire and tube. It is supplied with warm water The men's lockers are around; they stand upon them to change.

Underground men:—

22 men and 11 boys on tribute.
36 „ 26 „ tutwork.

Dressing Floors.—All well covered in. The number employed is 43 girls, 61 boys, and 27 men on the tin floors' and 22 girls, 1 boy, and 2 men on the copper floors.

A good dining house 36 feet long by 12 wide, furnished with fire and ovens. This is for the tin dressers. Another smaller house with an open fire for copper dressers.

North Dolcoath.

Engine Shaft is 47 fathoms below adit, which is 10 fathoms deep. It is perpendicular to the 20, then underlays 2½ feet per fathom. It is 12 feet 3 inches by 6 feet. Horsewhim and 2 kibbles. Ladder way. Ladders in 5 fathoms lengths on footwall. Staves 10 inches apart. There are 14 men working underground; they charge over the boilers.

Whim Shaft to adit 6 by 3 feet. Horse whim and 2 kibbles. Footway shaft, perpendicular to the adit. 6 by 3 feet.

Dressing floors. Only 7 persons employed. A very comortable house in which they can dine.

Huel Nelson.

Engine Shaft is 74 fathoms deep.

Changing house is 40 feet long, 20 wide, and 12 feet wall; fire and tube. 16 men change here.

No dressing operations.

Huel Grenville.

Engine Shaft is 114 fathoms from surface, there being no adit. It is perpendicular for 18 fathoms, and then underlays at the rate of from 16 to 18 inches per fathom. It is 13 by 6 feet. Winding by single skip and chain. A footway in the shaft, the ladders in 5 fathom lengths, on the footwall, with staves 10 inches apart.

There is a footway through winzes all through the mine.

The men change on the boilers. It is intended that a dry shall be built shortly. The number of men working underground is 58 tutworkers and 28 tributers.

There are 14 girls dressing the ores, all under sheds.

East Grenville.

Engine Shaft is 53 fathoms deep. It is perpendicular to the 25, and then underlays at the rate of 1 foot 10 inches per fathom. It is 13 feet by 7. Horse whim, and footway. The ladders on footwall.

An air shaft to the 25, and winzes opened. This shaft is 70 fathoms west of engine shaft.

The men change over the boilers. There are 36 underground men.

There are 18 persons dressing the ores, all under cover.

East Rosewarne.

Engine Shaft is 55 fathoms deep below the adit, which is down 13 fathoms. It is perpendicular to the adit, and then underlays at the rate of 9 inches per fathom. It is 12 feet by 6. Horse whim and 1 kibble. Ladder way; ladders in 5 fathom lengths, with 4 feet base, and stattes 10 inches apart.

Hallett's Shaft is 55 fathoms below the adit. It is perpendicular to the adit, and then to the 22 fathom level underlays (S) at the rate of 18 inches per fathom. It is then perpendicular for 11 fathoms, and then to the 43 underlays (N) at the rate of 9 inches per fathom. Horse whim and kibbles. A footway for sump men.

There are several other shafts down to the adit, and some more down to various depths.

Changing House is 31 feet long by 13 wide, and 10 feet walls. It has two large sliding skylights, and 2 windows for lighting and ventilating. It is heated by a fire and tube. The floor is an earthen one. The men stand upon their boxes to change.

The number of men is 56.

There are about 20 persons on the floors, about one half of whom are under cover.

Rosewarne United.

No agent on the mine.

Changing House is 48 feet long, 15 wide, and 12 feet walls. It is well lighted by means of skylights. It is heated by means of a fire and long tubular boiler. On either side of the boiler the floor is raised about 4 feet, and boarded. Lockers all round. About 50 suits of clothes hanging around. The house is ventilated by having the skylights about 6 inches higher than the roof.

There were about 20 persons dressing the ores. All were under cover. The spalling house has closed sides and a fire place.

The shaft is down to the 90 below adit, which is 16 fathoms deep. From the plan there appeared to be about 10 shafts sunk to various depths.

Rosewarne Consols.

Engine Shaft is 55 fathoms deep from surface. It is perpendicular to the 20, and then underlays at the rate of 2½ feet per fathom. It is 10 feet by 6. The general footway for the men. Ladders in 5 fathom lengths, with 4 feet base in the perpendicular part.

Flat Rod Shaft is 30 fathoms below the adit, which is 14 fathoms deep. It is perpendicular to the adit, and then underlays at the rate of 18 inches per fathom. It is 8 feet by 3. Ladder way perpendicular to adit then on footwall.

Western Whim Shaft is 30 fathoms deep.

Ellen's Shaft is 45 fathoms deep. It is perpendicular to the 20, and then underlays at the rate of 2½ feet per fathom. It is 6 by 3 feet. Horse whim.

The men change on the boilers.

There are 10 people dressing. All under cover.

Huel Unity (Gwinear).

No agent to be seen, he being underground.

Only eight girls dressing ore. All under cover. The girls dine in bucking house.

About 30 men work underground. They change in boiler house.

There are two shafts. The deepest level is 29 fathoms deep.

Ladders in about 5 fathom lengths, with about 3 feet base.

Basset and Grylls.

There are two portions in this mine at present not communicating, but levels are being driven, which, when completed, will effect this.

In each part there are two or more shafts.

The Old Part.

Robartes' Shaft is 50 fathoms deep. It is perpendicular for 32 fathoms, and then underlays with a regular underlay of 2½ feet per fathom. It is an engine and winding shaft 11 feet by 7 in size. One kibble drawn by chain used.

A ladder way in this shaft which is used by about 150 men. The ladders are in 3 to 3½ fathom lengths, with bases of about 3 feet, and the staves 10 inches apart. It is about 40 fathoms from changing house.

Middle Work Shaft is 22 fathoms deep, 5 feet by 3 in size, and used for winding. A horse whim and kibble.

Huel Fat Shaft is now being sunk below the 30 fathom level. It is perpendicular the whole way, and 9 feet by 5½ large. Engine and whim shaft. Horse whin. One kibble and chain.

Footway, with ladders same as in No. 1. This shaft close to the changing house.

Harris' Shaft.—Whim shaft down to the 22.

Footway Shaft.—Adjoining Huel Fat Shaft down to the 16. The ladders are not so easy as in engine shaft, having only 1 foot base to 3 fathom ladders; hence the men mostly come up the engine shaft.

Changing House.—A house 40 feet long, 20 feet wide, and 15 feet high in centre, with a wooden roof. It has only one window and no ventilator in the roof. It is warmed by a tube leading from the sump house, which is a portion of the changing house partitioned off, but included in the measurements before given. There are 2 windows in the sump house.

Dressing Floors.—The number of hands employed on the floors in this part of the mine is 10 men and 4 girls. They are not under cover. They take their dinner in the sump house.

A number (about 15) of men change over the boiler. This is against the law of the mine, and with the knowledge that in case of any accident arising therefrom, they shall have no claim upon the club.

This engine boiler house is about 40 fathoms from the change, but there is a shaft close by the changing house, through which these men might all travel, and so avoid the boiler house altogether.

New Part of the Mine.

Tyack's Shaft is 34 fathoms deep, and 11 by 7½ feet in size in the upper part, while downward it is 13 feet in length. It is a perpendicular shaft used for engine and winding shaft. House whim and 2 kibbles. Only 12 men working in three cores at work here.

Wilkins Shaft is down to the 32. It is 8 by 5½ feet. 27 men working in 3 cores.

The men from these shafts change over the boilers.

Dressing Floors.—The main floors are in this part of the mine. About 150 persons employed, of whom only 15 are working in the open air. The girls mostly eat their dinners under the sheds where they are working. There is one house for the purpose, 12 feet long by 10 wide, with a fire, and several go into the burning house, where an open fire is kept. This house has a good ventilator, and there is no arsenic in the tin.

Wendron United.

Engine Shaft is 50 fathoms deep, and 11 feet by 5½ large. It is perpendicular down to the 20, and then underlays about 1 foot in a fathom. Engine and whim shaft. Ladder way all down. Ladders 4 fathom lengths with 4 feet base, and staves 11 inches apart.

This is the principal shaft and general footway. About 50 men and boys travel here.

Men's Shaft.—40 fathoms deep. 6 by 4½ feet. Horse whim. 2 kibbles.

South Shaft.—Horse whim. 2 kibbles 9 by 4½.

New Shaft.—30 fathoms deep. Whim shaft and ladder road.

Dressing Floors.—Only 15 to 20 boys and girls dressing. All under cover. They dine in the burning house, which has an open fire in it. No arsenic fumes.

The men change over the boilers, close to the engine shaft. The house has no ventilation.

The sump men, six in number, have a portion of the mith's shop partitioned off for them. No ventilation.

Calvadnack.

Engine Shaft is 92 fathoms deep, underlaying from surface at the rate of 6 inches per fathom. It is 14 feet by 6. Engine and whim shaft. A single kibble drawn by chain.

Ladder way.—Ladders in 3½ to 4 fathom lengths, with a base of 6 feet; and staves 10 inches apart.

Paynter's Snaft is 70 fathoms deep, with the same underlay as engine shaft. It is 8 feet by 6 in size. There is a whim shaft and ladder way. The skip is used here, and is 5 feet deep by 2 feet square. Ladder way is cased off, and is 3 by 6 feet. The ladders average 5½ fathom lengths, with a base of 3 feet. This, with the underlay, makes a base of 5½ feet from the perpendicular.

Granju Shaft. — 40 fathoms deep, underlaying from surface 18 inches per fathom. It is 8 by 5 feet in size. The ladders are in 3½ fathom lengths, with 18 inches base. 30 men travel through this shaft. Skip used for drawing stuff.

Changing House is 40 feet long, 15 feet wide, and 15 high. It is warmed by a tube leading from the sump house. It has two open windows, but no roof ventilation. There are about 100 men changing here, about 40 at a time.

Sump House adjoining changing house, 6 men and 3 boys. Not kept very clean.

Dressing Floors.—Out of 100 dressers, only about 30 are under cover. Sheds are being erected, and it is intended that all shall be covered in before the approach of winter. There is a house provided for the dressers to dine in, 15 feet long 12 wide and 10 high, warmed by a fire and tube.

Polhigey Moor.

South Shaft is 15 fathoms deep and a perpendicular one. It is 8 by 6 feet at the top, increasing to 10 by 7 at bottom, Engine and whim shaft. Horse whim, kibble, and chain. A footway of 3 ladders in this shaft, each having a base of 2 to 3 feet, and staves 10 inches apart. 15 men.

East Shaft is perpendicular and 13 fathoms deep, is 6½ by 4 feet in size, and is for whim shaft only.

Treffry's Shaft is perpendicular and 15 fathoms deep, is 11 by 7 feet in size. Engine and whim shaft. Ladder way same as in South Shaft.

There is no regularly built changing house, it not being known which shaft will be devoted to a footway shaft. At the present time some of the men change over the boilers, while others change in a shed 20 feet long close to Treffry's shaft.

There are no dressing operations carried on, except two little boys attending to a round buddle.

Garlidna.

Engine Shaft is 52 fathoms deep, and perpendicular. It is 7 by 10 feet. Engine and whim shaft. Winding by means of horse whim, kibble, and chain.

Ladder way in engine shaft, with ladders in 5 fathom lengths; the ladders are perpendicular. Not used by the men.

Flat Rod Shaft is the principal shaft. It is 60 fathoms deep and 12 by 5 feet in size. It is an engine shaft below the 50. Winding by a single kibble. Footway in this shaft. Ladders in 4 fathom lengths, with 6 to 7 inches underlay per fathom. Staves 10 inches apart.

Footway Shaft is down to the 20. Then the men go through winzes. The ladders here underlay 1 foot in fathom. Staves 10 inches apart.

The men change over the boilers, which are 30 yards from footway shaft. About 65 underground men and boys. It is intended that a drying and changing house shall be built at some future time.

The whole of the dressing is carried on under cover. There is no special house for the girls to dine in; but they go to the tin house where a fire is kept for their convenience. The foundation for a dining house is dug out, so that one will be erected shortly.

The amount of covering provided on this mine is 12,000 feet. There are 50 persons employed on the floors.

Wendron Consols.

Sump Shaft is 45 fathoms deep. It is perpendicular for 25 fathoms, then underlays at the rate of 2 feet 9 inches per fathom. It is 11 feet by 6. Engine and winding shaft. Winding by means of a single skip and chain. The general footway is through this shaft. The ladders are in from 3½ to 4 fathom lengths, with 2 feet base in the perpendicular part, but no base given in the underlay part. The staves are 10 inches apart. It is 30 fathoms from the changing house.

Sleeman's Shaft is 35 fathoms deep, and still being sunk. It is 5 feet by 7 at the top, but widens downward. This is a whim shaft, a double kibble, horse whim and chains employed. The shaft is perpendicular to the 25, then underlays at the rate of 2 to 9 inches per fathom. A ladder way in this shaft. It is 80 fathoms from the changing house.

3. *Baldhee's Shaft* is a perpendicular shaft of 45 fathoms deep. At top it is 7 by 5½ feet, increasing downward to 10 by 6. Engine and whim shaft. Drawing by 2 kibbles, horse whim and chain. A ladder way in this shaft, with 6 inches underlay per fathom. This shaft is 120 fathoms from changing house.

4. *Hill's Shaft* is 80 fathoms deep, and still being sunk. In the upper part it is 6 by 9 feet, while lower it is 10 by 5 ft. Engine and winding shaft. Winding by means of singleskip. The shaft is perpendicular for 20 fathoms, and then underlays at the rate of 1 foot 7 inches per fathom. A ladder way. This shaft is 130 fathoms from the changing house.

5. *Huel Flat Shaft* is a horse whim shaft 25 fathoms deep. 5 feet by 2½ in size.

6. *Bishop's Shaft* is 62 fathoms deep, perpendicular for 12 fathoms, and then underlays at the rate of 2 feet 9 inches per fathom. Engine and whim shaft. Winding by single skip. Ladder way 90 fathoms from changing house.

Changing House is a very good building 36 feet long, 12 feet wide, and 14 feet walls. A gallery runs around it at a height of 8 feet from the floor. The house is warmed by means of a tube. The house is well lighted, and ventilated from the roof. There are 152 underground men.

A few men, perhaps 20, were changing over the boilers.

All the dressing appeared to be carried on under sheds; but a portion of the ores is dressed by contract by another party. This part appeared badly off for shelter. The number of dressers engaged were 54 men, 87 boys, and 59 girls.

Crane.

This is a mine lately set to work. There is no house as yet provided for the men specially to change in. Until such accommodation be provided the men change in the smith's shop, and the sump men in a room over the carpenter's shop. There are 20 men working underground, and 12 sump men. The men dry their clothes over the boilers.

Engine Shaft is 60 fathoms below the adit, which is 20 fathoms deep. It is perpendicular to the adit, and then underlays at the rate of 1 foot in a fathom. It is 9 feet by 6 to the adit, and then increases to 12 feet by 7. Engine and whin shaft. Winding by single skip. The skip is 6 feet deep by 2 feet, by 1 foot 9 inches at the top. A

ladder way in this shaft. The ladders from 5 to 10 fathoms long, with a base of 5 to 7 feet.

Whim Shaft is down 30 fathoms below adit. It is perpendicular down to the adit, and then underlays from 10 to 12 inches per fathom. It is intended to sink on the lode from the adit, and to put in a double skip way. The shaft to be 8 feet by 5.

Footway Shaft.—A special footway to the 30. Then the men go through winzes. The shaft is 6 feet by 4. Ladders in 5 fathom lengths, with 4 feet base and staves 10 inches apart.

There are only 4 or 5 hands engaged in dressing, and these are under cover.

South Seton.

Marriott's Shaft is 40 fathoms below the adit, which is 11 fathoms deep. It is perpendicular to adit, and then underlays at the rate of 5½ feet per fathom. It is 14 feet by 6. Engine and drawing shaft. A double skip road is laid down, winding by horse whim. Ladder way in this shaft. In the perpendicular part there are 3 ladders, each with a base of 3 feet. In the underlay part no base required. The staves are 10 inches apart. This will be the principal ladder way to the 26, and then through winzes.

Tippett's Shaft is a perpendicular shaft, and 42 fathoms deep. It is 13 feet by 6.

There are no dressing operations on the mine.

Changing House is 20 feet long and 10 feet wide, It is 15 feet high one side, and 8 the other. There is no window nor ventilator. It is warmed by fire and tube; 30 men and boys at work underground, there would therefore be about 10 or 12 changing at a time.

West Seton.

Engine Shaft is 130 fathoms below the adit which is 22 fathoms deep. It is perpendicular to the 18, then underlays at a varying rate, averaging 3½ feet per fathom. It is 14 feet by 5½, whim and engine shaft. Winding by double skips and chains. Ladder way for shaftmen.

New or *Western Shaft* is down to the 56. It is perpendicular to the 18, and then underlays regularly at a rate of 4½ feet per fathom. Winding by double skips. The shaft is 10 by 6 feet.

Old Sump Shaft down to 50 is a perpendicular shaft.

South Shaft is down to the 110. It is perpendicular to the 18 and then underlays at the rate of 3½ feet per fathom. It is 12 by 6. This is the general footway, the ladders in 2 to 3 fathom lengths with 3 to 4 feet base, and staves 10 inches apart. In the inclined portion the ladders require no base.

There is a special footway to the 18; then through the previous way.

Changing House is a good stone building, 50 feet long 20 feet wide, and 24 feet high.

It has a gallery running around the whole building. This part is lighted by 5 windows each 3½ by 4½ feet.

The lower part is divided, one part 22 feet long, for the men, the other part for sumpmen and pitmen. This part has also windows; and there is a large ventilator in the roof.

There is a large trough with warm water for the men to wash in.

There are about 250 men working underground. About 80 would be changing at a time. There were about 150 suits hanging.

Dressing Floors.—(1). The main dressing floor is well covered in. The side which is usually left open can be closed by means of moveable frames, formed of wooden supporters and thatch.

A dining house for the dressers on this floor, 54 feet long, 14 feet wide, and 13 feet high, provided with fireplace and ovens, as at Dolcoath. It has 5 windows. A woman to keep it clean, and attend to the dinners. There are 140 hands on this floor.

(2). *Tin Floors.*—36 hands on this floor, 6 of whom are not covered. A small house 16 feet by 13 with open fire provided for them to dine in.

(3.) *Halvan's Floors.*—30 people working, 13 of whom are under cover. A house 17 by 13 with a fire and oven provided.

New Huel Seton.

A new mine.

Engine Shaft is being sank under the 52. Adit 16 fathom. It is perpendicular to the 14, then underlays 4½ feet per fathom. It is 13 by 6 feet. Horse whim.

Whim Shaft to the 28. It is 10 by 6. Horse whim.

The men change over the boilers. There are 24 men and 4 boys.

No dressing operations.

Huel Seton.

Tilley's Shaft is 140 fathoms below the adit, which is 26 fathoms deep. It is perpendicular to the 20. It is 6 by 12 feet. Engine and winding shaft, two kibbles and chains. Ladder way. Ladders in from 3 to 5 fathom lengths with 4 feet bases; staves 12 inches apart.

Bull's Shaft is down to the 130; is 12 by 6 feet. Winding shaft; two kibbles and chains. No ladder way.

Footway Shaft to the 12; then through winzes. This shaft is 25 fathoms from the changing house.

Changing House is 40 feet long by 15 wide and 27 high. A gallery all round. There are 4 windows and a large ventilator in the roof to light and ventilate the upper part, and 3 windows under the gallery. There were also 3 other windows but they were fastened up. The house is warmed by means of a fire and tube. There are 160 men working underground.

There are 130 engaged on the dressing floors, nearly all of whom are under sheds. The girls dine in the sampling house, which is 40 feet long by 15 wide, and 14 high, and provided with an open fire.

North Crofty.

Engine Shaft is 170 fathoms below the adit, which is 20 fathoms deep. It has a regular underlay from the 20, of 3 feet per fathom. The shaft is 13 feet by 6. Engine and whim shaft, winding with chain and single kibble Ladder way for shaftmen. Ladders in 4 fathom lengths, no base required; staves 11 and 12 inches apart.

2. *Praed's Shaft* is 150 fathoms below the adit. It underlays from the adit at the rate of 2 feet. It is 8 by 4 feet. Winding by double skips and chains. No ladder road.

3. *Rule's Shaft* is 140 fathoms below adit, underlaying at the rate of 2 feet in a fathom. It is 10 by 5 feet; 1 kibble drawn by chain used here. Ladder way cased off from the whim shaft; ladders as in engine shaft. This is about 90 fathoms from the changing house.

There is a special footway down to the adit.

Changing Houses.—There is no large changing house on the mine, but there are three rows of buildings called barracks, which consist of 10 or 12 little houses, each about 8 feet long, 7 wide, and 8 high, appropriated for the use of a pair of men. These houses are not heated at all, and have no window. A stream of water flows through them for the men to wash in. The men dry their clothes over the boilers. If a party is working in a very wet place, they are allowed to use either a small house adjoining the sumphouse, or another house, each of which is furnished with fire.

Sumphouse is 20 feet long by 10 wide. Fire and tube; 8 men and boys.

The dressing floors are well provided with sheds. There are from 80 to 100 dressers, of whom, only 20 work in the open floors.

East Pool.

North Shaft is a perpendicular shaft, 150 fathoms below the adit, which is 20 fathoms deep. It is an engine and whim shaft. Winding with two kibbles and chains. Ladder way in 4 fathom ladders with 6 feet bases.

South Shaft is 112 fathoms below the adit. It underlays from the 38. It is 9 by 5 feet. Winding by two skips and chains. Footway. Ladders in 3½ fathom lengths in the underlay, no base required.

There is also a footway close to the changing house, through which all the men can travel.

Changing House.—A good building 72 feet long, 18 feet wide, and 27 feet high. There are 9 windows, the upper part of each is glazed, and the lower part is fitted with a sliding ventilator. There is also a large ventilator in the roof. The house is warmed by a fire and tube. A row of lockers run around the buildings 6 feet wide, on which the men stand to change. The floor is an earthen one, which gives up a great deal of dust. A washing trough 15 feet long by 12 inches wide, and 1½ deep, with a running stream of warm water for the men to wash in. About 150 men and boys.

Dressing Floors.—There are two floors, the northern and southern. The former is fairly supplied with sheds. The cobbing is done in a large shed, which has a fire in it. The southern floor is entirely enclosed. It is about a quarter of an acre in extent, completely walled in and roofed. It has a capital house for the dressers to dine in 30 feet long, 10 feet wide, and 8 feet high, and provided with a "slab" and ovens, similar to those described at Dolcoath.

Huel Tremayne.

Agents underground.

Engine Shaft.—The general footway for the men. It underlays 6 inches per fathom. The ladders appear to be very steep, having only one foot base on 5 fathom ladders. It is 130 fathoms deep.

There are two other shafts.

Changing House is 50 feet long, 20 wide, and walls 12 feet high. It is well ventilated from the roof, has 3 windows, fire and tube, and earth floor, 120 to 130 undergroundmen.

The trammers change on the upper floor of the whim engine house.

Dressing Floors are very well provided with sheds. The girls eat their dinners in the tool house, which is four bare walls with a thatched roof. About 60 dressers.

West Providence.

Just being abandoned. Captain not on the mine.

Changing House 36 feet long, 12 wide, and 8 feet wall. Heated by fire and tubular boiler. No roof ventilation.

Huel Anna.

Western Shaft is 90 fathoms below the adit, which is 20 fathoms deep. It is perpendicular to the 20, and then underlays at the rate of 1½ feet per fathom. It is 12 feet by 9 feet wide one end, and 7 feet wide the other. Engine and whim shaft. Winding by single skip. Footway for shaftmen.

Special footway for the men through a shaft to the adit, 6 feet by 3, with ladders of 3½ fathom lengths, and 4 feet or more base, and staves 10 inches apart. From the adit, ladders through winzes underlaying 1 foot 9 inches per fathom. Over each ladder a "pentice" or sloping board is placed to prevent anything from falling upon the men while climbing.

James Shaft,	70	fathoms	deep.	All on one lode.
Richards „	60	„	„	
Bucket „	50	„	„	
Ellerys „	70	„	„	
Lobbys „	72	„	„	

Changing House is 80 feet long, 16 wide, and 16 feet walls. It has 10 windows in front wall, each 3½ feet square, and two good ventilators in the roof. A gallery runs all round it, about 8 feet high. The lower part for drying the clothes, with a tube heated by fire in sumphouse adjoining, and the upper part for the men to change in. About 100 underground men. The day core about 50.

The sumphouse is 16 feet square, and has 3 windows.

Dressing Floors are very well provided with sheds. There are between 60 and 70 dressers employed.

There are several small houses with fires in different parts of the floors for the dressers to dine in, as well as a large space in the calciner house.

Huel Gurlyn.

Bawden's Shaft, or engine shaft, is 70 fathoms below the adit, which is 10 fathoms deep. The mine is not being worked below the 40. It is 10 feet by 6. Footway. Ladders in 5 fathom lengths, with bases of 4½ feet.

From the adit, there are ladders through winzes to the 40, underlaying 2½ per fathom.

Whim Shaft.—Perpendicular to adit, then underlays at the rate of 2½ feet per fathom. Horse whim and kibble.

Whim Shaft on Rich's Lode is perpendicular to the adit, and then underlays as before to the 30. It is 6 feet by 4½.

Shaft on Fox's Lode is a perpendicular shaft 30 fathoms below adit.

A ladder way to adit on this shaft, and then through winzes.

There are 64 tributers, and 25 tutworkers, all of whom change over the boilers.

Dressing Floors.—On the tin floors, 13 dressers at work, and none under sheds. On Guskin's floors 24 employed, 8 of whom are under cover. There is no special house appropriated for dining, &c., but the females use the smith's shop.

West Stray Park.

Until a short time ago, the men changed over the boilers, but as the mine became deeper, and the engine required to be worked with a higher pressure steam, it was determined that a dry and changing house should be built. This is done by the side of and communicating with the boiler house. The house is 32 feet long by 14 wide; has a wooden floor, and a trough of warm water for the men to wash in. There were about 40 suits of clothes hanging in his house. The men dry their clothes over the boilers.

Shafts.—Only one shaft, which is 130 fathoms deep, underlaying 3 feet in a fathom. The ventilation is produced by adit and winzes.

Floors very well furnished with sheds. About 50 dressers at work.

Huel Agar.

Engine Shaft is 100 fathoms below adit, which is 23 fathoms deep. It underlays from adit at the rate of 3 feet per fathom. It is 12 feet by 6. Winding by 2 skips. Footway. Ladders in perpendicular position in 4 fathom lengths with 4 feet base, in underlaying part 20 fathom lengths.

There is a special footway perpendicular to the adit, then through winzes to the 13, and then through the engine shaft.

In the western part of the mine there are 3 shafts open to the 90.

Changing House is 38 feet long by 18 wide and 10 feet wall. It has only one window and no roof ventilation. A part of this length partitioned off for pitman's, and sumpmen's house. The whole is heated by a fire and tube.

There are 60 persons employed underground.

Dressing Floors are well roofed in. About 20 dressers. They dine in the sampling house.

Great South Tolgus.

Engine Shaft is 140 fathoms deep, is perpendicular to the 60, and then underlays at the rate of 2½ feet per fathom. Winding by single skip. The shaft is 14 feet by 6. Footway to the 25. The ladders in 4 fathom lengths, with 4 feet base. Then through winzes.

Changing House is 50 feet long, 20 wide, and walls 16 feet high. There is a gallery around. The ground floor is of earth. There are 3 windows, with a sliding panel in each. It is warmed by a fire and pipe. It is supplied with warm water. About 100 men change here.

Dressing Floors.—Well provided with roofs. The dressers dine in the sampling house, which is 26 feet long by 12 wide; fire and 2 windows. There are 40 girls and boys at work.

Providence Mines.

Changing House.—A good stone building with slate roof, well lighted and ventilated, and kept thoroughly clean. It is 90 feet long by 20 feet broad. It has a wooden floor, and the men's lockers are neatly arranged around the room. The day clothes are hung over each man's locker.

It is warmed by a fire under a large tube of water, which runs the whole length of the house.

It is lighted by 6 windows made to open, and by 6 skylights placed in the roof. Besides these windows which open, 3 large ventilators are placed in the roof, and kept constantly open.

A long trough is laid in the floor, through which a stream of warm water is constantly flowing. This is one of the best changing houses in the county.

Boilers.—Stamps boilers. Manhole leaking very badly. Gauge cocks.

Whim boiler. Gauge cocks.

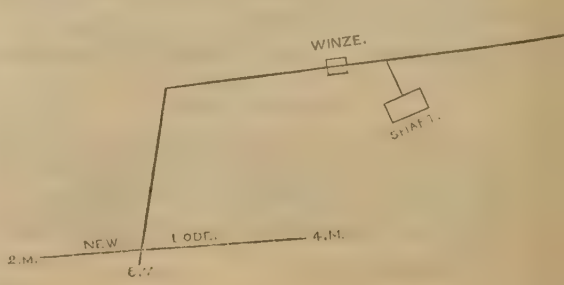
Stamps boiler. Safely weighted with bricks. Gauge cocks.

East Providence.

Boorman's Shaft, 12 feet long by 5 feet wide, is 70 fathoms deep. Used as pumping and winding shaft, underlays 3 feet per fathom.

70 fathom level now driving by 6 men, about 10 fathoms from Boorman's shaft.

60 fathom level, driven 18 fathom to new lode, which it has gone through, and is still driving by 6 men. The new lode is being driven east by 4 men and is 15 feet in, the western end is 6 feet in and being driven by 2 men. The winze by 6 men nearly through to the 70.



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40 fathoms level driving towards Wilson's shaft which is being sunk from surface by 6 men, and is 45 fathoms from Boorman's shaft.

30 fathoms level is driven from Boorman's to under Wilson's. A bore hole has just been made through.

The men change over the boiler in boiler house. The boiler has guage feed cocks, and is working at low pressure.

Polbreen Mine.

1. *Engine Shaft* is 32 fathoms below the adit (30). It is 9 by 6 feet. Perpendicular. Winding by kibbles and hemp rope. Ladder way. Ladders in 5 fathom lengths with 1 to 2½ feet base. Some are perpendicular.

2. *Dorcas Shaft*, 91 fathoms east of engine shaft. Perpendicular to the adit, and then underlays on the course f the lode to the 52, at the rate of 9 inches per fathom. Ladder way continuous from level to level. The shaft is 9 by 6 feet. Horse whim, kibble and rope.

All the dressing operations are under cover. A comfortable house provided for females to dine in.

No dry at present. The men change in boiler house. There is one being built adjoining the boiler house, 30 feet long, 12 wide, and 15 high, and which will be supplied with a cistern of warm water.

Penhall's Mine.

1. *Engine Shaft.*—It is down 40 fathoms below the adit (46). It is perpendicular for 50 fathoms below the surface, thence underlays at the rate of 2 feet per fathom. It is 12 by 5 feet. Horse whim and kibble employed for winding.

Footway.—Ladders in 4 fathoms lengths, underlaying in perpendicular part, 9 to 10 inches per fathom. The staves 10 inches apart. It is 60 fathoms from the changing house.

2. *Western Shaft.*—70 fathoms deep from surface. It is 6 by 4 feet. Horse whim and kibble.

The men change in boiler house, but a new dry is being built.

Report on Devonshire Mines. By C. Twite, Esq.

Bedford Hotel, Tavistock,
25th May 1863.

My Lord,

In obedience with your instructions we have visited the mines in the neighbourhood of Tavistock and Ashburton, and beg herewith to submit our report upon the same.

We are, my Lord,
Your Lordships obedient servants,
Chs. Twite.
W. H. Rowe.

The Rt. Hon. Lord Kinnaird, K.T.
Chairman, Royal Mines Commission, 1862.

THE DEVONSHIRE GREAT CONSOLIDATED MINES.

These mines, the largest and richest copper mines of England, are situated about four miles west of Tavistock. They consist of five largely developed mines, giving a series of workings on one large main lode of nearly two miles in length, and all communicating one with the other, and a tract of new ground nearly a mile in length, which is now being opened out.

The Company is formed upon the old joint stock system. The Chairman of the Company is Mr. W. A. Thomas, of Threadneedle Street, London; Mr. Thomas Morris, of Tavistock, is the resident director; and Captain James Richards the managing agent, with Captain Isaac Richards, principal dressing agent.

The mines taken in order from the west are :—

1. Huel Maria	- -	120 fathoms long.
2. Huel Fanny	- -	285 „
3. Huel Anna Maria	- -	197 „
4. Huel Josiah	- -	367 „
5. Huel Emma	- - -	417 „

The number of persons employed during month of April were as follows :—

Underground :—	Agents - - -	10	
	Pit and timber men -	11	
	Tutwork men - -	334	
	Tributers - -	13	
	Trammers, fillers, and landers - - -	79	
	Laborers - -	7	
	Boys - - -	19	
			473
Surface :—	Agents and engineer -	9	
	Smiths - - -	20	
	Carpenters and sawyers -	18	
	Masons - - -	13	
	Engine men - -	15	
	Laborers - -	128	
	Foundry - - -	15	
	Railway - - -	22	
			240
Dressing Pans :—	Men - - -	117	
	Boys - - -	181	
	Girls - - -	199	
			497
	Total - -		1210

Going through the workings of these mines from west to east, the principal points to be observed are as follows:—

I. Huel Maria Mine, the most westerly, has three shafts :—

1. *Castles Shaft*, 23 fathoms deep, is quite at the western extremity of the workings, and is kept open as a ventilating shaft. It is 9 × 5 feet.

2. *Gards Shaft* is 60 fathoms east of Castles shaft, and 100 fathoms deep; is 10 × 6 feet, and used for pumping and drawing.

3. *Morris' Shaft* is 60 fathoms east of Gards shaft, is down to the 100 fathom level, and is 10 × 6 feet in size.

These are all perpendicular shafts.

The only end driving in this mine is a cross-cut from the 23 fathom level, which is driven 20 fathoms from Morris Shaft. All the other workings are upon tutwork, this being the only part where tributers are employed.

II. Huel Fanny Mine is next going east. The workings here are 80 fathoms south of those in Huel Maria, the lode having been heaved that distance by the Great Cross Course, and extends for a length of 285 fathoms.

Huel Fanny is worked from 3 shafts.

1. *The Western Engine Shaft*, 90 fathoms east of Morris' shaft, is 12 × 8 feet in size, 135 fathoms deep, and used for pumping and drawing. It is perpendicular to the 18, and then underlays 2 feet in a fathom. The drawing is done in kibbles.

2. *The Eastern Engine Shaft*, 65 fathoms east. The last one is down to the 80—15 perpendicular ; the rest on the course of the lode. It is 10 × 6 feet in size, and used for drawing.

3. *The Ventilating Shaft*, 65 fathoms east of the eastern shaft, is 65 fathoms deep, and 8 × 4 feet.

There are only two ends being driven in this mine :—

1. A cross cut from the 25 fathom level driven fathoms in from the main level. A good current of air would be circulating through the level, and air pipes are placed to carry the air in to the end.

2. A cross cut driven from the 55 to intersect a lode 10 fathoms south.

III.—Huel Anna Maria Mine extends 197 fathoms east of Huel Fanny to Agnes Shaft. It has two shafts.

1. *Engine Shaft*, 102 fathoms east of the boundary, is down 137 fathoms, 30 fathoms perpendicular, and 107 on the course of the lode. It is 12 × 7 feet in size, and used for pumping and drawing. The drawing is done by two skips, drawn by a 7-inch flat hemp rope.

2. *Field's Shaft*, 95 fathoms east of Engine Shaft, is down 154 fathoms, is 10 × 6 feet in size, drawing by a single skip.

The drivings in this mine are :—

1. *Jeffries' cross cut*, gone out from the 70, 50 fathoms west of Engine Shaft, driven 60 fathoms south by two men. Ventilated by air pipes.

2. *The 95 fathom level*, driven 90 fathoms west of Engine Shaft, and 20 fathoms from a winze. The back of this level has been taken away, so that the level is open.

3. *The 40 fathom level*, driven 100 fathoms west of Engine Shaft, and 15 fathoms beyond a winze. No backs opened. Southcomb's rise is going up about 3 fathoms east of this end.

4. *The* 80 *fathom level*, driven 47 fathoms west of Engine shaft, 18 fathoms from winze.

IV.—Huel Josiah Mine extends from Field's Shaft to Agnes Shaft, a distance of 367 fathoms. This part is worked deeper than any of the others. It is worked by 3 shafts.

1. *Richards' Shaft*, 100 fathoms east of Field's Shaft, is now sinking below the 212, by 9 men. It is perpendicular to the 40, then on the course of the lode. Engine and drawing shaft. Kibbles are used here, drawn by 6-inch flat ropes.

2. *Hitchen's Shaft*, 67 fathoms east of Richards', is 170 fathoms deep. Is 12 × 6 feet in size. Used for pumping and drawing. Kibble, and 6-inch flat rope.

3. *Agnes' Shaft*, 200 fathoms east of Hitchen's.

(*a.*) *Old Shaft* to be 103, open for ventilation and ladder way.

(*b.*) *New Shaft* to be 184, perpendicular to the 115, and then underlays 2 feet per fathom. Engine and drawing shafts, 12 × 7 feet in size, 2 kibbles, and 4-inch flat ropes.

The drivings are more numerous in this part.

1. *Drivings from Field's Shaft* :—

(1.) *The* 130 fathom level is driving on the south lode, and is 40 fathoms east of the shaft, and 15 fathoms beyond a rise. Driving by 4 men.

(2.) *The* 115 *fathom level* is driving 70 fathoms east of the shaft, and is 5 fathoms beyond a rise. Driving by 4 men.

(3.) *The* 103 *fathom level* is driving 90 fathoms east of the shaft, and is 25 fathoms beyond a rise. A winze is coming down from the 90 just upon this end.

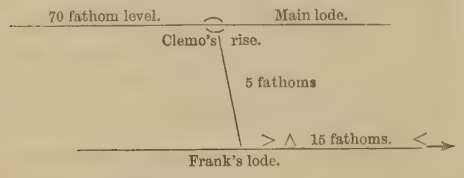
(4.) *The* 90 *fathom level* is driving 100 fathoms east of shaft, and is 20 fathoms beyond a rise. A winze is going down to the 103, about 8 fathoms behind this end, sinking by 4 men, and 4 men are now put to rise against it.

(5.) *The* 80 *fathom level* is driving 150 fathoms east of shaft, and is 10 fathoms beyond a rise.

(6.) *The* 70 *fathom level* is 45 fathoms east of shaft, and 35 fathoms beyond a rise.

(7.) *The* 60 *fathom level* is driving 45 fathoms east of shaft, and 12 fathoms beyond a rise.

8.) In the 70 fathom level, 60 fathoms east of shaft, a cross cut 5 fathoms long is driven south to Frank's lode, and a level driven east 15 fathoms on this lode. Clemo's rise from the 80 is just at the mouth of the cross cut.



2. *Drivings from Richards' Shaft* :—

(1.) 212 *fathoms level*, driven east 20 fathoms. It is now stopped in consequence of the high temperature (90° F.) of the end, until a winze is brought down.

(2.) 158 *fathoms level*. A rise going up from the back of the level, 4 fathoms west of the shaft, to meet a winze coming down from the 144.

(3.) 144 *fathoms level*, driven 50 fathoms west. It only requires driving 1 or 2 fathoms to communicate with the 114 east of Field's Shaft.

(4.) 90 *fathoms level*. James' cross cut gone out 5 fathoms west of Richards' Shaft a length of 25 fathoms to the south lode. When the cross cut is through the south lode, a rise will be put up.

If the 212 level turns out well, it is proposed to sink a perpendicular shaft to that depth, and to put in a man-engine.

A very powerful double piston air-machine is now being made, which will be placed in Richards' Shaft under the 144, and be worked by the pumping rods, to ventilate these deep workings.

3. *Drivings from Hitchen's Shaft upon South Lode* :—

(1.) 70 *fathom level*. Wilkin's cross cut gone out 3 fathoms east of the shaft, a length of 35 fathoms to the south lode, upon which a level is driving east 35 fathoms. Daniel's rise is 35 fathoms west of the mouth of cross cut.

(2.) 60 *fathom level*. The cross course cross cut is gone out rom the level 35 fathoms east of the shaft, a length of 30 fathoms to the south lode, upon which a level is driving, 20 fathoms east and 70 fathoms west, on the course of the lode. The latter end is 8 fathoms from a rise, and there is a winze sinking close to the end.

The cross cut is continued south, 95 fathoms.

(3.) 50 *fathom level*. Trevenas cross cut is gone out from the level at a distance of 35 fathoms east of the shaft, for a length of 25 fathoms to the south lode. A level is driving from it on the course of the lode, 25 fathoms east and 75 fathoms west. The western end is 10 fathoms beyond a rise.

Trevanas cross cut is continued north of the main lode, under the name of Hawk's cross cut, a distance of 25 fathoms, where it cuts a north part of the main lode. A level is driving east upon it, and is about 10 fathoms in.

(4.) 40 *fathom level*. Bennett's cross cut is gone out 37 fathoms east of the shaft, and cuts the south lode at a distance of 22 fathoms. A level is driving upon the lode 18 fathoms east and 55 fathoms west. Western end is just communicated with the 50 by means of Broad's rise.

(5.) 30 *fathom level*, is worked by Burrow's rise from the 40, which is 5 fathoms west of Bennet's cross cut. Driving west from rise 25 fathoms.

(6.) 80 *fathom level*. Steven's cross cut is gone out 65 fathoms east of the shaft, a length of 30 fathoms to the south lode, on which a level is driving 8 fathoms west.

4. *Drivings from Agnes' Shaft* on main lode :—

(1.) 157 *fathom level*, driving east, 70 fathoms from shaft. A rise open close to the end.

(2.) 144 *fathoms level*, driving east, 80 fathoms from shaft. End a few fathoms beyond a rise.

(3.) 130 *fathom level*, driving east, 125 fathoms from shaft. End 35 fathoms beyond a rise. The ground here is very soft in its character, not requiring any powder. A rise is going up from this end, which will communicate with the 124 in Huel Emma, the next mine east.

V.—Huel Emma Mine extends from Agnes' Shaft in an easterly direction to the road, which was formerly the boundary of the sett, a distance of 417 fathoms on the course of the lode.

In this mine there are two principal shafts,—the Incline Shaft, and Thomas's Shaft.

1. *Incline Shaft* is on the course of the lode, and is down 8 fathoms below the 162, inclining 2 feet in a fathom from surface. It is situated 200 fathoms east of Agnes' Shaft, and the ground rises 20 fathoms above the level of Agnes' Shaft. It is 14 × 7 feet in size. C is used as a pumping and drawing shaft. The drawing is done over a double skip road, the skips being drawn by wire rope over timber guides.

2. *Thomas's Shaft* is 102 fathoms east of the incline shaft, and 20 fathoms above its level. It is perpendicular to the 50, and then on the curve of the lode to the 145. It is 12 × 7 feet large, and used as a pumping and engine shaft, drawing by kibbles and chains.

Drivings from Incline Shaft:—

(1.) 162 *fathom level*, driving 25 fathoms east.

(2.) 150 *fathom level*, 40 fathoms east and 40 fathoms west, without any winzes or rises.

(3.) 137 *fathom level*, is driven 80 fathoms east, but is now stopped, and driving west 75 fathoms from shaft, and 43 fathoms from Chenoweth's rise.

(4.) 124 *fathom level*, is driving west 70 fathoms from shaft. Is now on the point of communicating with 130 east from Agnes' Shaft.

(5.) 50 *fathom level*, driving 5 fathoms west from shaft.

(6.) 47 *fathom level*. Parsons' cross cut gone out from plat 25 fathoms south.

(7.) 50 *fathom level*. Barkel's cross cut gone out 55 fathoms west from shaft, and 50 fathoms south.

Drivings from Thomas's Shaft:—

(1.) *Sinking the shaft* below the 145 by 6 men.

(2.) 130 *fathom level*, driving east 85 fathoms, with a rise close to the end.

(3.) 60 *fathom level*, is driven 110 fathoms east of the shaft to the boundary, and then continued 167 fathoms to Stephen's rise, which communicates with a shallow adit level, and then is driven 10 fathoms further east.

(4.) 30 *fathom level*. A cross cut is gone out from the shaft 10 fathoms long, from which a level is driving 50 fathoms west and 115 fathoms east. The cross cut is also driving south 25 fathoms by two men.

(5.) 20 *fathom level*, is driving from Water's rise, which comes up from the 60, and is 25 fathoms west of it, driving by two men.

VI.—Eastern Ground. This ground has recently been included in the company's set, and extends from the old boundary for a length of 900 fathoms east on the course of the lode.

At a distance of 660 fathoms east of the old boundary a cross cut was commenced from the adjoining valley, which cut the lode 25 fathoms south. Driving was continued on the course of the lode for 110 fathoms, when a cross course was met with; through which a cross cut was driven 25 fathoms long, and the lode again met with, and followed upon. This level is 100 fathoms in serving as an adit, and is still driving. Several air shafts have been opened from the surface to ventilate these workings, and there is one now open within 20 fathoms of the end.

The men pay monthly the sum of 9*d.* to the mine doctor, and 6*d.* towards the club fund. For this the man and family are provided with medical attendance (midwifery excepted), and the man when ill receives 4*s.* a week. In case of accident an additional allowance of 5*s.* a week is paid from the mine.

During illness a regular system of visiting the men by the agents prevails, and the agents have power to give donations of money where it is needed.

In cases of accidents, in addition to the 9*s.* allowed weekly, the injured man is provided with coals, candles, and a nurse if one is needed.

When a death occurs, all the funeral expenses are paid by the mine.

A school is held on the mines for all the children of the men on the mine under 10 years of age. The charge per child is one penny per week.

Surface Arrangements.

Huel Josiah.

Drying and Changing House.—A stone building, 81 fee long and 15 wide. Lighted and ventilated from the roof The floor is of stone, but there are wooden platforms around for the men to stand upon when changing. Wooden pegs are placed around these walls for the men's clothes. The house is warmed by a fire, communicating with a tube, which runs lengthways through the middle of the house. Two men are employed to attend to this house, keeping it clean, and drying the clothes.

The men are not allowed to keep their hutches in this house, another being provided for the purpose, into which no lighted candle is admitted, it being lighted by a lamp outside the window to avoid the risk of explosion.

Other houses provided for the lamp-men and watchmen.

Huel Anna Maria.

Another large drying and changing house for the men on this part, 42 feet long and 24 feet wide, lighted and ventilated from the roof.

Instead of placing the pegs for the men's clothes around the walls, as is generally the case, they are here placed in lines across the house.

In none of the changing houses is there any provision made for the men washing themselves.

Dressing Floors. Are well provided with sheds, nearly all the hands employed being under cover.

A large house is specially devoted for the dressers to dine in. This is furnished with tables and seats, a large oven for warming dinners, and a boiler for water for making tea or coffee.

CRELAKE MINE.

Situated in the town of Tavistock, near the railway station, under the management of Captain Wm. Skewis.

There are two sets of workings, one upon the copper lodes, the other upon the lead lode, and these do not communicate. Examined the workings upon the lead lode.

Bedford Shaft. Is perpendicular, and 52 fathoms deep. It is 12 feet long and 7 wide, and used for pumping and drawing. The footway is also in this shaft. The stuff is drawn up in kibbles by chains $\frac{3}{4}$″ diameter. Besides this shaft, which is the main working shaft in this part of the mine, there is another opened to the 26 fathom level for the purpose of ventilation, and called the Ventilation Shaft. It is about 100 fathoms south of Bedford Shaft. A rise is being prosecuted from the 40 fathom level to the 24, which will communicate with this shaft, and so continue it to this depth. The size of this shaft is 6 feet long by 3½ feet wide.

Visited the following places:—

1. The 52 fathom level, the north end. Two men driving 24 fathoms beyond a rise. Sample No. 4.

2. About 15 fathoms north of shaft at the 52 fathom level is a rise, now nearly holed to the 40 fathom level. This rise is in communication with another, 5 fathoms south, which serves as a pass, and for ventilation, the current coming up the first, which is the roadway, 2·6 long. 2 feet wide, and supported with timber. Temperature of air 68°. Tube, 5 of air.

3. 40 end; driving south; 4 men; 96 fathoms from shaft. Ventilated by a fall of water in the shaft, the top of which is a few fathoms below the 24. Zinc pipes, 2½ in. diameter towards the end, and 4 ins. outside. Level, 7 by 4 feet. Temperature of air, 66. Blast at end of pipes very weak. Tube, 6.

4. 24 south on No. 5 lode, 80 fathoms south of shaft; 4 men in a rise; 13 fathoms above level; ladder way up one end; ground insecure, falling stuff having broken the ladder stones considerably; no platforms, and the stairs wood.

5. Sample No. 8, was taken from the end of the 24 fathom level on No. 5 lode, worked by 2 men, and now 16 to 20 fathoms beyond a winze.

6. Samples No. 9, taken respectively from the top of a rise in the back of the 12 fathom level, going south on No. 1 lead lode. The rise was 4 fathoms high, without any current of air passing through it. Two men.

7. Samples No. 10, from the end of the 12 fathom level, going south from Ventilation Shaft about 4 fathoms beyond this shaft.

The footway used by the men is in the Engine Shaft. The ladders are about 5 fathom lengths, with a base of about 3 feet.

There is a complete casing between the engine and their shafts; and at each sollar on which the ladders rest, a guard about 5 feet high is placed to prevent the men falling off.

The levels were generally well timbered. The nature of the ground is such that it requires a great deal of timbering, and in some places it is giving way.

There is a very commodious changing house on the mine, which only requires a roof ventilation, wooden floor and a stream of water for washing purposes, to make it all that is desirable for such a purpose.

The stoves are well provided with sheds.

DEVON HUEL UNION MINE.

This mine is situated about two miles N.E. of Tavistock, and is under the management of Capt. T. Williams, of Huel Friendship. It is divided into 12,000 shares with limited liability.

The workings are confined to exploring the north lode.

The Engine Shaft is down to the 50 fathom level, underlaying north from about 3 feet to 3 ft. 6″ per fathom. It is 14 ft. long and 7 ft. wide. It is divided by wooden casing, and serves as an engine and drawing shaft, the engine part being 11 × 7 ft. with 19-inch and 12-inch pit work side by side, and a ladder way. The drawing is done by kibbles. The pumping and drawing is effected by a water wheel 40 ft. high and 10 ft. breast.

Ventilation Shaft is another shaft sunk to the 15 fathom level, about 37 fathoms east of the Engine Shaft, used, as its name implies, for the purpose of ventilation. It is 10 ft. long and 6 ft. wide. The 10 fathom level and the 15 fathom level are driven from shaft to shaft.

There are 3 pairs of men working—

1. A pair of 2 men driving the 28 fathom level east. The end is 30 fathoms from shaft.

2. A pair of 4 men driving the 40 fathom east. The end is 20 fathoms from shaft.

3. A pair of 8 men sinking the Engine Shaft.

The South Lode has been opened upon by Quick's Shaft, which lies about 80 fms. S.E. of the engine shaft, but the workings here are now suspended.

There is a house 20 ft. long, 12 ft. wide, and 10 ft. high, provided with a fire which heads a boiler for the men to change in, but it is dirty and badly ventilated. The men pay 8*d.* per lb. for candles, and 7*d.* per lb. for powder. The sum of 1*s.* 6*d.* per man is deducted monthly for doctor and club. For this the man and family is attended by the doctor, and the man receives sick pay as well as hurt pay.

HUEL FRIENDSHIP.

Is a very large copper mine about 4 miles N.E. of Tavistock, worked under the management of Messrs. Taylor and Sons. The resident agents are Capt. L. Williams, Capts. Bennetts, Pearce, and Kent. It has been under the present management more than 60 years; and as the workings have been actively prosecuted on 16 different lodes besides numerous branches during this period, and as these workings are all communicated by means of shafts, levels, and cross cuts, all of which are kept open for ventilation and for carrying on the necessary operations of the mine, the quantity of ground opened out, and the length of levels kept open, is very great.

The number of persons employed during the month of April were as follows :—

Resident agents	6
Engineer	1
Assistant Engineers	3
Carpenters	2
Sawyers	2
Smiths	7
Superannuated smiths	1
Pitman and binder	2
Machine men	2
Dry men	4
Cart men	2
Fillers and landers	4
Trammers	9
Tributers	14
Do. boys	19
Halvanners man	1
Do. boys	5
Do. girls	1
Tutwork men	66
Do. boys	31
On dressing floors, men	15
Do. boys	34
Do. girls	58
Total	289

The mine is worked from the following shafts :—

1. *Taylor's Shaft*, on the main lode to the 2,400 is perpendicular to the 90, and then underlays 5 feet in a fathom.

2. *Curtis Shaft*, on the main lode 90 fathoms south-east of Taylor's Shaft; is perpendicular to the 40, and then on the course of the lode to the 170.

3. *Pearce's Shaft*, on the main lode 30 fathoms south-east of Curtis' Shaft; is perpendicular to the 40, and then on the course of the lode to the 150.

4. *Old Sump Shaft* is sunk upon the main lode 45 fathoms east of Pearce's Shaft; is perpendicular to the 26, it is then carried on the main lode to the 190; it cuts Sprague's lode at the 200, and is continued on this lode to the 220.

5. *Buller's Engine Shaft* is also on the main lode 70 fathoms north-east of the Old Sump Shaft. It is perpendicular to the 90, is then carried on the course of the lode to the 190, and is then perpendicular to the 220.

Connected with the main lode there are also two inclined shafts, both of which are open, but only one used.

New Inclined Shaft is sunk from the surface about 40 fathoms south-east of Taylor's Shaft, at an angle of 45°, and cuts the 200 fathom level a little to the west of Taylor's. Its length is 267 fathoms. This inclined shaft is 7½ feet long and 5 feet wide. A single waggon road of the ordinary bridge rails. The waggon is 6 feet long, 2 feet deep, and 2 feet 3 inches wide, and holds about a ton of stuff. It runs on 4 wheels, 2 of which are 1½ feet diameter, and the others are 2 feet. It is drawn by iron chain and water wheel. An iron bar one end, which is hinged to the under back part of the waggon, with the other end trailing on the road, forms a very good break to prevent the waggon running down the shaft in case the chain should break.

The men are not allowed to ride in this waggon.

6. *Brenton's Shaft* is 127 fathoms east of Buller's; is perpendicular to the adit, which is 35 fathoms deep in this part, and then is sunk on the course of the lode to the 150.

7. *Brenton's Incline*, 30 fathoms south-east of Brenton's Shaft, is sunk to the 100 at an angle of 40°.

8. *Kent's Shaft*, on Kent's Lode, 180 fathoms south-east of Brenton's, is 112 fathoms deep.

There are several shafts down to the shallow levels, and there is a new one now sinking 117 fathoms south of Kent's.

The operations now going on are various drivings, as follows, taken from setting book for April:—

1. A pair of 6 men and 2 boys, working in 4 shifts of 6 hours each, driving the 230 fathom level east. The end is 23 fathoms beyond a rise.

2. A pair of 6 men sinking a winze under the 220. They are in 35 fathoms from a rise.

3. A pair of 6 men driving the 150 fathom level east. This end is carried 160 fathoms, and is ventilated by an air pipe communicating with a water-fall. The water falls from the 100 fathom level into a funnel-shaped pipe leading into a cistern, where it strikes upon a board, scattering itself in spray. The air brought down by the water and thus liberated is conveyed by the pipes to the men.

4. A pair of 3 men and 3 boys driving a cross cut north of the 128. The level is in 48 fathoms from a rise, and the cross cut is driven 10 fathoms north. This place is ventilated by a similar water-fall to the last.

5. Driving the 100 fathom level by 3 men and 3 boys east of Brenton's Incline.

6. A pair of 3 men and 3 boys, driving the 100 fathoms level west of Dunn's winze, and in 6 fathoms from winze.

7. 3 men and 3 boys driving each of Dunn's winze, and 6 fathoms in from it.

8. A pair of 6 men sinking a winze under the 80, and 25 fathoms beyond a rise.

9. 4 men and 2 boys driving the 80 fathom level east, about 7 fathoms beyond a rise.

10. 2 men driving a cross cut south from the 80 fathom level, 10 fathoms in from the level, and 13 from a rise.

11. 4 men driving the 70 fathom level east of Crew's cross cut, 12 fathoms in.

12. 3 men and 3 boys driving 100 fathoms level east on the New Lode, 37 fathoms from rise.

13. 4 men sinking new shaft, 2 fathoms deep.

14. 2 men driving adit, west on New Lode. This is 117 fathoms from shaft. It is supplied with air by means of pipes carried along the level, near to the shaft; the level is then closed by a trap door, and the area of the airway being thus contracted, a greater rapidity is given to the current, and the air in the end is put into motion. An air fan is also in communication with these pipes, to be used when required.

15. A man and a boy driving adit east on New Lode; 130 fathoms from ventilation.

All the other men are engaged in taking away ground previously opened, mostly upon tribute.

There is a very large drying and changing house upon the mine. It is 52 feet long, 30 wide. It has a wooden floor, which is kept clean. It is deficient in ventilation and light, and would be much improved by being lime-washed.

There is a fire and boiler for warming and drying the house and clothes. There is also a trough of water for the men to wash in, but as it is stagnant it soon becomes very dirty.

The dressing floors are well provided with shedding.

The mine has a code of general laws, a copy of which is appended. These laws are suspended before the office every settling day.

The men pay 9*d.* a month per man to the doctor, and 9*d.* a month to the club. This club is a sick club only, the men receiving 15*s.* a month while sick. In case of accidents the mine allows those injured 1*l.* per month.

The sick fund is in arrears, but the debit account is charged monthly to the adventurers. The loss for the three last months being for February, 3*l.* 3*s.* 10*d*; January, 3*l.* 2*s.* 6*d.*; and for December, 2*l.* 11*s.* 8*d.*; total loss, 8*l.* 18*s.*

Besides this charge on the mine there are several blind men receiving pensions from the adventurers.

The men are paid monthly, but there is also a regular intermediate advance pay, when every man working on the mine receives a portion of his month's earnings.

WHEAL FRIENDSHIP.

150 east of "Brenton's plane;" driving east of cross-cut on New South Lode; 4-inch air pipes, length 170 fathoms; water fall 14 fathoms high; no perceptible draught at end of pipes, which are 6 fathoms from end. 6 men (2 every 8 hours) work here, but have been employed otherwise for a week. Temperature, 60; of water, 53. Level, 7 feet by 4 feet.

128 east of Brenton's; cross-cut driving north by 3 men and 3 boys (1 man and 1 boy every 8 hours). 100 fathoms air pipes, from a water fall. Temperature, 66. Barometer, 29.88. Tube, "21." About 50 fathoms from this end is a winze to the 150, where the draught is strong.

Cross-cut; driving south, by 3 men and 3 boys, at 100 fathoms level, 100 fathoms east of Brenton's shaft, and 50 fathoms from "Plane" and draught. Temperature, 66. Tube, 22.

100 east on New South Lode; driving by 3 men and 3 boys, 40 fathoms from a trap door, from which are air boxes to about 10 fathoms from the end; current at end of pipes pretty good. Temperature, 60. Ground wet. Temperature of water, 53. Tube, "23."

70 end east, 100 fathoms from Brenton's plane; 4 men (2 shifts); 20 fathoms from draught winze to 80. Temperature, 61. Tube, 24.

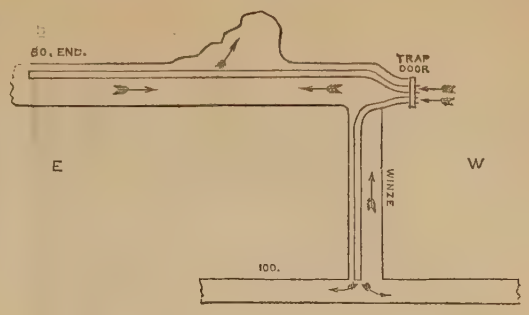
80 end east; driving by 3 men and 3 boys, three 8 hour

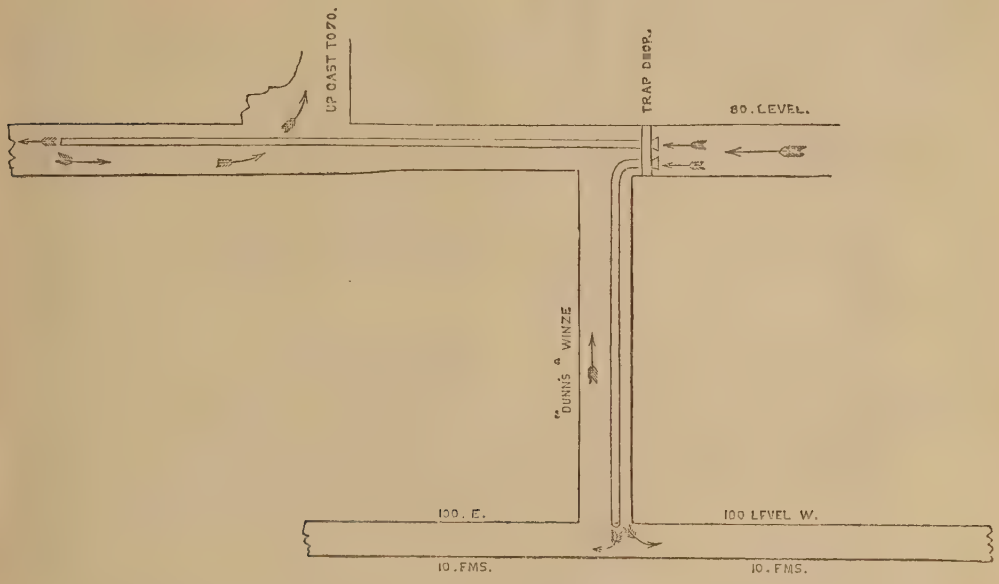
shifts. 40 fathoms from a winze from 70, and 30 fathoms from a trap door. Temperature, 65. Tube, "25."

80 cross-cut east, 12 fathoms from current. 2 men. Temperature, 65. Tube, 26.

100 west of and 10 fathoms from Dunn's winze, per sketch. Driving by 3 men and 3 boys. Temperature, 66. Tube, "27."

100 east. Driving by 3 men and 3 boys. Temperature, 66. 9½ fathoms from winze. Tube, "28." The ladder way to this part of the mine is through the "engine pump" on the dip of the lode, and alongside the pumps; sollars about every 10 fathoms; iron staves; and the footways generally are easy and safe.





SORTRIDGE CONSOLS.

About 4 miles south-west of Tavistock; is a copper mine, under the management of Captain James Richards.

It is 110 fathoms deep, but at the present time there are no men working at a greater depth than 50 fathoms.

The workings are upon a copper lode and two tin lodes, and extend a length of about 230 fathoms. In this length there are 4 shafts opened to the 50.

Visited :—

1. 30 fathom level on the tin lode. 2 men driving. Sample No. 11.

2. 40 fathom level. End going west on tin lode. 4 men. This end is 40 fathoms from eastern shaft, with air pipes communicating with an air fan, which was not at work. Sample No. 12.

3. From the western end of the 40 on tin lode. 4 men. No. 13.

4. From the western end of No. 2 tin lode, which is 60 fathoms south of No. 1 tin lode, here at the 40, and reached by a cross cut of this length. The lode has been worked upon a distance of 50 fathoms, and 4 men now driving. Sample No. 14.

A rise is up to this level from the 50, but the level requires to be driven about 8 fathoms to cut it.

5. Sample No. 15, from the cross cut, going north from eastern shaft at the 50 fathom level. 4 men.

6. Sample No. 16, taken from western end of the 50 fathom level on No. 2 tin lode. The length of cross cut from the eastern shaft to this lode is 60 fathoms, and the lode has been worked a length of 55 fathoms. The end is 16 fathoms beyond a rise, which is gone up to cut the 40 fathom level, but which requires driving in order to cut it.

7. Samples 17, from the 50 fathom level, west of ventilating shaft on copper lode; the end is 70 fathoms beyond the shaft without any rise or wings. Doors are placed a little east of the shaft to prevent the air going away to the eastern part of the mine.

The ladder ways are in the engine shaft, about 5 fathoms long, with 3 feet base. Stories, 4 inches apart.

EAST GUNNISLAKE AND SOUTH BEDFORD.

This mine is situated south of the Bedford United Mine, and is worked under the management of W. G. Gard, Esq., the resident agent being Capt. J. Phillips.

From the accompanying section it will be seen that there are four shafts.

Commencing st the western point there is,—

1. *Gullett's Shaft*, down to 55 fathom level, now only a ventilation shaft.

2. *Red Whim Shaft*, 50 fathoms east of Gullett's Shaft, down below the 75. Is 10 feet long by 6 feet wide.

3. *Engine Shaft*, 70 fathoms east of Red Whim Shaft, is down below the 62. Is the same size as the last. Used as engine and drawing shaft.

4. *Gard's Shaft*, 160 fathoms east of engine shaft, is now sinking below the 12, by 8 men. Is 11 feet long by 6½ broad. Used as engine and horse whim shaft.

East of Gard's Shaft the deep adit is driving east by 4 men, and is in 16 fathoms from the shaft. The 12 fathom level is also driving east by 4 men, and is in 7 fathoms from shaft.

The 36 fathom level is being driven from the engine shaft towards and now nearly under Gard's Shaft. Air is supplied to this end by a piston and cylinder worked by the main rod in the engine shaft; diameter of cylinder 18 inches, stroke 8 feet. The machine is double-acting, and forces a steady current of air through 4-inch zinc pipes to the 36 end, a distance of 156 fathoms. About half way from the shaft to the end is a rise to a 24 fathom level, driven east of engine shaft, a strong current of air passing up from this winze from engine shaft.

Places visited. Barometer at surface, 30·18.

"36" *end*; barometer, 30·40; temperature, 68; (tube 29)

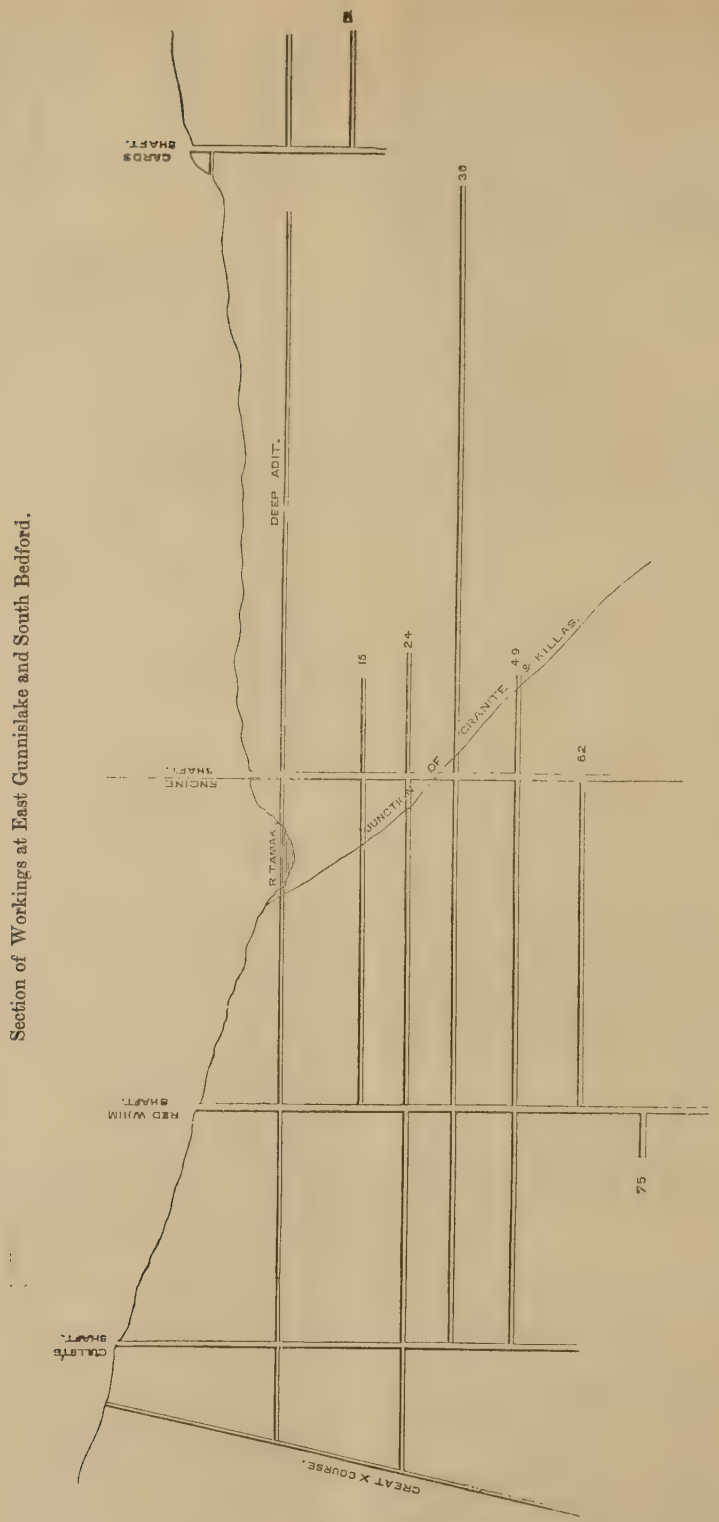
Garde's Shaft, bottom; barometer, 30·28; temperature, 64; of water from lode, 60; (tube 30).

Twelve fathom level, end; barometer, 30·34; temperature, 63; (tube 31).

Adit level end, north of Garde's; barometer, 30·20; temperature, 61; (tube 32).

The footway or ladder road in Garde's Shaft is only partly separated from the rest of the shaft. There are *rests*, but no proper sollors; and in order to get to the adit and 12 fathom level, it is necessary to crawl across the shaft on one's hands and knees over a couple of boards.

(*See woodcut next page.*)



Section of Workings at East Gunnislake and South Bedford.

HUEL EDWARD MINE.

This is a copper mine, having Mr. E. King as secretary, and Captain G. Rowe, as resident agent. The workings at this mine have been upon two parallel lodes about 50 fathoms apart, both underlaying north about 2½ feet per fathom. At the present time the workings upon the north lode are abandoned. Upon the south lode there are two shafts.

1. *Engine Shaft.* Is 98 fathoms deep from surface. Is 14 × 8 feet. Used as engine and drawing shaft. Is perpendicular to the 50 and then on course of lode. The footway is in the engine shaft.

2. *Air Shaft.* Is 38 fathoms south-east of engine shaft, and is down 30 fathoms from surface. Its size is 12 feet long and 6 feet wide.

It is to be noticed that the adit, which is 50 fathoms deep, communicates with the workings on the north lode, upon which there is an engine shaft; and also with Huel Arthur and adjoining mine.

The tutwork operations are:—

(1.) *92 fathom level.* Driving west, and in 40 fathoms from engine shaft, without any rise. It is driving by 6 men, working in three shifts of 8 hours. Size of end, 7 × 4 feet.

(2.) 81 *fathom level.* Driving west; 70 fathoms from shaft. A rise to the 70 about 25 fathoms behind the end. 4 men.

(3.) 61 *fathom level.* Driving west 100 fathoms from shaft; 40 fathoms beyond a winze to the 70, and a rise to the 50.

(4.) 50 *fathom level* east. A cross-cut gone out 70 fathoms from the shaft, which after a course of 50 fathoms south cuts the New South or Phœnix lode. A pair of 6 men are driving east on this lode, and are in about 6 feet. Another pair of 6 men are rising in the back. At the mouth of the cross cut a rise comes up from the 60.

There are two pitches in the north part.

Visited the following places :—

1. The bottom of the engine shaft, now sinking by 9 men. Sample 36.
2. *The* 91 *fathom level.* Driven 40 fathoms west of the shaft; 6 men; without any rise. Ventilated by air pipes 5″ square, communicating with a water-fall in shaft. Men had just fired a hole. Sample 37.
3. *The* 81 *fathom level.* Driven 62 fathoms west of shaft, without any rise or winze. Sample 38. There were 10 men working between this end and the shaft.
4. *The* 71 *fathom level.* Driving west. A winze sinking to communicate with the 80. Sample 39.

There are 26 persons on the floors; and these are fairly provided with sheds, for the pickers. There are two engines and three boilers. The boilers are each provided with two gauge tops.

There is no changing house; the men change over the boilers. Boiler houses dark, close, and dirty.

The surface hands eat their dinners in the smith's shop, or even in the boiler houses. The general pay takes place every two months, with a subsist pay between. 1*s.* 6*d.* per man is deducted monthly for doctor and club. Of this 9*d.* goes to the doctor, who has to attend the man, and all the members of his family who are under age, and not working at the mine. The other 9*d.* goes to the sick club, which provide 4*s.* per week for each man when sick. In case of accident, the mine allows 5*s.* per week as hurt money, which, with the 4*s.* from the sick club, gives 9*s.* per week.

The price of candles is 8*d.* per. lb., and the price of powder the same.

HUEL ARTHUR MINE.

Adjoins Huel Edward, and has Mr. Dunford for Secretary, and Capt. Carpenter for resident agent.

Engine Shaft is 110 fathoms deep from surface, perpendicular to the 90, and then on the course of the lode underlaying north 4 feet in a fathom. It is 12 × 6 feet large, and used as an engine and drawing shaft. The drawing is by 2 kibbles, worked by a water wheel with chains.

The operations on the main lode are—

(1.) Driving east and west from the bottom of shaft. This is just starting.

(2.) 60 *fathom level.* Driving west on the lode, 110 fathoms in from shaft, 70 fathoms beyond a rise, but with a winze just coming down from the 50 over the end. There are 6 men driving the end, and 6 men sinking the winze.

(3.) 50 *fathom level.* A pair of 6 men stoping.

(4.) 50 *fathom level.* 100 fathoms west of shaft a rise communicates to the 40, and 15 fathoms west in the 40 a rise communicates to the 30, which is driving south, 18 fathoms, by 4 men, to cut the Great South Lode.

Besides the operations on the main lode some workings are being prosecuted on Edward's lode 32 fathoms north of main lode. These are reached from the adit, 110 fathoms west of the shaft, and which is 60 fathoms deep here, from which a cross cut is driven 43 fathoms north cutting Edward's lode, and a pair of men are now driving 10 fathoms east on the lode.

The 50 is also driving on this lode 32 fathoms east.

A pair of 6 men, rising from the 60 on this lode near the cross cut.

Between these two lodes another lode is being worked upon at the 50.

The surface hands consist of 10. The pickers under cover. Dine in smiths' shop or boiler house.

There are two boilers, each provided with gauge cocks. Men change over boilers. There is a capital large dry adjoining the boiler house, which, if cleared up, would make a very satisfactory changing house.

The men pay 9*d.* per month to doctor, and 9*d.* per month to the hurt club, from which in time of accident they receive 40*s.* per month. There is no sick club. The price of candles is 8*d.* and of powder 8*d.* per lb.

2. ASHBURTON DISTRICT.

Buckfastleigh.

Huel Emma. Copper mine near the village of Buckfastleigh, and about 5 miles from Ashburton.

It is under the management of Mr. Hy. Crease, of Totnes. The number of persons employed is 127.

It is worked from our main shaft, with two others kept open for ventilation.

1. *Engine Shaft.* Is down to the 80 fathom level, which is 100 fathoms deep from surface, carried on the course of the lode, which inclines or underlays 3½ feet per fathom. It is 9 feet long by 6 feet wide, used as a pumping and drawing shaft; the drawing is done by a single skip. The two parts of the shaft are separated by casing. Footway in the engine shaft. The ladders in 10 fathom lengths. Staves of iron and wood 10 inches apart.

2. *Whim Shaft.* Is about 80 fathoms west of the engine shaft, and down to 10 fathom level. It is 6 feet long by 4 feet wide, kept open for ventilation.

3. *Whim Shaft.* Is 40 fathoms west of the east shaft down to the 30 fathom level, and used only for ventilation.

The operations consist of driving the 58, 70, and 82 fathom levels, and taking away ground at the 30, 46, 58 and 70 fathom levels.

58 *fathom level.* Is driving east of engine shaft, being 90 fathoms distant from it. The end is 4 fathoms beyond a rise to the 40, and 15 tons beyond a winze. Driving by 4 men, working in 2 cores.

70 *fathom level.* Is driving east of engine shaft, and is 100 fathoms beyond it. The end is 25 fathoms beyond a winze to the 80, and 4 fathoms beyond a rise to 58. The end is driven by 2 men working these cores.

This level is also driving west of the shaft, and is carried a distance of 50 fathoms, without communicating with the other levels. A rise is now going up to the 58 close to the end. There are 4 men driving the end, and 2 men rising.

80 *fathom level.* End is 70 fathoms east of engine shaft, and 5 fathoms beyond a rise. Driving by 6 men in 3 cores,

All the ends are set to be driven; 7 feet high and 4 feet wide.

All the places at which the ground is being taken away is east of the engine shaft. Therefore men working will not be benefitted by the shafts to the west.

There are 2 pitches in the 30 fathom level.

„	3	„	„	46	„
„	4	„	„	58	„
„	3	„	„	70	„

with 2 men working on tribute in each.

The 46 and 58 fathom levels are driven into the adjoining mine. There is no steam engines on the mine, all the work being done by water power. There is no changing place specially provided; the men use the smith's shop.

The men pay 9*d.* per month to doctor, and 9*d.* per month to hurt club.

The price for candles 8*d.* per pound, and for powder 9*d.*

Brookwood Mine.

Is east of Huel Emma, being on the same lode, and is under the same management.

It is worked by one shaft; but the two bottom levels run into Huel Emma. The shaft is down 9 fathoms below the 42.

The workings consist of driving the 30 and 42 levels east, and in working 3 pitches in the back of the 30. The men change in smith's shop. The same charges for materials and doctor and club as in the last mine.

No steam engine.

There are two small mines just opening up in this district,—Brookwood Consols and East Brookwood; but nothing of any importance has been done at either as yet.

Smith's Wood.—A small mine, just being opened. There is a shaft being sunk by 9 men, which is down 27 fathoms. It is 11 × 7 feet. A level has been driven about 10 fathoms west from the shaft.

Bag Tor.—Another small mine now opening. They are sinking a shaft, which is down 10 fathoms from surface; there are 9 men sinking it. A level has been driven from surface for 40 fathoms, but is now abandoned.

There are 7 people on the floors, all underground.

Hay Tor.—Another little mine, with 2 men working.

These mines are under the management of Captain Hoskings, of Ashburton.

Atlas Mines.

These are tin mines, but on a small scale. There are two shafts, one 20 fathoms deep, the other 35.

The work consists of sinking a winze in the 25 fathoms level, 16 fathoms east of the shaft, by 9 men working in 3 cores; it is 6 fathoms down. Of driving the 35 fathoms

level east by 6 men, and west by 6 men; each of these ends 2 fathoms in. There are also 4 men stoping in the back of the 35.

These men all change over the boilers.

The surface pair consists of 12, all under cover.

The secretary is Mr. G. F. Goodman, 7, George Yard, Lombard Street, London; and the manager is Capt. Warren, on the mine.

Yarner Mine.

This mine is a copper mine, under the management of Capt. R. Barkle, of Bovey Tracey.

1. *Engine shaft*, on the S. lode, is a perpendicular shaft, 46 fathoms deep, 11½ ft. long, and 6 wide. Engine; and drawing by kibble. Footway in engine shaft, and cased off from drawing. The ladders are in 4 fathom lengths, with a base of 4 ft.

2. *Air Shaft*. About 20 fathoms east down to the 20. Is 6 ft. long by 4 wide.

The operations consist of driving the 40 fathom level east by 4 men, who are about 11 fathoms from the shaft; and of driving the same level west by 4 men, who are 34 fathoms from shaft, and 7 fathoms beyond a rise to the 30. Besides these there are 25 men working on tutwork, taking down ground already opened out.

The men change in smith's shop.

The men pay 9*d*. per month to a sick club, receiving 3*s*. 6*d*. per week when invalided, and 9*d*. per month to doctor. There is no hurt club. The price paid by the men for candles and powder is 8*d*. per lb.

South Exmouth.

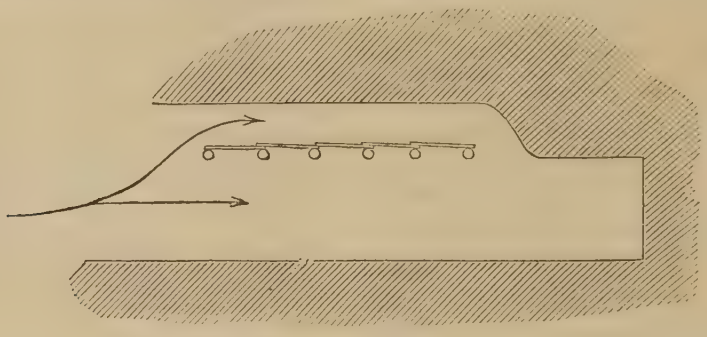
Is a lead mine, under the management of Capt. J. P. Nicholls.

The workings are upon two lodes, which are worked from cross cuts from a perpendicular engine shaft.

Westcomb's Engine Shaft, 60 fathoms deep, 11½ feet long. by 6½ wide. Pumping and drawing. 2 skips and flat hemp ropes. Footway in engine shaft. Ladders, lengths of 4 fathoms, with base of 4 ft. Staves, 11 inches apart.

45 *fathom level*. Driving S. on east lode by 4 men. About 27 fathoms from shaft. No rise or winze.

30 *fathom level south*, on west lode. Driving by 4 men. Ventilated by James's Shaft, which is 30 fathoms behind. A winze is sinking to cut the level below, about 20 fathoms behind this end.



45 *fathom level south*, on west lode. Driving by 6 men to cut the winze coming down from the level about . The end is 65 fathoms from air shaft, and 24 fathoms beyond a winze.

30 *fathom level south*, on east lode. Driving by 4 men. 15 fathoms beyond a communication. The back of this level has been worked out, and the air is carried through them, there being a casing between.

45 *fathom level south*, on east lode. Driving by 4 men. 45 fathoms in. Ventilated as the last place. Two other men driving a cross-cut.

South Exmouth Lead Mine on two parallel north and south lodes. The engine shaft is sunk to a depth of 60 fathoms. "James's" Shaft is a whim and footway shaft 60 fathoms north of the E. shaft, and sunk to and communicated with the 30 fathom level. Cross cuts are driven from the engine shaft westward to the lode at the 30 and 45 fathom levels. About where these cross cuts intersect the W. lode is an air shaft on the lode from the surface to the 45. The 30 is driven south of shaft about 70 fathoms, northward of James's Shaft 35 fathoms, where they are cross-cutting east. The 45 fathom level is driven southward 45 fathoms, and northward 60 fathoms, where a rise is now making to a sump sinking from the 30. Lastly, the 45 on east lode is driven northward to about 5 fathoms, from being under James's Shaft.

The engine shaft is a large well secured shaft; ladders about 5 fathoms in length; good sollars, dividing or uniting at the foot of each ladder. Skips drawn by a flat rope are used in this shaft. The ladder road at "James's" is not so good;—narrow, and the casing between it and the whim shaft broken, and for 10 or 12 fathoms at the bottom altogether gone.

Strong timber is necessary in this mine, the ground being soft.

Places visited:—

The bottom of the mine, the 60. 6 men cutting plat. Barometer 29° (at surface 28·65); temperature about 60°; (tube 50.)

45 north on east lode. 4 men driving 55 fathoms from cross cut and current. Temperature 68; (tube 51.)

45 north on west lode. 6 men rising (3 shifts, 8 hours). 24 fathoms back from the end is a rise to the 30, from which air-boxes are taken to the end, the bottom of rise being closed. Draught from end of pipe tolerably strong. Temperature at rise top 71; (tube 48).

45 south. 4 men driving 20 fathoms from rise to 30; temperature 66; (tube 49).

30 north. 4 men driving cross cut east, 44 fathoms from current. Temperature, 64.

30 south. 4 men driving end, about 25 fathoms from a current. Temperature 68; (tube 47).

Besides these there are 14 men working in stopes in the 40, and 6 men working in stopes in the 30.

There are 9 men opening a plat at the bottom of engine shaft.

The men change over the boilers.

The number of persons on the floors is 40. They are well provided with sheds.

The men pay 9*d*. per month to doctor, and 9*d*. per month to a hurt club, receiving from the latter 30*s*. per month in case of accident.

Frank Mill Mine.

A lead mine, under the management of Captain Nicholls. The workings are about 500 fathoms in extent.

The engine shaft is similar to engine shaft of the last mine described, and is 100 fathoms deep.

There are 60 men underground.

60 *fathom level*. 4 men driving 25 fathoms beyond a winze.

72 *fathom level*. 6 men driving. Not quite as far in as the 60.

A cross-cut is driving from the 60 to a new lode. These workings are under the lawn of Lord Exmouth's house; so no shaft can be sunk at this part of the mine.

Frank Mills Lead Mine, north of South Exmouth, on the same lodes, and of the same composition, with the exception that the "gossan" (quartz and oxide of iron), is still more abundant and runs deeper than at South Exmouth. Carbonates of lead, lime, and iron are also contained in these lodes. A perpendicular engine and drawing shaft, 12 feet by 7, divided cased ladderway, and otherwise properly timbered, is sunk 100 fathoms at this point. 6 men are cross-cutting west about 6 fathoms from shaft. Temperature here, 63. Tube, 46.

The other tutwork operations consist of driving the 70 *end north* (nothing is being done at the 80), by 4 men 335 fathoms from shaft. About half this distance is an air-shaft continued to the 80 fathom level; and 35 fathoms back from the end is a winze from the 60. Temperature of air, 65; of water, 60. The draught going towards the winze named, by means of a trap door and air pipes, is conveyed to the end, or nearly so, but is very weak. Tube, 45.

60 *end north* is only 7½ fathoms further than the 70 and about 42 from the winze. 4 men are cross-cutting, west. Temperature, 62. Tube, 43.

4 men are "stoping" the roof a few fathoms back, in a working about 5 fathoms in length, 15 feet wide, and 12 feet high. Temperature here, 64. Tube, 44.

We also visited a branch or side level, about 120 fathoms north of the shaft, about 30 fathoms from the main level. Temperature about 60. Tube, 42.

A range of tribute pitches are being worked above the 45, north of shaft. "Passes" about 10 fathoms apart form the limits of these pitches, and serve partially to ventilate them, being holed from one to another moreover. In one the temperature was 63; tube, 41. About 4 fathoms above the roof of the level.

In the 60, and some other parts, the timbering was giving way; but on the whole, considering the heavy nature of the ground, the mine is fairly secured in this respect.

There is a capital stone building for drying and changing house. The men dry their clothes below, and change above. It only requires cleaning up.

There are about 50 people on floors, well provided with sheds.

3. PLYMPTON DISTRICT.

There are two mines of some importance in this district, situated on adjoining hills, about 3 miles from Plympton railway station. These are—

1. Bottle Hill, producing tin, with a little copper. It is under the management of Capt. Eddy.

This mine has been working for about 60 or 70 years, so that a great deal of ground has been opened and taken away. The workings at present are principally in stopes above the deep adit, which is 60 fathoms deep.

On the main lode the levels are carried for a length of about ¾ of a mile. In this length there are 6 large shafts opening to the deep adit, besides several smaller ones to various depths. The longest distance from a shaft to an end is 80 fathoms, but there are several winzes communicating to the level.

On the north lode, which is about 50 fathoms from the main lode, there are two other shafts; and another shaft is sunk upon the south lode, which is 40 fathoms from the main lode. The workings upon these different lodes also communicate with each other by means of cross cuts.

There are 34 men working in stopes on the main lode; 8 men working in the same way on the north lode; and on the south lode there is a pair of 4 men employed in driving up a cross cut or adit from surface to cut the lode. The end of this level is 44 fathoms from the mouth without any assisted ventilation.

The men change, some in the smith's shop, others in small houses in different parts of the mines.

The dressing pair numbers 20. They are fairly provided with shelter.

The men are charged 8*d.* per lb. for candles, and 8*d.* for powder; 9*d.* per man monthly for doctor. There is no club.

Huel Sidney, Captain Edwards, is the adjoining mine, employing 40 men underground, and 20 on surface.

Of the underground men 4 are employed in driving the 60 fathom level, the lowest, east from the shaft, and are 17 fathoms from it; while six are driving the same level west, and are 20 fathoms in. All the others are employed stoping.

Furze Hill Wood Consols.

A small mine, 21 persons employed underground:
- 9 men sinking the shaft;
- 6 men driving the 20 fathom level;
- 6 men sinking a winze in the 20;
- 7 persons on the floors.

From conversation with several mine agents in the Tavistock district it appears the custom for the men, individually to select a doctor from the whole number practising in the district to attend each one in case of illness or accident.

At Huel Crebor, although the men pay 9*d.* monthly to a hurt club, there is no regular scale of payment allowed in case of accident, the amount paid being fixed by the doctor according to the necessities of the case.

Okel Tor Mine, Calstock, Cornwall.

Now working for copper and mundic on an east and west lode in clay slate; lode averaging 4 fathoms wide, and underlying south about 2 feet per fathom. There is a perpendicular engine shaft, 12 feet long, 7 feet wide, sunk to a depth of 80 fathoms; divided and caved for drawing; 2 kibbles and chain.

The mine extends eastward of the engine shaft about 170 fathoms, and consists of the adit, 20, 35, 50, 65, and 80 fathom levels. There is no other regular shaft other than the engine shaft. The ladder road or footway is a succession of winzes from one level to another, sunk on the lode, and situated from 20 to 30 fathoms east of the shaft. The most advanced and most important levels are the 80, 65, and 50 fathom levels now being driven eastward and form the only "tutwork" operations in the mine. 32 men work on tribute above and between these levels.

Places visited:—

80 *end* east driving by 6 men (3 shifts of 8 hours). A winze from the 65 is holed to this level about 50 fathoms back from the end. Barometer in end 30·80 (at surface 30·26). Temperature 67 (tube "33").

65 *end* driving east by 4 men, 2 shifts, 4 fathoms from a winze from the 50. Barometer 30·70. Temperature 65 (tube "34").

50 *end* east driving by 4 men, 2 shifts, 60 fathoms from a winze to the 65. Barometer 30·60. Temperature 67; of water 61.

The changing house is 30 feet long by 12 feet wide and 9 feet high. No fire or fireplace.

Report on Mines in Swaledale District. By C. Twite, Esq.

Camborne, Cornwall,
January 19th 1863.

My Lord,

In obedience to your Lordship's request I have visited the mining district of Richmond, Yorkshire, and beg herewith to submit my report upon the same.

It comprises in the first place a general report upon the whole district, and secondly a detailed report upon the operations of each mine visited, and descriptions of the places in which samples of air were taken.

The description of the rocks is taken from a book just published by a local gentleman, Mr. Lonsdale Bradley, which is a very trustworthy one, as also the map and general section.

I have the honour to be, My Lord,
Your Lordship's obedient Servant
(Signed) Ch. Twite.

To the Right Honorable
Lord Kinnaird, K.T.,
Chairman of the Royal Mines Commission, 1862.

The mining district of Swaledale is best visited from the village of Reeth, about 10 miles from Richmond in Yorkshire.

It comprises the following mines:—

Mines.	Name of Company.	Lessee.
Arkendale	Arkendale Co.	Jacques Roper and Co.
Blakethwaite	Blakethwaite Co.	Bradley and Co.
Beldi Hill	Beldi Hill Co.	Milner, Knowles, & Co.
Ellerton Moor	-	M. Wyvill.
Grinton	-	Robinson and Co.
Surrender	-	
Summer Lodge	-	
Hurst	Hurst Co.	Bradley and Co.
West Swaledale	-	Do. do.

Of these Blakethwaite and West Swaledale are now idle, owing to expiration of the old lease, all the others being in operation.

Character of the Rocks.

The valley or dale is formed by the river Swale, which, in its course eastward, has excavated a way through the whole of the Upper Limestone series to the lower series. On the north, west, and south are the highlands formed of millstone grit.

The principal rocks of these series are limestone, chert, grit, and plate or shale.

The mineral characters of these are as follows:

1. *Limestone*, a calcareous rock, consisting principally of carbonate of lime, with from 10 to 17 per cent. of silicious matter. It is generally fine grained, hard, and compact.

2. *Chert* is a silicious, and to some extent a calcareous deposit, dark in colour and extremely hard. It contains about 37 per cent. of carbonate of lime, and 57 of silicious matter.

3. *Grit* is a highly silicious and occasionally micaceous deposit, and is more commonly known as "Sandstone" or "freestone," consisting of more than three fourths of silica or sand.

4. *Plate* or *Shale* is an argillaceous deposit of a more or less slaty or laminated structure, containing much vegetable and carbonised matter. They contain about 80 per cent. of silicious matter.

From this description it will be observed that the rocks being formed with a high per-centage of silicious matter, chiefly sand, and as the workings in these rocks are very dry, the quantity of dust flying about and inhaled by the men must be very great.

The size of the mining setts.

The next point to which I would direct attention is the large tracts of country leased to the various companies to work.

Taking the list of mines in this district as given above, the Arkendale sett covers an area of 28 square miles, Blakethwaite 13 square miles, Beldi Hill one and a half square miles, Ellerton Moor two square miles, Grinton, Surrender, and Summer Lodge 21 square miles, Hurst 9 square miles, and West Swaledale 30 square miles. A result of this is that the workings are very much scattered about, and the ore found in each place is dressed as near the spot as possible, thus rendering a number of floors necessary, which being only used a few days at a time are left quite exposed to the weather, the companies urging the great expense which would have to be incurred if they were all provided with shedding. Another result is the long distances which many of the men have to travel in going to and returning from their work, it being in all cases from two to 5 miles, and as no changing houses are provided upon any of the mines, the men work in the clothes in which they walk to and fro. This must affect them very much in wet weather.

System of working.

In all the mines of this district now working the productive beds that have been explored are to be found above the level of the bottom of the dale. Hence all the workings are above the "adit" or "day level," which serves at once to drain the mine, and also to form the traffic way for men and mineral. Sometimes several of these levels are driven at different heights or randoms, communication being made by rises or winzes. These levels are carried for great lengths from 1 to 2 or 3 miles.

The ventilation is natural through these levels, and up and down the rises. In some cases air shafts are specially opened to the surface, while in others no provision at all is made, trusting entirely to the "swallows" or crevices in the rock. In some close places fans are used.

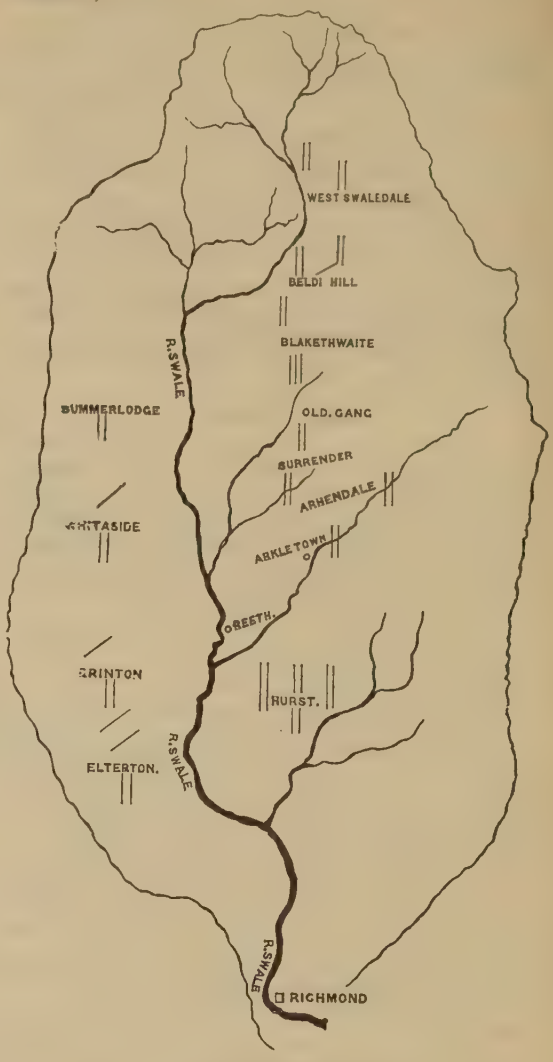
The men work in shifts of 8 hours, and work the 6 days of the week. They work by "bing tale" and "fathom tale," which corresponds to the Cornish "tribute" and "tut work." In all cases the material is provided by the mine, and charged against their accounts. They have monthly settlements. No club or doctor provided. The average wages of the men are variously stated, Mr. Bradley fixing from 6*s*. to 8*s*. per week, Mr. Robinson 11*s*. to 14*s*., and Mr. Coates 16*s*. to 18*s*.

Most of the men have small holdings of land, which enables them to keep a cow and pig, and which provides them with milk, a cheese for home use, and butter and bacon for market. Boys are allowed to enter the mine at 10 years of age.

There are very good schools at Reeth founded and endowed by some members of the "Society of Friends," who previously worked some of the mines. There are also night schools, and Mr. Robinson has a very good "brass band" of boys, and choral class for boys and girls formed of persons working in his mines.

Appended is a sketch map showing the position of the ines, and a general section of the strata.

Sketch of the Lead Mines in the Swaledale District, Yorkshire, 1863.



GRINTON MOOR MINE.

Surface temperature 55°.

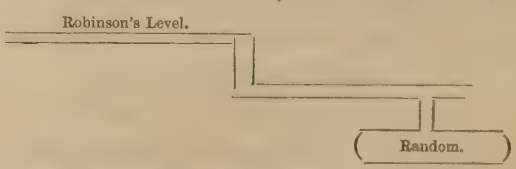
The first place visited was the end of main level driving east on Wellington's Vein, in the shale on the main limestone.

The end is driven by 1 man and 2 boys. 6 feet high and 5 feet wide. It was carried 200 fathoms from the mouth.

The ventilation was natural, there being an old shaft open to surface about 25 fathoms back from end, and a partnership of men were rising to a level within a fathom from this place.

Sample No. 32. Temperature 51° F.

The other place visited was the workings in the second Flot Random. This was reached by Robinson's level as far as Pearson's Sump, which is 7 fathoms deep, and the Random is 60 fathoms north of this, and 3 fathoms below it.



The working was aired by current of air passing above the sump. There were 7 men working in this place.

Sample No. 33. Temperature 53° F.

SURRENDER MINE.

Surface temperature 55° F.

The first place visited was a sinking upon the new vein in the middle turn level.

General Section of the Strata, Swaledale District, Yorkshire.

Millstone Grit.
Coal.
Plate.
Flinty Chert.
Plate.
Crow Chert.
Crow Lime.
10 fathoms Grit.
Plate.
Iron Beds.
Plate.
Redbeds (Lime).
Plate.
Blackbeds.
Lime.
Main Chert.
12 fathom Lime.
Grit.
Plate.
Middle Grit.
Plate.
Underset Chert.
Underset Lime.
27 fathom Grit.
Coal.
Grit.
Plate.
3rd Lime.
Grit.
4th Lime.
Grit.
5th Lime.
Grit.

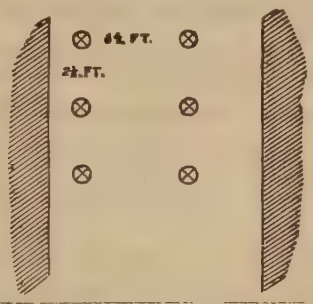
It was about 2 miles up the horse level. There is no direct communication by shaft to the surface, but 10 or 12 rises to workings above, and a branch level opening to the day.

The working was about 3 fathoms below the level, and embraced a space of about 20 fathoms in length and 4 in width. It is in the beds known as the Chert or Brangill rider. There were 3 openings to the level above.

Sample No. 34, temperature 51°.

The second place visited was the end of a cross cut, which was being driven from a rise 7 fathoms above the main level and about 150 fathoms from the end.

The rise was 9 feet long and 2 wide. There were no ladders, but stemples were fixed for climbing. These stemples are pieces of wood 2 or 3 inches diameter, placed across the rise, and firmly fixed in about 3 feet 6 inches apart in width, and 2 feet 6 inches apart in height.



In this case the rock was firm, so that no casing was required. The part by the side of the stemples is used as a pass for the ore.

The cross cut was driven a length of 110 fathoms 5 feet wide, and 4 feet high, by a partnership of 3 men. It was supplied with air from the level below, by means of a hand fan placed immediately over the rise, and worked by an old man 76 years of age, the air being conveyed through a zinc pipe, 4 inches diameter, and delivered at a velocity of 2½ feet per second.

No shot had been fired for the day

Sample No. 35. Temperature 57°.

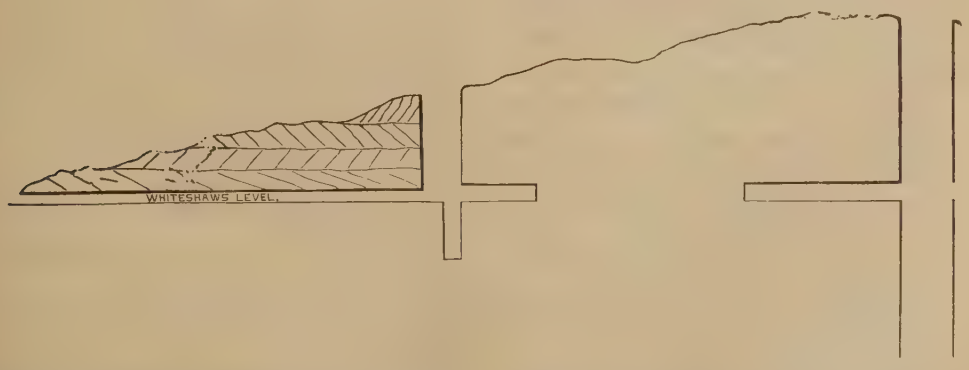
The third place visited was a working in Whiteshaws level, which is a level exploring the higher beds.

(*See plan below*).

The end of this level is 90 fathoms from mouth of the level, and about 12 fathoms beyond the shaft, which in 5 fathoms deep. The rock on one side is shale, and on the other chert. The level is being driven in to meet a level which is coming towards it from another shaft, and about 70 fathoms beyond it.

Sample No. 36. Temperature 48°.

The second shaft above spoken of is sunk to a depth of 60 fathoms to the lower workings, and is used as a travelling way for many of the men. It is 9 feet long and 4 feet wide, without ladders, but stemples as before described. At the distance of 4 fathoms apart, a bunting is put across one part of the shaft on which the men can stand and rest



In these two mines the men use iron tamping rods. The dressing of the ores is carried on entirely by men and boys, and is almost exclusively done in the open air.

The men are paid monthly.

Hurst Mine.

This mine is worked under the management of Mr. Bradley, of Richmond, Mr. Daykin being the local manager.

The workings consist in driving several trial levels, driving level on veins already proved, and in taking away the contents of the veins in the ground opened out.

Hurst head.

1. Lowest or Prye's Level.—This level is a main horse way, and is driven a length of 240 fathoms from the mouth. It is still being driven by a partnership of 8 men working in four shifts of six hours each, so that

there are 2 men working continuously the whole week brough. It is carried 9 ft. high and 7 ft. wide, in the rock known as Millstone Grit.

The end is carried 50 fathoms beyond an air rise.

Sample No. 65.

The next place visited was a working in a drift 8 fathoms below this level. The place contained a great deal of water. It is in the rock known as Plate. The air was very bad; so bad that the candles had to be held nearly upside down. It was impossible to seal the tubes. The man working said he burned five candles in six hours, and the air affected his breathing and caused head-ache.

The other levels on this vein are:

1. Queen's level about a mile west of Prye's, which is about a mile long, and still being driven.

There are no air shafts, but a double air gate is carried for ventilation.

2. A level called *Hurst level*, about 50 fathoms above Queen's level, exploring the upper oeds driven nearly a mile.

3. *Nungate level* on some strings of the same vein.

The number of men employed on these workings amount to 100.

Other levels are being driven on veins to the south of Hurst.

1. *Copperthwaite* still being driven at a distance of three quarters of a mile from the mouth. The vein is also being stoped away. 30 men working here. Ventilated by air shafts.

2. Marrick Moor Level
3. Marrick High „
4. Marrick Low „

} Trial levels four men each.

The dressing floors are very much scattered over the sett, and are nearly all exposed. About half a dozen persons were under cover. Women are employed to dress the ores.

The miners live, some near the mine in the village of Hurst, others scattered two or three miles away. Some very nice houses have lately been built on the mine, containing two good sleeping rooms, a living room with kitchen and dairy, but having no yard or back premises of any kind.

The men are settled with monthly.

Arkendale Mines.

These mines are about two miles from Reeth. They comprise an area of about 28 square miles, and have been worked from many points.

The following are the principal places at which operations are being prosecuted:

1. *Fell end. Gutter's level.*—Driven about 700 fathoms from the mouth, and 100 fathoms beyond an air shaft. It is being driven by three shifts of two men each. It is ventilated by an air drift carried about 8 fathoms above them, which is communicated with at about 15 fathoms interval. The present end is about 10 fathoms from the last hopper.

2. *Arkendale proper*—South side.
   (1.) *Fore Gill*, worked by 60 men and boys; 6 men are driving the horse level back towards a cross cut.
   (2.) *Turfmoor level*, about 14 fathoms higher than Fore Gill, with which it communicates. There are no men working here, but it is kept open for ventilation.
   (3.) *Moulds level*, at about the same level as Fore Gill. Only two men picking here. Communicates with the two last levels.
   (4.) *Daurigg level*, driven a mile from mouth. There are four men driving the main level fore end, which is about 30 fathoms beyond an air rise. Ventilated by zinc pipes placed in above a stopping in the level between two rises.
   (5.) *Danby level.* There are between 60 and 70 men working here. The main level fore end is half a mile in, and is being driven by 6 men.

   There is is no air shaft in this mine. The workings being in the limestone, in which there are numerous fissures called swallows, the supply of air is dependent upon these alone.
   (6.) *Kouth level*, driven a mile in. There are 4 men rising here; they are 30 fathoms above a level, and have no other opening, trusting to the air finding its way through the swallows.

2. *North side.*
   (1.) *Fagger Gill level*, 1¼ mile in the limestone; 4 men driving it. No air shafts or drifts, trusting to swallows.
   (2.) *Stang*, ¾ mile in. 34 men. No air shafts or drifts.

3. *Old Gang.*
   (1.) *Hard level*, driven 1½ miles, and still driving. It is also being worked away in stopes, employing about 100 men and boys.
   (2.) *Bunting level*, 60 men and boys following up old men's workings.
   (3.) *Barhary*, 30 men and boys working over the old men's places.
   (4.) *Kinning level*, with 6 men.

The dressing floors are scattered about these mines They are mostly exposed to the weather.

Old Gang Mine.

Visited the fore end of Hard level. This had been worked before by old men. It was quite dry.

Sample 68.

Sample 69 was taken from a similar fore end near to last one. Each of these worked by 3 shifts of 2 men each, the men working 8 hours.

The next place was a rise 7 feet high at the end, a cross-cut 22 fathoms from main level. It was in the black beds, 2 men working. The place was ventilated by a hand machine placed in the middle of the cross cut, worked by a a boy, which drew the air from the main level and forced it into the rise, through zinc pipes 4 inches diameter.

The machine was working while the sample was being taken.

Sample 70.

Access to this working by stemples 2 feet apart.

The Grassington Mines.

These are lead mines about 12 miles from Skipton, belonging to, and worked by his Grace the Duke of Devonshire, under the management of Mr. Jas. Kay Eddy, who has also the management of the Snailbeach Mines, Shropshire, and several slate quarries.

The sett is a very extensive one, covering some 13 or 14 square miles, and the number of men employed being 80.

The late Mr. Eddy, father of the present manager, having been a Cornishman, introduced the Cornish methods of mining. The mine is worked by several shafts; a changing house is provided for the men, but not one will use it; a doctor and sick club is established, and all the payments are made monthly.

The men live in the adjoining villages of Grassington and Habden, about 2½ and 3 miles from the mines.

The accompanying tracing from the plans at Grassington, kindly furnished by Mr. Eddy, will very clearly illustrate the system of ventilation, and the places which I thought it advisable to examine.

The ladders in Moss shaft were very good in about 3 to 4 fathom lengths, and with an inclination of from 2 to 2½ feet per fathom.

Grassington Mine.

Visited the end of the cross cut, driving south from the 60 fathom level. From the accompanying plan it will be seen that in the north part there is a vein called the middle vein, in which there are two shafts, marked Moss shaft and Cottingham shaft, about 190 fathoms apart. About 50 fathoms east of Moss shaft, a cross cut is driven south about 75 fathoms, where it cuts the south vein, on which workings are carried E. and W. for 150 and 100 fathoms respectively. The cross cut is then driven about 95 fathoms further south, for the purpose of exploring the south ground. The eastern end of the south vein communicates with the middle vein by workings on the Slanter vein.

Sample 71, taken from end of south cross cut, 2 men, 80 fathoms from a rise.

Sample 72, taken from the western end of the south vein, 80 fathoms from a rise.

Sample 73, taken from a rise going up from the 60 on Slantern vein, 10 fathoms high. In shale.

Sample 74, taken from end of north branch of the middle vein the 40 fathom level. About 10 fathoms from a rise.

Coalgrovebeck vein.

A cross cut is being driven from the end of the 58 fathom level on this vein. This end is 140 fathoms from the shaft. As there is no other level above or below this one, there is no back current. The end is driven by 2 shifts of 2 men each working 8 hours.

Sample No. 75.

Preparations are making for supplying this end with air from the shaft by a water pressure blast.

The ladders in 3 or 4 fathoms length, with an inclination

of 1 foot in a fathom, except the last 14 fathoms, which are perpendicular, and in one length.

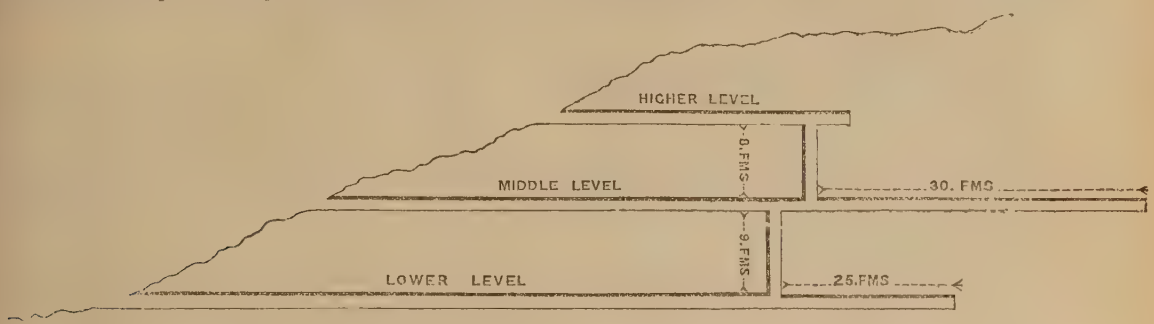
Some of the dressing is carried on under sheds, and houses are provided with fires for the men to eat their dinners in.

It is to be noticed that the men in this and other Grassington mines are working in the grit and limestone beds. The mines being dry, a great deal of dust is inhaled. As this dust is composed mostly of silicious matter, it must injure to a considerable degree the lungs of the men.

I append the rules of the sick club.

Habben Moor Mine

Adjoins the Grassington mine, and is worked by a Leeds Company, of which Mr. T. Kirkby is chairman, under the management of Mr. Job, the property being divided into 20,000 shares.



It is worked by three levels driven into the hill side, with communication between them.

The end of the lower level on the star vein is driven 500 fathoms from the mouth, and 25 fathoms from the air rise. It is drawn by 2 shifts of 2 men, working 8 hours. The end is dry, and in the grit rock. Sample 76.

The middle level not working, owing to the accumulation of black damp forcing the men out.

There are 46 men working underground, and 17 dressing the ore. There are no sheds on the mine.

No doctor or club.

Cononley Mines.

Near the village of Cononley about 3 or 4 miles from Skipton, worked by the Duke of Devonshire, under the management of Mr. Eddy.

The workings are all above the adit level, which is 34 fathoms deep at the engine shaft.

There are about 14 men and 14 pitches.

Sample 77, from Dakin's pitch in the back of Bigg's level. This pitch was about 15 feet wide and 7 feet high, worked by 3 men. Visited it 15 minutes after 2 holes had been fired.

Sample 78, from James Stoddart's sinking, 2½ fathoms below Bigg's level; 2 men working. There was a small air drain from a rise from air below; 40 minutes after blast.

Sample 79, from John Cherry's pitch in the back of the top adit, 3 fathoms high. It was 3 fathoms wide. One shift of 4 men working 8 hours. The same men working here for 6 years.

Sample 80, from the rise in the engine shaft middle level cross cut; 7 fathoms high. One shift.

Note.—Candles sold on the mine at 6*s.* per dozen.

Camborne, Cornwall,
My Lord, 6th February, 1863.

I beg herewith to send your Lordship, my report upon the mines visited by me in the Alston Moor district in September of last year.

I have the honour to be, My Lord,
Your Lordship's obedient servant,
Chas. Twite.

To the Rt. Hon. Lord Kinnaird, K.T.,
Chairman of the Royal Mines Commission, 1862.

Report on Alston Mines.

The district of Alston Moor is one of the largest mineral districts in the north of England. It lies around the town of Alston which is reached by a branch line from Haltwhistle on the Newcastle and Carlisle railway.

The mines are mostly in the high lands or fells around at an elevation of from 1,200 to 2,000 feet above the sea level. They are mostly the property of the Greenwich Hospital Commissioners, and are leased to the various companies now working them.

Some of these companies, as the London Lead Company, are the lessees of very large extent of mineral ground, and employ large number of men, while others consist of only two or three speculative working miners who, receiving a "take note" or permission to work from the lord's agent, go into any part which is not being worked, and search for mineral.

The character of the *rocks* is of the same description as those described in my report upon Swaledale.

The system of working is also the same excepting that the men work only 5 days in the week.

The period which the men's accounts are allowed to run vary in this district. With the London Lead Company the accounts are settled *annually*, the men drawing a regular amount of *advance* money monthly. At Rodderup Fell the accounts are made up quarterly.

A new feature to be observed in this district is the providing of sleeping rooms on the mine for those men who live at a distance of several miles, who go home only on the Friday night, and remain there until Monday morning.

This district, and especially the London Lead Company's mines afford good opportunities for seeing the working of ventilating machinery. I have reported fully on three of these machines, working respectively at Rampgill, Long, Cleough, and Fletcheras mines. In each of these cases the pressure from a column of water is the motive power. In the first two, the power thus obtained is applied to a fan while in the other case the velocity of the jet of water is applied to increase the velocity of the air in the small air course, that is, the air pipe, and so to increase very largely the quantity of air entering the end or working place per minute.

The quantity of air supplied in the first case was about 30 cubic feet per minute, in the second 20, while in the third case it amounted to 38, while the distances the air was carried in the first and second was 90 fathoms, in the third it was 190.

The quality of the air supplied is good in these respects. It is cooled from the contact of the water, and to a great measure purified, if the air be supplied from the mine itself.

There are good schools provided by the London Lead Company at Nenthead. All the children of the men employed upon their mines are compelled to send their children to school, the boys until they are 12 years of age, the girls until 14. The boys enter the works at 12, but have to attend a night school until 18.

A good reading room and library is also provided.

The Ramp-gill Vein.—This vein is worked by the London Lead Company. It is situate at Nenthead, about 4 miles from Alstone. The deposit of lead occurs in the great limestone, having the beds of plate above, and the Hazle beds, known as the tuft or water sill, below.

Visited the end of the water level, which was driven about a mile from mouth, and was still being prosecuted by two men. The contract for driving was to the effect that it should be driven 6½ feet wide and 4½ feet clear height above the rails. The end was about 50 fathoms from an air rise, and was 4½ feet high in all. The men were working in a sitting posture, one beating and the other turning the borer.

Two holes had been fired, consuming ¾ pint of powder, about 2 hours previous to visiting.

The temperature was 68° F. Sample No. 1.

Air was being forced into this end by means of a blast consisting of a fan driven by a band, attached to a water wheel, fixed under an air rise 90 fathoms from the end, and communicating by a 6 inch pipe of cast iron. The

velocity of the air at the end of the pipe was 150 feet per minute.

This not being considered quite sufficient a new one was being constructed with a different motive power. Instead of driving the fan by a water wheel, a column of 3½ inch pipes, 20 fathoms high is to be erected, which will always be kept full of water, and a jet issuing from near the bottom will strike against the vanes of the air fan, causing them to revolve with much greater rapidity.

This machine will be erected under an air shaft, communicating with the surface.

The next place visited was a level 16 fathoms above the water level working in a flat on Carr's vein. This place was 16 feet high, 21 feet wide at one end of the working, and 18 feet wide on the other. There were 4 men working on the south end, and 4 men in the north end.

Sample No. 2 from south end.

The men do not employ fuse in blasting. In its stead they make squibs from pieces of paper about a foot or a foot and half long, and about an inch wide. These are folded length ways several times, and then a train of fine powder is laid through the inside.

The hole is tamped previous to the introduction of this squit, room being kept for it, by introducing into the hole a copper needle or pricker, which is withdrawn after the hole is tamped.

The tamping bar is furnished with an end capped with copper.

The squib is fired by a match, made of well-greased twisted paper, placed obliquely across the hole.

The ladders throughout the mines are good, being of wood, about 12 feet long, with flat staves about 10 inches apart, and inclining about 2 feet in 12.

Owing to the abundance of suitable stone, the levels and passes are mostly lined with pack walls, and the roof, where it is required, secured by arching.

The men all go to their respective places of work from the water level. As the rock is, comparatively speaking, hard here, the quantity of tools to be carried by the men is large, and therefore would be a tax upon their strength. To ease them in this respect each partnership is provided with a small light tool waggon sufficiently large to carry the tools and men; this is pushed along by one of the partnership.

Surface Operations.—In all the mines worked by the London Lead Company, the dressing of the ores is carried on by men and boys, no females being employed in any of the operations. As this company have such extensive fields of operations, and as they have been working for many years, they have afforded employment to a great many families for successive generations; it being a rare thing for any of their employed going to any other mines for work. They thus take them from school at 12 years of age, place them at work on the floors, where they remain until they attain the age of 18, when they are sent to work in the mines.

The greater part of the dressing operations are carried on in the open air. In consequence of this, during a portion of the year, three or four months, these operations are suspended owing to the inclemency of the weather. During this time the young men are sent into the mines to act as labourers in repairing the road, &c. By the time operations can be resumed, there is a great accumulation of ores to be dressed, when the younger men among the miners are brought out and put to this work.

There are several dining houses furnished with seats and fires for the workmen to dine in.

As many of the men live at great distances, 4, 5, or even more miles from the mine, sleeping-rooms have been provided, so as to obviate the necessity of the men going this distance more than once a week; these sleeping rooms are called "mine shops."

Visited Small Cleough mine shop.

This was a stone building divided into two rooms, one for day use, the other for night.

The day room was 15 feet long 14 feet wide and 7 feet high. It had a wooden floor, and was ceiled. It was lighted and ventilated by one window 3½ by 2 feet, opening at the top. A good fire and oven provided. The sleeping room was 19 feet long; it had no ceiling, and was furnished with two windows 3 by 2½ feet; also an open fire grate. There were six bedsteads giving accommodation for 12 men.

The company provide bedsteads, the men their beds and blankets.

The men clean the house. They generally bring their provisions with them on the Monday ready for use in sufficient quantity to last them until Friday when they leave work.

Long Cleough Mine.—Also at Nenthead and belonging to and worked by the London Lead Company.

The first place visited was that worked by William Foster and partners, consisting of five men, father, son, and three half-brothers of the latter. It was a place in a flat in the great limestone 20 feet high.

Sample No. 3. Temperature 60° F.

The next place was a driving upon a vein, by Thomas Vickers and partners, 4 men; 6 feet wide. It was stoped to a height of 20 feet. It was about 7 fathoms from a cross cut along which the air was travelling.

Visited a rise in which Alex. Paterson and partners were working. It was about 5 fathoms high; and ventilated by means of a water blast similar to the one described as being in course of erection at Rampgill vein. The height of the water column was 68 fathoms, but there was only an available height of 20 fathoms on this occasion. The pipes were 3½ inches diameter, with an orifice of ⅝ths of an inch. The fan had 6 vanes each, 6 inches square. The pipes conveying the air were 5 feet diameter of cast-iron. These pipes traversed a length of 90 fathoms, and then up the rise, and air was being forced into the working with a velocity of 1,200 feet per minute.

Visited Robert Barnes' partnership's bargain. This consisted of 5 men who were driving to meet those driving in the first place visited. The place was 16 feet high. Ten holes had been fired that morning, consuming about 4 lbs. of powder; one had been fired within 15 minutes. Sample No. 5; temperature 61.

The men in these mines carry their powder in gutta percha bottles called "cuddies," costing from 3*s.* 6*d.* to 5*s.* each.

The London Lead Company settle accounts with their workpeople only once in the year. To enable them to go on a regular system of advancing money prevails. For the first three months each man draws 35*s.* per month. From that time until he is 21 years old 40*s.* is the sum allowed, and after that period each man draws 44*s.* per month.

Rodderup Fell Mine.

This mine is about three miles from the town of Alstone, and is worked by a private company under the management of Mr. Crawhall.

In this mine workings are being carried on both above and below the water or Blackburn's level.

The workings below are only of recent date, and consist of sinking two shafts about 12 or 14 fathoms apart, between which on reaching the productive beds communication will be made, and levels driven.

These shafts are circular in form, and 9½ feet diameter inside cribs; the ground not being firm they are timbered the whole way down. This timbering consists of cribs of English oak 5 inches square, placed around the shaft at distances varying from 3 to 6 feet apart. To these are fastened a complete lining of 1½-inch timbering, the joints all being made tight.

Only one of these shafts was being sunk; it was 60 feet deep, and was divided into two portions by wooden brattice. It was used as a winding, pumping, and ladder way shaft. Four men were working in the bottom, which was very wet and cold; the pumps raising 2,100 gallons of water per hour.

Sample No. 6; temperature 58°; water 54°.

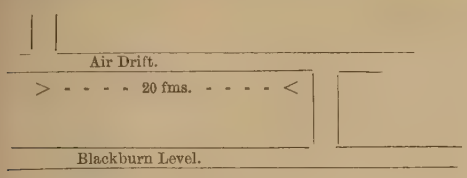
Sample No. 7 was taken from a working on the sun or south head of the Rodderup Clough vein, 3 or 4 fathoms from the main level or air-way. It was 9 feet high and 6 feet wide, worked by 4 men. Two holes had been fired about 15 minutes previous to visiting this place. Temperature 57° F.

Sample No. 8 was taken from a partnership of 4 men's working on the same vein as previously mentioned, who were driving to meet the last partnership. A small communication 4 feet wide by 1 foot 9 inches high had been opened between them, so that the air passed from the main level to the place last visited, then through this small opening to these men, and then to main level again. All the ground had been worked away above, but the space was filled in with attle. Temperature 58°.

Sample No. 9 was from a heading in the principal vein driving by 4 men. A hole had been fired about two hours previously. Temperature 62°.

The next sample No. 10 was from a working in a drift above the lower water level. This drift or level was 5½ feet wide, and 5 feet high. Four men were stoping. There was a circulating current passing through the place. Temperature 64° F.

Sample No. 11 was from Jonathan Spark's partnership working in the air drift above Blackburn level, which communicates with an air shaft to surface.



Two leads meet in this drift, making a vein 15 feet wide which these men were working away. The rise was 6 feet wide and divided off into two parts, one forming the travelling road for the men, the other serving as a pass for the material. There were no ladders for the men, they having to climb by the stemples, which were 2½ feet apart.

From the air drift last referred to a rise, 13 fathoms high, communicates to the middle level. This rise is used as a travelling way, it being furnished with stemples, which were 3 feet apart and several missing.

At the top of this rise a level has been driven 7 fathoms eastward and 9 fathoms westward, and 6 men were working in it. Sample No. 12 was taken just over the rise. A shot had been fired about half an hour previously.

Surface Arrangements.—There is only a changing house provided for those men who are working in the shaft, and even these men, although working in such a wet place, do not keep a change of clothes, but simply dry themselves before the fire.

There were 86 men and boys employed in dressing the lead ores. With the exception of 3 or 4 employed with the Brunton frames all these were working exposed to the weather.

There were several sleeping houses in the mine; one was a house of 2 storeys, 18 feet long and 16 feet wide. The ground floor room serving for a day room was 7 feet high. Each man here had a lock-up cupboard to himself. The first floor room, 7 feet high, was a sleeping room accommodating 8 men. There were 2 windows, 4×3 feet, but no fire-place. The upper room having beds for 4 men had 2 windows. In all these shops it is the rule for two men to sleep together.

There were three other shops on the mine similar to this one built for the convenience near the mouths of the different levels.

Besides these shops the company has built several houses for their workmen; they are let at moderate rents, a five roomed house with a right of pasturage for two cows on the common being let for 8*l.* per year.

Another large house is a lodging house for single men working upon the mine. A man and his wife has charge of it living rent free and receiving from each lodger sixpence per week as remuneration. This is the only payment they have to make.

Cashwell Mine.—This mine is about 5 miles from Alstone, at an altitude of 2,000 feet above the sea level. The operations are carried on mostly below the water level. There are 80 men underground.

Sample No. 13 was taken from the bottom level, 7 fathoms from the eastern end, where 4 men were employed taking down the sides. The height of the level varied from 5 to 9 feet, and was generally 4½ feet wide. There were several heaps of mineral in the level 2 to 3 feet high. Temperature 61° F.

Sample No. 14 was taken from the same level, about 8 fathoms west of the last one. There were 4 men taking down the side. Temperature 57° F.

Sample No. 15 was from a working in the main bot om level, 13 fathoms from the shaft. Four men were working. Temperature 61° F.

Sample No. 16, taken in the same level, in direct current where two men were working. Temperature 55° F.

Sample No. 17 was taken from the western end of the Copper Hazle Level, 10 minutes after a shot. Temperature 57° F.

There are no sheds of any kind upon the mine for the dressers.

There is a comfortable sleeping shop.

In the passes from the water level to the deep workings, which serve as travelling ways for the men, wooden ladders are fixed, having flat wooden staves 12 inches apart.

Appended to this report is a section of the workings at Cashmell Mine, which will illustrate this district.

Garrigill Mine.—Visited this mine, belonging to the London Lead Company, to see another kind of water blast. It differs from the one before described in this respect only, the absence of the revolving fan, the jet of water being the acting cause.

It was erected under an air shaft, 194 fathoms west of the eastern forehead in the scar limestone in Fletcheras level.

The pressure pipe was 8 fathoms high and 3 inches diameter, while the supply pipe was 6 inches diameter, of cast iron. Air was being supplied to the end at a velocity of 170 feet per minute. Temperature of the end was 61° F.

This was not the whole effective power of the blast, as a part of the supply went by a branch pipe to ventilate a rise in another part of the mine.

Allenheads Mines.—These mines are worked by W. Beaumont, Esquire, M.P., under the management of Thomas Sopwith, Esquire, F.R.S., and form part of the W.B. Lead Mines.

Visited first the ventilating furnace erected at Plantation shaft on Henry's vein. The workings on this vein are very extensive, and at certain seasons the ventilation had been so feeble that the men were obliged to leave their work for days at a time. To prevent this a furnace was erected, of which I append a plan and sections, which insures at all times the circulation of a good current of air through the mine, which can be distributed to all the working places. The furnace is erected at the top of the shaft, for convenience of attending to it. The shaft is 25 feet higher than the other shafts, and communicates with the workings of all the mines in the district.

The fire grate is 4 feet 3 inches by 3 feet.

The chimney is 40 feet high from the foundation, or 35 feet above the fire. This height was necessary from its being built close by the road.

A drift is carried from the shaft about 8 feet from the top to the furnace, having a section of 5 feet by 3 feet 6 inches. The top of the shaft is closed by air tight doors.

The expense for one year of this furnace was 170*l.* This includes 10 per cent. on the cost of building, 25*s.* per week for attendance. The price of coal on the mine is 13*s.* 6*d.* per ton.

There was another ventilating furnace in course of erection at the Burtree pasture shaft, which is now completed and in working. This furnace is placed at the top of a surface shaft, about 500 feet above the highest and upwards of 1400 feet above the lowest workings in the Burtree pasture vein. This shaft is situated 350 fathoms west of the present easternmost forehead in the vein, and 1100 fathoms east of the principal winding shaft. It may therefore, be considered to ,at any rate, ventilate a mile in length of vein workings, allowing that a portion of the total length is ventilated by the engine, or winding, and other shafts, but I have no doubt its influence is felt over the entire workings. It is placed at the N.W. corner of the workings.

In the heart of the walls on each side of the furnace there is put in a course of ashes, which being compressible, allow of the expansion of the inner course of bricks, without bulging the external face of the walls. The fire bars rest on metal plates, built into the walls with a little projection.

Visited the workings on the western part of Henry's vein. Descended Gin Hill shaft, which is a perpendicular one, 77½ fathoms deep. It is five feet square, used for winding, having two cages each, 5 feet by 2 feet 4 inches. The guides are the common bridge rails, weighing 16 lbs. per yard, and fit into a groove in the cage. The cages have neither bonnets nor safety catches. Three men ride at a time in each cage. They are lifted by wire ropes 2¾ inches circumference, which are wound over 6 feet pulleys unto 4½ feet drums, by hydraulic engines. The engine is worked by a man at the shaft top. The time occupied in putting the waggon into the cage and drawing it to surface is one minute. The shaft is enclosed by a wooden house, for the protection of the engine man and landers.

Went down Gin Hill shaft for 40 fathoms, to the horse level, which I may here state, is carried by an incline to the surface, and which forms the ordinary travelling way for the men and horses, which we travelled for a length of ¾ of a mile, until we reached Kearston's cross-cut, which after a length of ⅜ of a mile, cut the Henry's vein, the western forehead of which we visited, at a distance of one mile from the mouth of the cross-cut. This end was about 20 fathoms from a rise, was 5½ feet high by 5 feet wide. Six men were employed taking down the sides. Temperature 66° F. Sample of air No. 18.

Visited the level above horse level to test the velocity of the air current. The air was being drawn up through the rise about 20 fathoms east of the last place; visited along

this level towards the furnace drift. The level was 3 feet 3 inches wide by 3 feet 4 inches high, and the velocity of the air in the centre was 150 feet per minute.

We visited the workings in the 2nd level above the horse level. The workings are driving westward, which end is 5 fathoms from the rise, and taking down the sides of the level on the eastern side, which leads to the furnace drift.

Took sample No. 19 from the western end, where the air was standing and temperature 66°; and sample No. 20, from the eastern end, where the velocity of the current was 100 feet per minute, and the temperature 63° F.

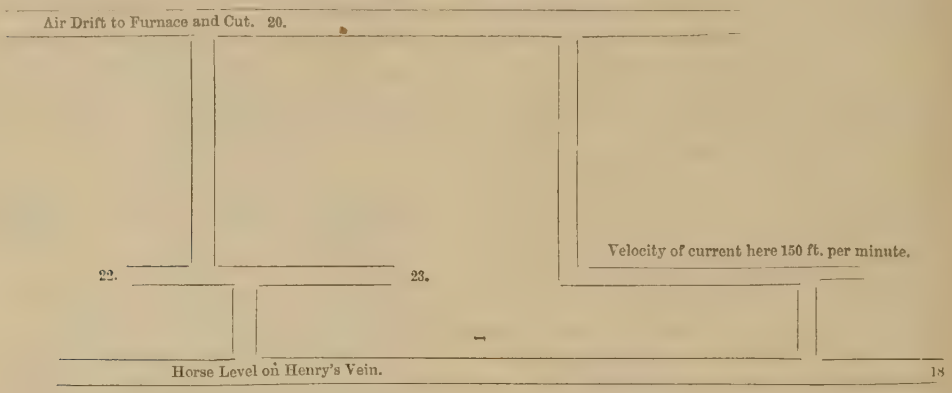
The next sample, No. 21, was taken from the rise at the end of Plantation cross cut in Henry's vein. This rise, 80 fathoms high, is a double one, or has the centr part filled in with attle or deads, forming an air-tight division, and ensuring an up and down current of air. The circulation in this place is ensured by placing a stopping in the level underneath the middle of the rise, and by cutting an air drift to the furnace drift on the other side. The men were working about 6 feet above the division in the rise. Brattice cloth is allowed, but not put up here. Temperature 66 F.

Sample No. 2 was from the workings in a flat in the middling or level above the horse level, about 12 fathoms east of the winza. Temperature 65°.

Sample No.23 was from the western end, 15 fathoms from the winze. Temperature 78° F.

These flats are very dry and dusty; so much so that occasionally they are watered by means of small water carts.

Hand Sketch of Workings visited.



The Workings on the Eastern part of Henry's Vein.—Entered by Famside Level driven in the shale on the top of the fire stone, which, at a distance of a mile from the mouth joins the high underground shaft, down which we went to the level in the 4 fathom limestone, a depth of 77 fathoms, from which level we visited John Oatman's place in the deep workings in the 6 fathom hazle.

The men ride up and down the shaft in the cages which are the same as before described. In the rises ladders are placed throughout these mines.

Sample No. 24 was taken from this place.

Samples No. 25 and 26 were taken from the flat workings in the lower part of thick limestone. These places of workings were about 18 fathoms wide, and 8 feet high. The temperature was high, it being respectively 69° F, and 67° F. No shots had been fired for several days.

Sample No. 27 were from Thomas Iceton's Rise on Henry's Vein. The rise was 3 fathoms high, 2 men working. A shot had been fired about an hour before visiting it. Temperature 70°.

Sample 28 was from Isaac Reed's working in string from Victoria Vein. Very smoky half an hour after a shot. Temperature 67°.

The Allenheads Benefit Society.—There is no benefit club immediately in connection with the W. B. lead mines; but from a very early period benefit clubs had been in existence in the district, supported almost entirely and managed by Mr. Beaumont's workmen. These worked until about the year 1847, when it was found that the principles of management not having been laid down by qualified persons, the affairs of these societies, like many others of the same class, were in such a condition that nothing else could be expected but disappointment and eventual distress, which was seen fast approaching. Steps were taken, through the active interference of Mr. Sopwith, and the liberality of Mr. Beaumont, to enable the existing societies to meet their engagements for three years, so as to allow time to consider the proper basis of a new society to be formed from the several old ones upon *correct calculations*, and which, by *improved management*, should ensure permanent benefit to the old members as well as to new ones. For this purpose a joint committee was nominated, the services of eminent actuaries secured, and the result was the formation of the Allenhead's Benefit Society on the 25th February, 1850, which is now in a very flourishing condition.

The benefits to be secured by the members are of three degrees:

1st. An assurance for an allowance of from four to ten shillings a week in sickness, to commence one year after enrolmen t,and to extend over the lifetime of the assured.

2nd. An assurance for an *annuity* of from two shillings and sixpence to ten shillings weekly for life, commencing when the assured has attained his seventieth year.

3rd. An assurance for the payment by the society to the heir or heirs of the assured, any sum from five to twenty pounds on the death of the assured.

In no case can any member assure for more than three-fourths of his average weekly earnings, including any benefits from any other Friendly Societies.

The contributions from members are regulated by the age of the member at the time of admission, and are set forth in Tables, approved by Mr. F. G. P. Neison, the Consulting Actuary.

Besides these contributions by the members, honorary members subscribe to the funds; and Mr. Beaumont gives a sum annually, equal to 5 per cent. on the sum subscribed by the ordinary members.

The management is vested in the hands of a president, four vice-presidents, four trustees, and a board of 9 directors elected by the members.

The surplus funds are invested with the Commissioners for Reduction of National Debt, but the rules provide for this to be distributed among the members every 5 years. Besides the annual contribution from Mr. Beaumont referred to above, this gentleman subscribes also a sum equal to 2 per cent. annually on the surplus money or capital of the society.

From the twelfth annual statement of the society, being for the year ending May 16th 1862, it appears that the income in the year was 553*l.* 5*s.* 5*d.*, while the expenditure was 272*l.* 11*s.*, leaving an excess of 280*l.* 14*s.* 5*d.*, which added to previous credit balance, makes the capital for the year 1863, 2,400*l.* 15*s.* 3*d.*

From the same statement we learn that the number of members admitted since its establishment, is 493 ordinary, and 44 honorary, making a total of 537, that the number who have died has been 54 ordinary and 10 honorary, and that the number withdrawn has been ordinary 29, honorary 8, leaving the nnmber at the time of statement 410 ordinary and 26 honorary; total=436.

The number of members receiving sick pay from May 18 1861 to May 16 1862=49, and the amount so paid 232*l.* 18*s.* 6*d.* The amount paid by the society on sums assured on death of member for the year was 20*l.*

There are good schools provided by Mr. Beaumont for the children of his workpeople. The instruction is given by a master and mistress, and appeared to be sound and suited to the condition which the children are likely to fill in after life. I was very much struck with the cleanliness and order of the children as well as their general intelligence.

Report on Mines in North Wales. By C. Twite, Esq.

Camborne, Cornwall,
My Lord, 3rd August 1863.

In obedience with your lordship's instruction I have visited some of the mines of North Wales, and examined the underground workings of the same, for the purpose of reporting to your lordship the condition of the mines in regard to ventilation, the safety of the footways, and arrangements for the general welfare of the working miners. With this object in view, I have visited the mines in the districts of Wrexham, Mold, Holywell, Llandudno, Llanrwst, Carnarvon, Pary's Mount, Dolgelly, Aberystwith, and Shrewsbury.

As the time at my disposal is limited, the plan adopted has been,—first, to visit each district, in order to acquire a general knowledge of it, inspecting the principal mines, taking samples of air in different parts, and reporting upon the same; then if time will permit, and your lordship should think it necessary, to return and visit such other mines as require it, and so, in a supplementary report, complete the whole district.

The following summary will show the mines in each district :—

Summary of Mines in North Wales.

District.	Principal Mines.	Secondary.
Wrexham	Minera	South Minera, Park, Central Minera, Pool Park.
Mold	Maesysafn	Westminster, Panty Buarth, Hendre Ucha, Bryngwyn, Mt. Pleasant, Cefn Cileen.
Holywell (Halkin side.)	Rhosesmawr, Bryngwiog, Long Rake.	Halkin Level, Milwr, Grosvernor.
Holywell (St. Asaph side.)	Talargoch	Holywell Level, Orsedd, Merllyn, Michell, Trelogan, Pennant.
Llandudno	Old and New Llandudno.	
Llanrwst	—	Coed Mawr Pool.
Carnarvon	—	Smydde Dylluan, Drwys-y-Coed· Cwmdyle.
Parys Mountain	Pary, Mona.	
Dolgelly	Clogau, Vigra, Cambrian.	
Aberystwith	Lisburne Cwm Erfen E. Darren	Aberyffwd, Abernant, Rheidol United—Gelli rheiron.
Shrewsbury	Snailbeach Roman Gravels.	
Macynlleth	Dyliffe.	

These are all lead mines, with the exception of those around Llandudno and Carnarvon, which are copper.

These mines, visited and reported upon in detail, give a general idea of the various works in operation. For convenience, the mines may be divided into two classes. First, those in North Wales, around Wrexham, Mold, and Holywell, and, secondly, those in Anglesea, and those around Aberystwith and Shrewsbury. In the first division the Minera, Maes-y-safn, Rhosesmawr, and Talargoch mines present large works upon metallic veins traversing the country, and opened upon to great depth, and affording employment to large numbers of people; while those of Park, Hendre-Ucha, Mount Pleasant, are cases where the ore is found lying between the beds of the rock, with all the working upon one plane, an inclined one. And, lastly, several of the others are explorations, conducted in many cases by numbers of poor men, working miners, and known as poor men's ventures. These are mostly to be found in the neighbourhood of Holywell and Llanrwst. These men join together in taking a "take note" of a piece of mineral ground, and work it themselves in their spare time, after working their usual 6 hours shifts in some mine. As they are in all cases totally deficient in capital, the opening out of the property is most imperfectly done. Holes are dug, they cannot be called shafts, and levels are driven small and cramped.

The result is the travelling ways are bad and the ventilation bad also. The men ,weakened by excess of bodily fatigue, are more affected by these evils, and so these ventures are known as bad places to work in.

In addition to this, the loss to the mineral proprietor is great. Instead of having his property well explored and opened out, he has it burrowed in, the richest portion of the ore taken away, while middling and inferior ore, which would return a fair profit if the whole were fairly worked, is left behind, requiring at any future time a large expenditure of capital to work the property, necessitating a reduction of dues on the part of the lord, to induce capitalists to come forward.

Of course there are cases where a large mine has been the result, as in Rhosesmawr, where a few poor men have in a short time found themselves proprietors of great riches, but for one success of this kind there are many where little has been found to reward the explorers for their trouble.

The rocks in which these mines are situated are of the same description as those in which the lead is found in Cumberland, known as mountain limestone and millstone grit, and described in my report upon the lead mines of Alston Moor, and, as in those mines, the deposits are in the upper measures, and form elevated ridges, but the system of day levels does not prevail in Wales to the extent that it does in the North, rendering pumping machinery necessary, and causing all the descending and ascending of the men to be done by means of ladders. A notice of the footways will be found in the report of each mine visited and reported upon. From some of these is will be seen that in the earlier workings of them, the levels driven were low, particularly narrow, the shaft, small and irregular, so that when they come to be reworked, either great expense has to be incurred in widening the levels and enlarging the shafts and passes, or the footways allowed to remain small and inconvenient. But as these passages serve also as airways as well as footways the inconvenience not only applies to the latter but also to the former, and as anything which affects the ventilation of a mine affects also the economic working of the same, the outlay required to remedy these defects would neither have been wasted nor unprofitably employed. In some cases the present management appear to be impressed with this view, and are sinking new shafts and driving larger levels, while in others nothing is being done, things being left exactly as they were found.

In the second division the mines are in the clay, slate, and gritstone beds, and the veins are found traversing these deposits, and going down to considerable depth. In this district the workings assimilate themselves to those seen in Cornwall.

Through the whole of the districts visited, with the exception of the Dyliffe mine, there is a great want of suitable places for the men to change their clothes in before descending to their work, and again upon ascending. In many places there is no provision whatever, in others they change upon the boilers, and in those mines where houses are provided, with only a few exceptions, they are far from being uncomfortable as they might be made by the outlay of a very small sum of money. In no mine that I have visited was there any place provided for the men to wash themselves in, and when we consider the importance of cleanliness upon the general health of these men, working as they do in an atmosphere charged at times with a large proportion of deleterious matter, and considering also the fact that the flannels worn undergound by the men are rarely if ever washed except when taken home to be repaired, it becomes a question worthy of consideration, if a suitable place was provided and the men became accustomed to a good wash upon coming up out of the mine, whether they would not, in the first place, more frequently wash their flannels as well as themselves, and then, secondly, whether the clean flannels and clean skin would not improve the general health, and so prevent their being affected so much when working in badly ventilated places. Again, if the changing houses were loftier and better ventilated, and in this all, even the very best, are defective, the underground clothes of the men would have the benefit of a current of resh air, and so be benefited by being a little sweetened. As it is the clothes of the men are hung up to dry in close house, and with the exception of being dried are very little improved.

The dressing of the ores in the mines visited is done by men and boys, girls being only employed in Anglesea. The dressing floors are not, as a rule, well shedded.

Doctors and Club.—There is no general system prevailing in respect to doctor or club. In some cases the mine appoints a doctor to whom the men pay the sum of sixpence monthly; in others where no doctor is appointed the men generally belong to some friendly society or club, by which means they get medical attendance at the same rate, or in other cases medical men contract to attend any body of men at the same charge. Whenever clubs exist they are described in the report of the mine.

The price of material varies from 6*d.* to 9*d.* per pound for powder and candles, with the exception of the Mona mine, where the price is 1*s.* 4*d.* and 1*s.* 2*d.* per pound.

General habits of men.—The mines are very much scattered, and are in most cases away from towns. The men therefore have the advantages of a country life.

The length of the shifts is generally six hours in the north and eight in the south.

Most of the men with families have allotments of ground as a garden or small farm, so that the miners have the advantages of short hours, country air, and agricultural pursuits for leisure time. In addition to these they have a better diet than their fellows in towns, having a good supply of vegetables, milk, and bacon, but little fresh meat.

These, my Lord, have been the different points to which I have directed my attention, and beg now to submit my report upon the same.

The Right Honorable I am, &c.,
Lord Kinnaird, K.T., C. TWITE.
Chairman of Mines Commission.

MINERA MINE.

This mine, situated about 4 miles N.E. of Wrexham, is worked for lead, under the management of the Messrs. Taylor and Sons, London, and having Mr. John Darlington for the resident agent. It is one of the most important lead mines of this country, and has stood high since the year 1710, both for the large quantities of mineral returned, and for the large profits yelded. The present company commenced operations in 1849, working having been suspended for some years in consequence of the great quantity of water met with, which frequently resulted in flooding the mine, and the stopping of the regular workings. The present management attacked this difficulty by driving a deep adit through the mine, which collects and carries off all the water which is found in a depth of 120 yards. The water below this is raised by an 80-inch and a 40-inch steam engine.

The rocks found in the sett are the millstone grit, mountain limestone, and silurian rocks.

The workings are upon two veins, and extend about 1¾ miles in length, giving rise to many varieties both as to the form of deposition, and also as to quantity, in some places presenting a vein of solid galena 8 to 10 or 12 feet wide, and giving a produce of 80 per cent. of lead. In other places nothing but the finest thread, scarcely perceptible to the most experienced eye, is to be seen; while again in other places huge excavations lend proof to what would otherwise appear to be fabulous tales of large deposits met with and removed in times past, to the advantage of the district and the profit of the shareholders.

The two veins now being worked upon are parallel, and about 80 yards apart. They are worked from a large number of shafts, there being 15 used for winding, pumping, and footways; besides which several more are open for the purposes of ventilation. Levels are driven upon both veins at distances of 20 yards apart, and these communicate with each other, and with the shafts, which are all, with one exception, perpendicular, by means of cross cuts.

Ventilation.—The general ventilation of the mine is good. By this I mean, that, taking the whole range of workings between the two extreme shafts, in consequence of the large number of openings to the surface, and the frequent communication between the respective levels by means of sumps, together with the hardness of the ground, reducing the use of timber almost to a minimum, everything is favourable to a state of good natural ventilation. But while this is the case between the shafts in the direct line of current, the air in the ends of levels now being driven was dead, even when at no great distance from sump. Two samples of air were taken from ends.

W. 1. From the end of the north vein, 120 yard level, 35 yards from a sump, with two men working in it. Size of level 6½ feet high by 4½ wide. Character of rock, hard, dry, and silicious, with bands of shale.

W. 2. From end of the deep day or adit level. Driving towards the western boundary. This end is 70 yards in from a sump, with a sump hob sinking from the level above, directly upon this end. Two men. An accumulation of stuff in this level.

W. 3. Was taken from a level immediately between two shafts.

Travelling Ways.—Ladders are placed in several of the drawing shafts, which are divided in two parts by wooden casing. The ladders are about 8 yards long, and incline about 1 in 3. They rest upon wooden platforms in the shaft which extend the whole width, and leave only the manhole open. In the mine the roadways are generally good. In some cases, especially where the roads are carried over stopes and pitches in the bottom of the level, they require attention; the plank between the rails being narrow and weak, and in some instances altogether wanting. In one or two places the men have to walk up to their knees through water.

Changing Houses.—The mine is not so well provided in this respect as one would expect to find it. The principal house was formerly a boiler house. It is about 50 feet long by 21 wide. It is lighted and ventilated from the roof. The floor is of loose earth. It is warmed by means of a fire and tube, and also by the steam pipe from an adjoining boiler house passing through to an engine house adjoining. The number of men changing here is 200. The house is dark and dirty. Besides this house there are several other smaller ones, for about 20 men each, in various parts of the mine, but none of them more comfortable than the larger one.

Dressing Floors.—These are several in number. Only men and boys are employed. The principal floors are roofed in. The other floors, which are used by equally as many persons, are not roofed in. There is no place provided for the men to dine in.

There is no sick club. The men pay one penny per month each to an accident club, and the company pay an equal sum to the same. In case of a man receiving an injury, the managing committee award him a gratuity varying in amount at their discretion.

A doctor at Wrexham contracts with the men to attend them and families at the rate of 6*d.* per month per man.

The price of candles and powder is 6*d.* per lb. each.

Boilers.—Saw eight boilers in use. They were all Cornish tubular boilers. They were all provided with a safety valve, several of them having two, one with a weight, the other attached to a spring indicator. They were each provided with a steam gauge, water gauge, glass tube or cocks, and a swimmer connected with a weight, showing height of water in boiler, or with a steam whistle, which is brought into operation when the feed is low, and continues pouring forth its shrill sound until the engine man has remedied the evil.

In connexion with this mine, I called upon Edward Davis, Esq., surgeon, of Wrexham. This gentleman has a most extensive practice amongst the labouring community of the district, being the doctor to the Minera and other mines, Westminster colliery, several quarries, eight clubs, parish doctor, and one of the surgeons of the infirmary. He stated that the general condition of the lead miners of the district, so far as he had an opportunity of knowing, was good; that they lived well, having good proportion of animal food, were well lodged, though inclined to think a little over-crowded; and were not subjected to any peculiar disease, any more than the general population. He has promised to consider the cases now under his care, and will be very willing to give the Commission any assistance in their inquiry.

The number of accidents appear to be very small, he having had only six in that number of years.

SOUTH MINERA MINE.

Another lead mine adjoining the Minera, but only working on a very small scale. It is under the management of — Williams, Esq., 4, King Street, Wrexham, and gives employment to 23 underground men and 12 surface men. There are no dressing floors.

The operations consist in sinking the shaft, driving a day level from the hill side, and driving the 108 yard level.

The shaft is an oval one, now 130 yards deep, perpendicular the whole depth. It is divided into two parts by an air-tight wooden bratticing, the one part used for winding, the other for a footway. The sides of the shaft are walled with brick laid upon wooden curbs. The winding is by kibble drawn with wire rope. A skipway will be put in when the shaft is completed, and the men will be raised by means of it. The ladderway is in good condition.

The 108 yards level, driving south by 6 men in 3 shifts, is about 30 yards from shaft. It is driven 7 feet high by 5 wide; the ground moderately hard, with fair quantity of water. Sample W. 4 taken here, several hours after a shot. A changing house is provided for the men. It is a good stone building with a fire. The floor of loose earth.

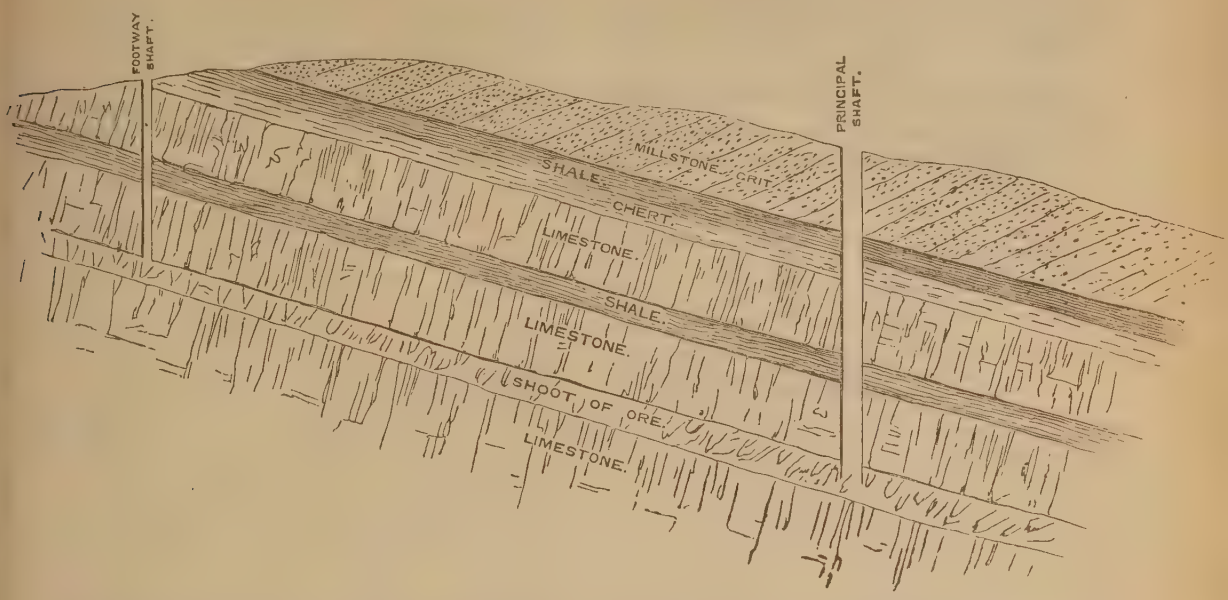
There is one steam boiler on the mine, recently new. It has two safety valves, and a glass tube to show the height of the water in the boiler. There is no steam gauge; but the arm of the lever, on which the weight of the safety valve slides, is graduated in pounds weight, showing at once the pressure of steam on the boiler. In this case it was 25 lbs.; but the two valves being under the control of the engine man, the actual weight on each valve was 50 lbs. He explained that his object was to prevent the steam blowing off.

PARK MINE.

Another lead mine adjoining the Minera, and under the same management as the South Minera. It has been very extensively worked upon a very valuable shoot of ore in the lower limestone rock, which has been followed as deep as the dip of the beds would allow the water to be drained by the Minera mine. The operations are now nearly at a standstill, waiting until a day level has been brought up

to drain the lower parts. This shoot of ore appears to be in connexion with a long line of caverns, in which runs for a considerable distane a subterranean river, emptying itself into the adjoining mine.

Sketch Section, showing the Strata and Deposit of Ore at the Park Mine, Wrexham.



All the workings have been upon this deposit, which in the western part of the mine comes to within 30 yards of the surface, while at the main shaft it is 140 yards. Between these two shafts the workings form a rough kind of incline plane, no ladders being required, steps being cut in the rock. The main shaft is 190 yards deep, and a level has been driven 150 yards beyond it, and about 50 yards beyond a rise. It is ventilated by a fan worked by a boy sending in air through a 40-inch zinc pipe. The fan is fixed about 100 yards from the end. Sample W. 5. was taken from the end of level, and Sample W. 6. from the pipe furnishing the air. Size of level $6\frac{1}{2}' \times 5'$ worked by two men.

Travelling ways. — There is a good ladderway in the principal shaft, but it is not used by the men, they preferring to use the footway shaft in the western part of the mine, which gives them only 30 yards of climbing, and walking through the old workings. This 30 yards of laddering is in a very bad state; the ladders perpendicular, very old, and, in many cases, several staves wanting. The levels through the old workings are small, showing a marked difference to those now being driven.

Ventilation.—The rock being hard, with very little timbering ground, and the frequency of swallows, are so many aids to good ventilation. The number of men working is also small, and consequently the quantity of powder used is trifling.

Dressing Floors.—The ore is found in a state of pure galena, scarcely at all mixed up with matrix or other mineral, and the amount of dressing therefore required is consequently small. The number of dressers is but six. There is a house for these.

Changing House.—A fair stone building in the mine without fire.

Rhoses Mawr Mine

Is a large lead mine in the Halkin mountain range, about 500 feet high.

It is worked by two perpendicular shafts, which are about 200 yards apart, and both intended for engine and drawing shafts. This mine, like most others visited, is overburdened with water, which interferes with the working of the bottom parts of the mine. Descended the new engine shaft, which is 120 yards deep, 12 feet long, and 9 feet wide. This shaft communicates with the vein at the 120, by means of a cross cut 8 yards long. A level is driven eastward on the vein to the other shaft. At a distance of 70 yards from the shaft another cross cut is driven south 7 yards long, at the end of which a sump or winze is sunk a depth of 5 yards. Four men were at work here in two shifts of 6 hours each. Sample of air, W. 10, taken here.

Sample, W. 11, taken from workings in the 120 yard level between the shafts. Men engaged in taking down the sides of the level.

Sample, W. 12, taken from the end, a cross cut from the 140 yard level, which was about 15 yards from a shaft.

Sample, W. 13. End of 140 yard level on the course of the vein; 25 yards from shaft; 4 men.

These were the only places accessible; all other workings being stopped by the water.

The ore found in this mine is of a very rich quality; and the character of the deposit is very interesting, more especially as showing some very sudden changes in the underlay of the rocks and vein.

Changing House.—A large stone building, without any fire. Loose earth floor.

Talargoch Mine.

Very extensive lead mines in the neighbourhood of Rhyl, giving employment to from 200 to 300 men. Here also, the water is the great difficulty to be contended with. All the sumps from the lower level being full, a pumping engine with 100-inch cylinder has lately been erected at Clive's shaft, and a level is being driven from this shaft through the whole length of workings. When this is effected the whole mine will be drained, and exploration resumed.

Visited with Lord Kinnaird, and took samples of air from the following places:—

1. End of 180 yard level, driving west from Clive's shaft to communicate with the workings in the western part of the mine. This end is being driven by 8 men, working in four shifts of 6 hours each, 6 feet high, and 4 feet wide. It is in limestone rock, 24 yards from shaft; and sample, W. 14, was taken $1\frac{1}{2}$ hours after two holes had been fired.

2. 180 yard level, driving east to communicate with the place last visited. At a distance of 40 yards from the end men were engaged in taking down ore upon tribute. The air here was coming down a sump from the 150 yard level. Sample, W. 15, taken.

3. End of great cross cut from the 180 yard level. This is driven about 200 yards from the level in limestone, by 8 men working in 4 shifts of 6 hours each, 6 feet high by 4 wide. Air is supplied by putting a door in the level to stop the air passing, and fixing the mouth of a pipe 8 inches square in the upper part, which carries the air to the end. On visiting the end, the quantity of air coming through the pipe was nil. Sample, W. 16, taken in the end, and W. 17, from the mouth of pipe in the level.

4. While walking through the 180 yard level, and especially while over sumps, a peculiar smell was experienced, very like that of sulphuretted hydrogen, and the eyes became affected, becoming very sore and watery. Sample, W. 18, taken where these sensations were most strongly experienced.

5. The western end of the 220 yard level, 80 yards west of the shaft, and 30 yards from a rise; 8 men in 4 shifts. W. 20.

6. In the eastern part of the 220 yard level, between 2 shafts, main current of air. W. 19.

There were several sumps down from 220 yard level various depths. These were all more or less filled with water, and men were employed in pumping them dry. When in work, I am of opinion the air would be close.

It would be very interesting and beneficial to this inquiry if Dr. Smith visited this mine, and examined the air more

minutely, especially as to the nature of the gases found in the 180 yard level.

Footways.—Throughout the whole of the mine the state of the ladders and passages were remarkably good.

Changing Houses.—A long stone building used for this purpose. They were low, dark, and dusty, arising from a loose earth floor.

Orsedd Mine.

A small lead mine near Holyweli, giving employment to about 20 men.

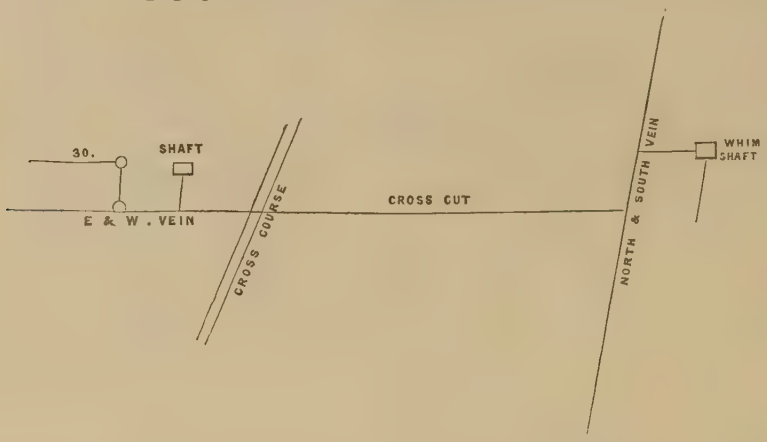
The mine is 100 yards deep, with two shafts; one small steam engine, with the men changing upon the boiler. The ladders in the whim shaft are used by the men to a depth of 30 fathoms. They are all in one length without any resting place.

Merllyn Mine

Is worked by a London Company, with Mr. John Watson as secretary and Capt. Sandow resident manager.

The number of men working underground is 14.

The workings are upon an east and west lode and a north aud south one. A shaft is sunk upon each of these and communicated by means of levels. The workings are 20 fathoms deep in the former, and 30 fathoms deep on the on the latter.



The workings are :—

1. Sinking whim shaft below the 30, by 6 men in 3 shifts of 6 hours each. This shaft is 7 feet long by 3 wide, used for winding,—a kibble and horse whim employed,—and as footway. The ladders are securely cased off from the kibble.

2. Driving level south from the 30, by 2 men working 6 hours. They are 15 fathoms from shaft, and 5 fathoms from a winze from the 20.

3. 6 men stoping the winze from the 20.

4. 2 men driving west on the east and west vein. The men change in the boiler-house, but the engine is not worked.

Went through all the workings of this mine. None of them are any great distance from the shaft or winze, and the air throughout was good. The ladders are in the whin shaft, and are cased off from the kibble way. There is scarcely sufficient room allowed for the ladders, only three by two feet, which cause them to be very steep until they reach the 20 fathom level, when they are on the footwall, and incline 20°.

Michell Mine.?

Adjoins the last mine, and is under the same management, and is only just being opened; 8 men being employed in sinking a shaft, working in 4 shifts of 8 hours each.

Garreg Mine.

Also under the same management. This is an old mine, but the workings are now being carried on in new ground.

The workings are—

1. Two men driving east in the 20 fathom level, about 40 fathoms from shaft. Air pipes carried to the end from the shaft.

2. About 15 fathoms behind this end, 4 men are rising towards the surface. They are 8 fathoms high. This rise is divided into two parts for air to ascend, go through the top and down the other side.

3. Two men sinking a winze in this end; now 3 fathoms deep.

4. Four men driving north from an old shaft in another vein.

5. Two men driving south of another shaft 7 fathom deep.

The time at my disposal would not allow of my visiting the underground workings of this mine.

Trelogan Mine.

A large sett recently taken by a limited liability company, having Mr. Martin, of Mold, as secretary. Very extensive workings have been opened out by the former workers, but the shafts are small and the level low and narrow. The operations now in progress are—

1. Driving a level from the Pen-y-frith shaft. The shaft is 25 yards deep, and from it a level has been driven 45 yards. There is no bratticing in the shaft, nor level above or below working. The air in the end was very bad; the men had left work, and it was with the greatest difficulty that the candle could be kept burning.

2. Driving a cross cut from the level on the course of the vein at Afon-goel shaft. The shaft is 21 fathoms deep; the level is driven 40 fathoms from shaft, and the cross cut is 10 fathoms from level. The level would not average 3 feet in width nor 4½ feet wide, and as might be expected the air was very bad. In each of these places the ground is hard and dry.

3. Clearing up an old shaft, only 20 fathoms deep. The footways are very steep, and in the first shaft there are no proper sollars, and in the second shaft it is only one ladder.

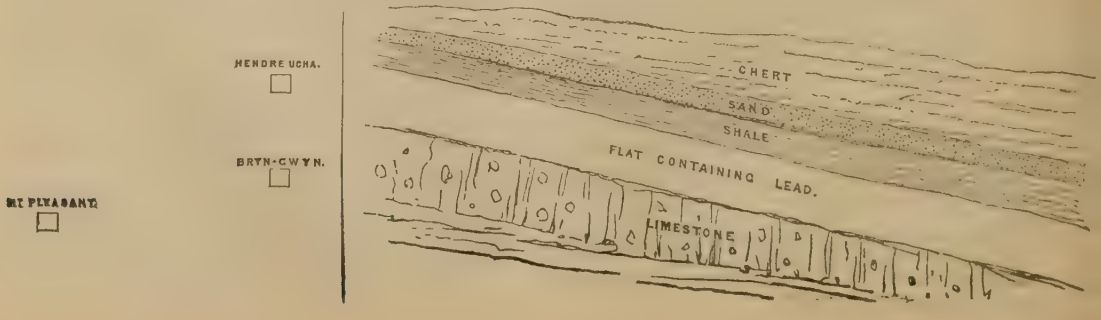
The men go home in their underground clothes.

Bryn-gwyn Mine.

A lead mine in the Mold district. F. Field, Crown Court, secretary, and Captain Nottingham, on the mine, manager. This and the two adjoining mines, Hendre Ucha and Mount Pleasant, are working upon a deposit of lead ore, which is found in a large flat, traversing the three sets. The ground dips very fast eastward, and all the water naturally drains off.

The mines are worked from one shaft each, but the workings, which may be considered as being all upon one plane, an inclined one, communicate with each other, and so assist the ventilation in each.

Sketch Plan and Section, showing Relative Position, and Strata of these Mines.



The ore is found in lumps of solid galena, which only requires washing to get rid of the clay about it to render it fit for the market.

The shaft in Bryn-gwyn is 84 yards deep, 6 feet long, and 4 wide, divided by tight casing into two parts, one used as a ladder way for the men, the other as a winding shaft. The ore is drawn up in kibbles by horse whim and hemp rope.

A very good room provided for the men to change in.

The number of men working underground is 19.

Hendre Ucha.

Worked exactly as the last from one shaft, which is 84 yards deep, and used for winding and as a ladder way. The manager is Captain Ivelgilga, Waen, near Mold.

The number of men underground is 12.

Mount Pleasant.

Could get no information, there being no person on the mine.

Axton Lead Mine.

Seven miles from Holywell, a new adventure, with limited liability, E. Marshall, Esq., Britannia Works, Birmingham, Managing Director, with Woodehouse and Jeffcock, of Derby, Engineers.

The operations consist in sinking an engine shaft, which is 108 yards deep, by 12 men working in 4 shifts of 6 hours. The shaft is 9 feet diameter, and is bratticed to the 60. The air at the bottom must be close, the men were not working in consequence of an accident, a report of which follows.

There were two boilers of good construction, each having two safety valves, and a steam water gauge whistle.

The men change upon the boilers.

Axton Mine.—Fatal Accident.

On the 24th July a fatal accident occurred at this mine, resulting in the death of Ellis Pritchard, a miner 50 years of age, engaged in sinking the engine shaft. This shaft is perpendicular, sunk through beds of limestone, for the purpose of cutting the vein in depth. It is now 108 yards deep and 9 feet diameter, divided by wooden bratticing for a distance of 60 yards, and furnished with ladders to this depth. Below this the shaft is open and without ladders of any kind, the men being lowered and raised in a kibble drawn by a flat hemp rope by a horizontal steam engine. The number of men engaged in the shaft is 12 working in 4 shifts of 6 hours duration.

At a depth of 50 yards from surface a flat or lodge is cut and the men come up to this lodge every time a hole is fired, and there wait till they can descend to their work again.

It appeared from the statements of Capt. S. Evans and of Evan Evans, who was the comrade of the deceased, that they in company with a third man went down to their work at six o'clock in the morning, and shortly before twelve, their holes being ready to fire, they went up to the lodge at the 50 yard, and that after hearing the report of the explosion the three men prepared to descend in the usual manner, standing upon the rim of the kibble and holding by the rope. The act of stepping on the kibble would naturally give it a swinging motion, there being no guides of any kind to steady it; and on this occasion, immediately after starting, and before they had descended half a dozen yards, it struck against the side of the shaft and jerked the unfortunate man from his standing-place, causing him to be precipitated to the bottom of the shaft, and instantly killed.

It also appeared that about a year ago this same man was at work in this shaft, and an auger or borer fell upon him and cut his right hand very severely between the fore finger and thumb, causing him to be disabled for 6 weeks, and that since then he has complained of a weakness in his arm and hand.

During the morning of the accident, while holding the borer, he observed to the man Evans, who was beating it, "That something had taken his hand like rheumatics;" and it was found upon recovering the body that his fingers were black.

The poor fellow leaves a wife and 9 children, 6 of whom are as yet totally unprovided for.

I examined the whole of the machinery, and found everything well arranged.

The system of men stepping from a level into a swinging kibble, as well as the habit of riding in the manner described, cannot but be considered, as it has proved to be, highly dangerous, and one which it is to be hoped will be checked for the future.

Maes-y-safn Mine.

This is the largest lead mine in the district, and is under the management of the Messrs. Taylor and Sons, Captain Ninnis being the resident agent.

This mine is opened upon a large vein, which has been very productive; and the working dates back for many years. The present company has had it only for two years.

After going through the mine the conclusion forced itself upon me, that the workings had not been opened out in so satisfactory a manner as could be wished. The levels were in all cases, where driven through unproductive parts of the vein, low and narrow, ignoring the principle that good levels are necessary for good ventilation, and consequent economic working of a mine. For many fathoms, both in length and depth, the travelling can be called nothing better than scrambling: for though the present management has put all through the mine good sound ladders, with sollars as convenient as possible, yet the contracted size of the levels and passes quite prevents anything like a good footway.

For the general working and ventilation of the mine there are four shafts down, besides two inclined planes.

Samples of air were taken as follows:—

W. 7, from the 250 yard level driving west from No. 4 shaft. It was 30 yards beyond ventilation, and the air was very dead. Two samples taken. A sump or winze was being sunk upon this end. In connection with this level there is a swallow, from which, after heavy rain, a large efflux of water takes place, bringing with it considerable quantities of gravel and sand, which partially closes the level.

A rise also going up from this end; 4 men in the en and 4 in the rise, working in 2 shifts of 8 hours each.

W. 8, two samples were taken, one from the bottom and the other from the back of the end of the 310 yard level going east from No. 4 shaft. It was about 30 yards from shaft; 6 men working here.

Another end was driving from an incline shaft towards the end visited. A distance of 60 yards has to be driven through when there will be communication between.

W. 9, was taken from the bottom of No. 4 shaft as the air was coming down the shaft, to enter the workings and ventilate them.

Travelling Ways.—From what I have said upon the general state of the mine it will be seen that these are not so good as they should be in a first-class mine. The ladders are all safe, but in many cases there is not rope enough.

Changing Houses.—About 100 men change upon the boilers attached to No. 4 engine-house; the rest change in a house which is set apart for the purpose. A new house is repuired which shall accommodate all the men.

Boilers.—There are two classes of these to be seen,—the old ones left by the former proprietors, and which are being gradually replaced by new ones. The latter are of the most approved kinds, having two safety valves to each, gauge to show the pressure of steam in the engine-house, and swimmers to show the height of water in the boilers, and connected with a steam whistle which calls attention when the feed is low.

Westminster Mine.

Under the management of Captain Floyd.

The principal work now is in the part known as the Bog Mine. There the shaft is 120 yards deep, and is used as a pumping, winding, and footway shaft, and is still being sunk. Winding by kibbles and chain. Two pairs, of 6 men each, have just commenced driving at the 110. All the other men, 50 in number, are picking over all the old workings.

Boilers.—Two boilers to the engine, each with feed cocks, and a swimmer in one.

Changing-house.—A stone building, no fire, loose earth floor.

Cefn Cilcin Mine.

This is a series of single shafts sunk in various parts of the set, with men driving upon different veins, none of which communicate with each other. The number working underground is 30.

These shafts are from 80 to 115 yards deep

I am inclined to think that the ventilation in these mines is generally poor, and especially so at such times as when the external air is damp and heavy with little or no wind; and upon inquiry it appears that the men have been on several occasions totally unable to work here.

There is no steam engine on the mine, nor changing-house for the men.

The manager is Mr. Hector.

Bryn-Gwiog and Long Rake Mines.

These mines are lead mines, in the Halkin Mountain Range, and are worked by London companies, having Mr. Dunsford for secretary, and Capt. F. Evans as manager.

They are both in similar strata, limestone and accompanying rocks, have been worked by previous companies, and have a great deal of ground opened in the upper levels.

Bryn Gwiog employs about 80 underground men. Of these 12 men are sinking the shaft, which is now 90 fathoms deep; 28 are exploring the bottom level westward, and the others are employed in raising ore from the old working.

Visited and took samples of air as follows:—

W. 47. From the western end of the 75 fathom level, 50 fathoms west of engine shaft, and 20 fathoms from a rise. The end is driving by 8 men working in 4 shifts of 6 hours each, and carried 6½ feet high by 5 wide.

Between this end and the rise spoken of there were two pairs of men of 4 and 8 each working in pitches in the back, and one pair of 8 men sinking a winze.

W. 48 was taken from one of the pitches in the back, in which 4 men were working about 2 fathoms above the level, and which was 3 to 4 feet wide.

W. 49 was taken under the winze where the air would be purest, and which would give the air as it came down to supply all the men in this level.

W. 50 was taken from the bottom of the shaft.

All these samples were taken just before the time of midday relief, and before the shots had been fired.

Travelling ways.—In no place could the ladderway be pronounced good. In going through that part of the mine worked by the previous proprietors, the passes were small and levels low, while in the new part the ladders were only temporary ones. The passes require to be enlarged, and more inclination given to the ladders. A little attention is also required in the footway over some of the sumps.

Changing houses are provided for the men, but with the exception of the shaft men, the miners use them very little, wearing their underground clothes from home, and changing there after finishing their labor.

Dressing Floors.—The spalling under cover, all other operations exposed.

Long Rake.

In consequence of a stoppage of the pumping engine, the water was in the bottom of the mine, and the work stopped.

Pary's Mine.

In the island of Anglesea, near the town of Alnwick, is a copper mine under the management of the Messrs. Taylor and sons, with Captain Vivian as resident manager. The workings have been carried on by different bodies of proprietors for above a century; the earlier operations having taken the form of an open cast upon a large mass of low produce ore, leaving an excavation 200 fathoms long, 40 to 65 fathoms deep, and from 30 to 65 fathoms wide. The later workings have followed the deposit in depth where it contracted in width, but increased in thickness; and the present party commenced operations at the 100 fathom level and have proceeded to sink Gwen's shaft, to put in new pitwork and skip way, drive the 112 fathom level on the course of the vein, and sink winzes below the 100 and 112. From this it will be seen that the main body of the men are working in these two levels.

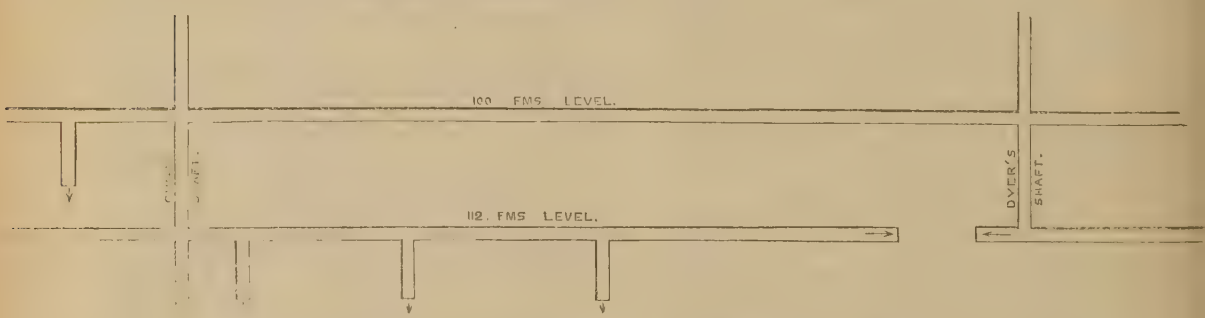
Visited with Lord Kinnaird most of the workings, and took samples of air as follows:—

W. 28. From a pair of stopes going east and west from a winze between the 100 and 112 fathom levels. Length, 12 fathoms; 7 to 8 feet wide. 6 men in 3 shifts working in each end. Two holes in each end had been fired within a quarter of an hour.

W. 29. From the western end of the 112 fathom level 35 fathoms beyond Gwen's shaft. A winze is sinking from the 100 to come down on this end; 6 men in 3 shifts in the end and in the winze.

W. 30. Winze sinking below the 112, about 10 fathoms east of Gwen's shaft down about 4 fathoms, 8 feet long by 4 wide. Six men.

Sketch section showing the workings in and below 112 fathom level.



W. 31. From main level in 112. Air between 2 shafts; they supply air to all the workings.

W. 32. From the 90 fathom level, where 4 men were working on a south branch of the lode, 35 fathoms west of Gwen's shaft.

These samples would give the fair average state of the air in the various workings through this mine. This season of the year is against natural ventilation, and at that time there was no communication between the two shafts in 112 east. This has now (second visit) been effected, though even since this the air has been so dead as to drive the men from the 112 workings; but ventilation has been restored by pouring large quantities of water down the shaft.

The ladders and travelling ways were in very good condition.

The dressing is performed by 58 men and 70 girls. They were mostly in open air, but there is a good supply of shedding for their use in wet weather. The girls are allowed to use the sampling house, and a small house for retiring to for dinner.

The men change at home.

Mona Mine

adjoins Pary's mine, and is worked for copper by a very old company.

The deposit of ore must have been an enormous one, judging from the extensive and large underground excavations and the huge burrows on surface.

The present works consist of 3 exploring parties numbering 30 men, and 125 men working on tribute in various parts of the old mine, who are scattered very much about.

Visited and took samples of air as follows:—

W. 52. A cross cut driven south from the new shaft at a depth of 60 fathoms; the level then driven for a length of 30 fathoms to the lodes, and 10 fathoms on the course of it. End driving by 6 men in 3 shifts. Air dead.

This is the only working from this shaft. No cross cut above or below. There are air pipes from the adit level to bottom of shaft, 8 inches square, but are not of much, if any, use in improving the ventilation.

W. 53. From a level driving from Cairn's Shaft at the 44 fathom level, about 25 fathoms in. Two pairs of men working here, one of 4 men driving the end, and 4 men working in a tribute pitch. No communication with level above or below. The object of driving is to communicate with old workings and so to open out the intermediate ground. These workings are ventilated by air pipes brought from the 30 fathom level down the shaft. The end of the pipe in the level is placed by the side of a trap door, which is between two shafts. The door was not tight, and consequently no air was going down the pipe. This sample taken in tribute pitch.

W. 54. Taken from the end. Air very dead indeed. Candle scarcely burn. Men working.

W. 55. Taken some time after when a boy had been working a blower in the level above connected with the pipe and forcing air in.

W. 56. Was taken at the place where the machine was working. This machine consisted of a piston with two valves opening inwards, working horizontally in an air pipe by a boy. A fan would be more efficient.

W. 57. Cross cut at the 60 fathom level from Charlotte's shaft. The end was about 20 fathoms from shaft. Six men.

The men work in 6 hour shifts single-handed, and blast with straws.

The price of candles is 1*s.* 2*d.* per lb., and of powder 1*s.* 4*d.*

No changing house.

The men pay 6*d.* per month to the doctor and club, receiving attendance and 5*s.* weekly in case of accident. There are 22 persons receiving pensions varying from 16*s.* to 20*s.* per month. The agents report this as coming from the mine, but as accidents are very rare, and the men get no benefit in case of sickness, either the club fund must be in a very prosperous condition, or these pensions come from it. As no account is rendered of this fund, a very common feeling exists that this should no longer be the case. This has arisen from the fact that the adjoining mine has recently changed hands, and previous to the retiring of the former proprietors no account was given of any balance that might be in hand.

There are 60 girls at work on the floors, earning from 7*d.* to 10*d.* per day, and 25 boys, getting 10*d.* to 1*s.* 4*d.* per day.

The ladder-ways in the shafts were steep and small. In the old workings the men principally walk over rough inclines, as the lode lays very flat.

General Condition of Miners in Anglesea.—The men earn from 35*s.* to 50*s.* per month. According to Dr. Hughes, surgeon to the Pary's Mine, the men and families are most healthy, are well lodged and fed. Consumption, asthma, and rheumatic affections almost unknown. But Dr. Parry, who has practised in Amlwch 15 years, and was for some time the Union doctor, described them as in a very wretched state. Badly fed and wretchedly lodged, the men and their families are constantly suffering from disease. Consumption, fever, or some other disease in nearly every house.

Went with him to about 100 cottages scattered about the Pary's mine, and inhabited by miners. I should scarcely think it possible to conceive anything more wretched or miserable.

In nearly all cases the dimensions of the whole house was 20 feet long by 12 wide, generally of one room, with a door, and two or three windows from 12 to 18 inches square, but not made to be opened.

The roof was thatched, without any ceiling, and the floors of earth. No outlet or convenience of any kind to be seen or heard of. A cesspool in front of every house, and a heap of rubbish to keep it company.

In these miserable hovels families from 3 to 9 members were living and sleeping. Mother, father, grown up sons and daughters, all mixed together, and observing none of the decencies of common life. No wonder that disease and death should prevail; and of all the houses visited more than one half had some member ill of some illness or the other.

A change for the better is happily to be seen in some newly built cottages, where the roofs are of slate, the floors of flags or boards, and the building containing two or three rooms.

Symmdde Dylluam.

A copper mine about 10 miles from Carnarvon. Captain Julian resident manager.

Visited with Lord Kinnaird and took samples of air as follows:—

W. 22. From the 40 fathom level 10 fathoms from Whim Shaft, about 20 minutes after 2 holes had been fired; men working in two 8 hour cores.

W. 23. From a sump or winze 3 fathoms below the 40 level, and 6 fathoms from shaft. Six men; 3 cores.

W. 24. From a rise about 5 fathoms above the 40 fathom level. Four men in 2 cores.

W. 25. From the 35 fathom level. Four men.

W. 26. From the 70 fathom level in the western part of the mine. fathoms from shaft.

W. 27. From a winze 2 fathoms below the 56 fathom level. Three men in one shift.

The men work single handed.

Ladders pretty good, but in some places very inconvenient.

The wages in this mine are high owing to the demand for labour in the slate quarries adjoining. Some of the men live at Carnarvon, and these sleep in a house adjoining the office, which is much too small, very dirty, and badly ventilated.

Coed Mawr Pool Mine.

A lead mine about 4 miles from Llanrwst. The workings were very limited in consequence of the great quantity of water which overpowered the machinery.

Visited with Lord Kinnaird and took samples of air as follows:—

W 20 b. From the 15 fathom level from the Footway Shaft. A cross cut was driven 10 fathoms south from the shaft, and the level was driven from this cross cut 2 fathoms west. Four men in two 8 hour shifts. Air poor.

W. 21. From end of the 10 fathom level driving west of Mallett's Shaft, and now 17 fathoms from it.

The levels are smaller than generally found. Ladders safe.

There were some sheds for the use of the dressers.

Lisburn Mines.

A group of lead mines near Aberystwith, under the management of Messrs. Taylor and Sons. Mr. Henry Thomas, of Aberystwith, general manager.

Visited Glayvawr Mine, accompanied by Lord Kinnaird.

Is 103 fathoms deep, with 54 men underground. The workings are upon one lode, and are ventilated by three shafts to the 56 fathom level. Below that there is only one shaft.

1. Western shaft, 31 fathoms deep.

2. Skinner's shaft, 120 fathoms east of Western shaft to the 103. The surface rises going eastward, so that the mouth of this shaft is 30 fathoms higher than that of the Western shaft.

3. Lug shaft 40 fathoms east of Skinner's shaft. 26 fathoms deep.

Visited and took samples of air as follows:—

W. 33. From a stope going east in the 88 fathom level worked by 4 men on tribute, about 3 fathoms above the back of the level 20 fathoms east of shaft. A communication with the level each end, but one just closed to prevent the stuff falling down into the level below on blasting. It had been closed some few minutes.

W. 34. From the western end of the 103 fathom level driving by 6 men working in 3 shifts of 8 hours.

The end is 45 fathoms west from Skinner's shaft, and 25 fathoms from a rise driving towards Reddith's winze, which is coming down from the 88, and is now about 5 fathoms short of it.

W. 35. From the bottom of Reddith's winze sinking by 6 men in 2 shifts. The accompanying sectional diagram shows these two places.

W. 36. From the western end of the 73 fathom, 140 fathoms from Skinner's shaft and 40 from a winze, driving by 4 men, 7½ feet high by 4½ wide. No holes had been fired for some hours. Air pipes were in the level, but very little air passing through them.

W. 37. From the western end of the 58 fathom level fathoms from Skinner's shaft. Air pipes were also in this level, but as they were carried 20 fathoms in an easterly direction in the level above, and then down a winze 15 fathoms long and then west for 20 fathoms, and as there was no fan or motive power of any kind, the amount of air brought in or carried out was quite a minimum quantity.

Ladders very good both with regard to safety and ease.

No changing house.

Dressing floors only partly covered in.

In addition to these works on the lode, a party of men were engaged driving a level on adit, from the hill side to intersect the lode at a greater depth than the present adit, which would serve the purpose of exploring the ground and afterwards as a channel for the water to flow through. Visited the end and took sample W. 38. Driven 30 fathoms north, 5 fathoms east, and then 6 fathoms north, in all 41 fathoms from mouth, 6 men, 7½ feet high by 5½ wide. No shots for some hours.

A new shaft was being sunk in another part of the set, and was about 9 fathoms deep. Men complained of the air. Air pipes appeared at the top but only went down a few feet. An old barrel was placed upon the pipe to catch the air, but was of very little service being nearly to pieces. Holes had been just fired. Went to the bottom, but was unable to remain there, in consequence of the smoke laying.

W. 39. At the Loggy Lass Mine there was a long level known as Level Vawr being driven in from the hill side to serve as an adit and also to explore the district. It has been driven 365 fathoms to the first vein and then 86 fathoms to the next vein and then fathoms to the present end. Workings have been carried on upon the veins with shafts to surface.

The end is ventilated by a fan worked by a water wheel, the pipes being within 15 feet from the end. Sample W. 39 taken in the end.

The broken stuff was in a heap higher than the mouth of the pipe, interfering with the delivery. End 7½ feet high by 5 wide.

It must be noticed that this period of the year (July) is very unfavourable to good ventilation. The exterior temperature is very high, on this day, being 90° F., and very little or no breeze.

The air in the mines was generally dull.

Cwm-Erfin Mine.

A lead mine under the management of Messrs. Taylor and sons.

Visited with Lord Kinnaird and took samples of air as follows:—

W. 40. From a crop cut in the 32 fathom level, 50 fathoms from a shaft with no other communication with other levels.

W. 41. From the eastern end of the 32 fathom level driving by 4 men in 2 shifts of 1 hours each, 7 feet high by 5 wide, 35 fathoms beyond a rise and 25 beyond a winze. It is 8 fathoms beyond a rise now going up to level above driving by 4 men, 4 yards high. A pair of men are also sinking from the level above to meet these, who are 4 yards deep. These two parties expect to communicate in 9 weeks.

W. 42. From the rise.

W. 43. From the eastern end of the 20 fathom level 140 fathoms from shaft, and 52 from a rise driving by 6 men. There are 4 men sinking a winze 7 fathoms behind the end; 4 holes had been recently fired.

W. 44. From a stope in the back of the 20 fathom level, 20 yards long. Several openings to level above and below. Worked by 6 men, 4 in the morning and 2 in the afternoon.

Ladders good and easy.

No changing house.

East Darren.

Adjoins the last mine, and is under the same management.

Visited with Lord Kinnaird and took samples of air.

W. 45. From the western end of the 104 fathom level. 45 fathoms from Taylor's shaft; 4 men in 2 cores, size of level 7 by 5.

W. 46. From the eastern end of the 80 fathom level 30 fathoms beyond a winze. A rise going up 26 fathoms behind the end which is up 10 feet. The end is being driven by 6 men, working in 3 shifts of 8 hours.

Ladders good and easy.

No changing house.

The following mines in the neighbourhood of Aberystwith were also visited:—

Abernant.—No person on the mine.

Aberyffwd.—Suspended.

Rheidol United.—Capt. Ridge; 32 underground men.

The following drivings were being prosecuted; 6 men driving Gwaithcoch level; end is 130 fathoms from shaft. Ventilated by waterfall in shaft, having a fall of 30 feet, 6 men driving. Nantglass level 40 fathoms beyond old workings. Price of powder and candles 6*d.* per lb. The men pay 6*d.* per month to the doctor. The manager being away, I could not go underground.

Gelli-rheiron.—Capt. Northey. 18 men underground; 6 men sinking engine shaft, which was then 30 fathoms deep.

Two men driving Burn's level eastward, 70 fathoms beyond the stopes.

Ten men stoping.

Fourteen people dressing.

Snailbeach Mine.

Visited in company with Lord Kinnaird, Sir Philip Egerton, N. Kendall, Esq., and J. F. Campbell, Esq.

Large lead mines about 11 miles from Shrewsbury, under the management of Mr. James Ray Eddy, of Carlton Grange, Skipton, and Capt. Henwood, underground agent.

The workings are upon one large main vein, and one or two branches of the same, and extend in length about 90 yards east of Chapple shaft, and about 400 yards west of the engine shaft.

There are three shafts open as follows:—

1. *Chapple shaft* is about half a mile west of the eastern boundary. This is a new shaft sunk in ground recently added to the sett, and the workings only extend 80 yards east of it. It is 340 yards deep from surface, and perpendicular, cutting the vein at the 280 yards level. The mouth of this shaft is 60 yards higher than that of the engine shaft, owing to its being situated in higher ground. It is 9 feet long by 7 wide, and used as a pumping and drawing shaft. The drawing is done by skips drawn by 1¼ inch wire ropes.

2. *Engine shaft*, 720 yards west of Chapple shaft. Is perpendicular to the 282 yards level, where it cuts the vein, and is continued from there to the 402 yard level, following its course and underlaying south 2 feet in a fathom.

This shaft is circular and 10 feet in diameter while perpendicular, and the diagonal part is 12 feet long by 6 wide; engine and drawing shaft. Winding by two kibbles, drawn by flat wire ropes 3½ inches by ⅝ths, which pass each other in the perpendicular part of the shaft when in operation.

3. *Old engine shaft* is 120 yards north of the last one, and is down to the 252 yards level. It is perpendicular. The new shaft was sunk to save the cutting of cross cuts in the deeper levels. This shaft is now used as a footway shaft, and occasionally for sending down tools and timber as far as the 150 yard level, it being divided off to that depth, but below the whole shaft is used as a footway.

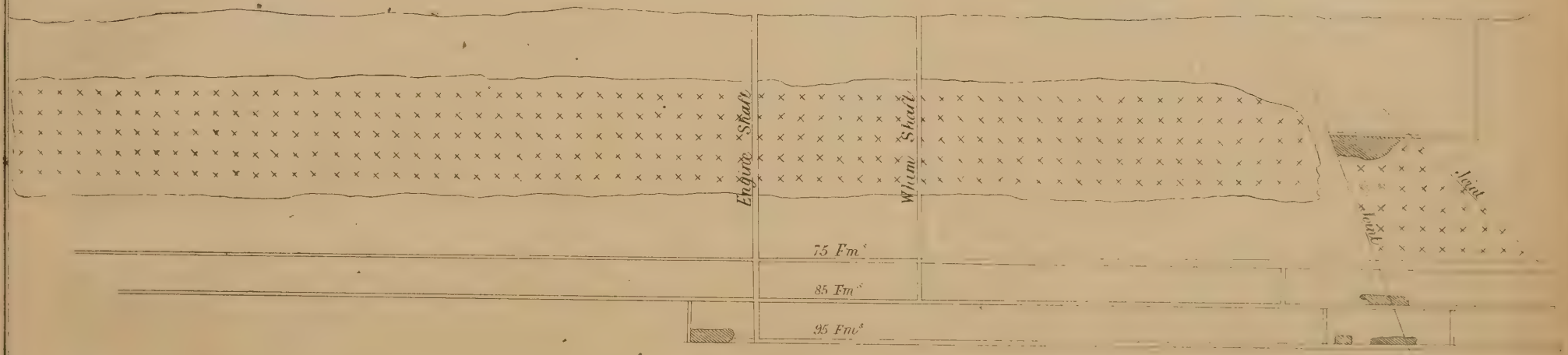
It is circular, 10 feet in diameter, and in consequence makes a most capital ladder road, there being plenty of room, plenty of air, and easy ladders. I do not think it possible to find a more easy or safer footway. The ladders are in 10 yard lengths, including 7° to the 150 yard level, and 10° below that point. They rest upon wooden platforms or sollars, which occupy the whole space of the shaft, leaving only an opening sufficiently large for a man to go through, so that each platform forms a good and safe resting place. A considerable difference is to be noticed in the exertion required to climb the ladders upon changing from the lower to the upper ones, greatly to the favour of the former ones. Workings consist of driving several levels and cross cuts, and taking down ore in tribute and tutwork.

1. 212 yard level driving east towards Chapple's shaft and about 37 yards from it; 6 men in 3 shifts of 8 hours. The end is about 30 yards beyond a winze, which communicates with the 282 yard level, which is through to Chapple's shaft.

2. 252 yard level driving east of Chapple's shaft and about 100 yards beyond it. No communication with other levels. This level is about 22 yards south of Chappel's shaft, connected by a cross cut. From this shaft being higher than the others, it is generally an upcast. A door is

DYLIFFE MINES.

SECTION ON LLECHWEDDU LODE.



Old Workings

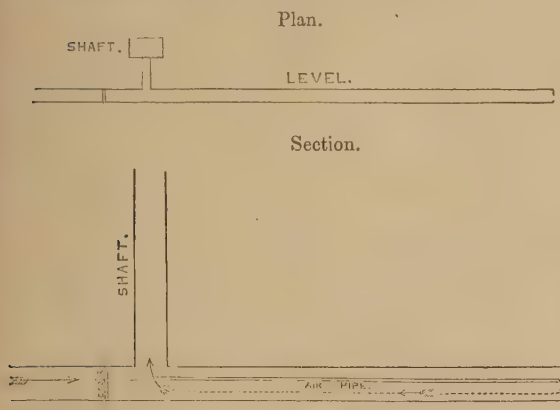
Present Workings

SCALE 40 FATHOMS TO AN INCH

placed in the level west of the cross cut, and the air so drawn from the end, a supply being furnished by means of a pipe through the door carried in the roof of the level close up to the end.

The air in the end, however, was very dead, owing to there being a partial stoppage of the shaft in the form of a platform to protect the men sinking in the bottom of it.

Sample W. 65 was taken from the western side of the door, and W. 66 from the end, 2 hours after a hole had been blasted and while 2 men were at work.



Sample W. 67, was taken from Thomas Lee's tribute pitch in this level between two shafts about 3 hours after a hole had been fired.

3. 282 yard level; 30 feet east of Chapple's shaft. 6 men.

4. 312 yard level; Chapple's shaft is not down to this level, but preparations are now being made to sink it. The eastern end is 105 yards beyond a sump from the 282. Six men.

Sample W. 64 taken in this end an hour and a half after firing, and while 2 men were working. Temperature 64° F. The level was choked with accumulations of ore.

5. 342 yard level. Eastern end 480 yards from engine shaft and 44 yards beyond a sump. 6 men.

This level was partially choked with ore and deads, there being only a clear height of 4 feet. Air at end dead. Sample W. 63 taken there.

6. 342 yard level. Western end 360 yards from shaft, and 150 yards from sump. 6 men. Air close and flat. Sample W. 58 taken here half an hour after shot. 2 men in end. Sample W. 59 was taken from under the sump, air coming down.

7. 372 yard level. 135 yards east of engine shaft, and 90 yards east of sump. 6 men. Sample W. 60 taken here. Temperature 65° F. There was a small boog in the end, in which the candle would not burn. W. 61 was taken from this boog.

8. 402 yard level, driving east and west of engine shaft, about 2 feet each way. No men working when visited, but took sample W. 62.

9. 112 yard level. A cross cut from Chapple's shaft, south towards Eddy's vein, 76 yards long. 6 men. 7½ feet high by 7 wide.

All the levels in this mine are driven a good size; they being 7 feet high by 6 feet wide in all cases. The result upon general ventilation of the mine is most beneficial, and consequently upon the economical working.

Raising ore in stopes.

1. Above 242 yard level; 10 men between the last sump and the end.

2. Above 312 yard level; nine men between sump and shaft.

3. Above 282 yard level; 9 men.

4. Above 230 yard level; 6 men.

The rest of the men are working on tribute ground in various parts of the mine. The total number underground is 206.

Changing houses.—A row of sheds about 70 feet long by 10 wide, divided into 6 houses. The roofs are very low; no ventilation; floors of loose earth and houses dusty. An iron pipe runs through them all, with a fire in one end. There is no provision for the men's washing themselves.

Dressing Floors.—There are several floors. All dressing done by men and boys. Some portions are covered in. There is a small house for the men to dine in in wet weather, but it is small and uncomfortable.

There is a benefit club in connection with the mine known as the Snailbeach Miners' BenefitSociety, which is managed by a committee elected annually from among the men, which conducts all the business of the club, and renders an account of all moneys received and expended each year.

The sums paid are 9*d.* per month for each man earning 1*s.* per day, and 6*d.* per month for those earning less than that amount. But this is reduced to 6*d.* and 4*d.* a month, when the balance in hand amounts to 150*l.* For this each man receives 7*s.* per week in case of sickness or injury, for a period of six months; 5*s.* 6*d.* for the next twelve months; and after that period until the termination of his illness 4*s.* 6*d.* per week.

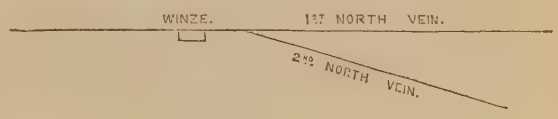
In case of the death of any member, each adult pays the sum of 6*d.* and each junior 4*d.* to the funds, from which the widow or nearest relation receives 4*l.* The same levy and payment is also made when the wife of a member dies.

Roman Gravels.

A lead mine, 14 miles from Shrewsbury, under the management of Capt. Vivian. Visited it in company with Lord Kinnaird.

This mine is worked from the engine shaft, situated at the northern extremity of the workings, and is 60 fathoms deep. It is perpendicular, 8½ feet long by 5½ feet wide. The shaft is divided, one part used as engine and footway shaft, the other for winding. The ladders are in lengths of 4 fathoms, quite perpendicular, and are very difficult to climb. The winding is done by kibbles drawn by wire ropes.

Workings.—1. 6 men on the second north vein in the 6 fathom level, 72 fathoms from shaft, and 20 fathoms from a winze; size of level 7 × 4 feet. This level runs along side of another level driven on the first north vein.



It is 20 fathoms from a winze, while the other is 30 fathoms. At the time visited the end was very close and smoky; the smoke coming from a hole which had been fired from the end of the first north vein about one hour and a half previously. The air was coming down the winze and keeping the smoke in the two ends. Sample W. 68, taken in the second end where men were working.

2. 4 men on the first north vein in the 20 fathom level, 6 fathoms from shaft and 8 fathoms from winze.

3. 4 men in the 20 fathom level on Gravel Vein, 40 fathoms from winze. This end was close. It was supposed to be ventilated by air pipes communicating with a waterfall running from the 6 fathom level; but the pipes were a long way from the end and in a very poor state, and the level was choked with stuff. Sample W. 69 taken here.

4. 9 men sinking a sump in the first north vein going down to the 40, now 6 fathoms deep. Sample W. 70 taken here.

5. 4 men in 40 fathom level on Gravel vein, 48 fathoms from shaft, 20 fathoms from winze.

6. 4 men in 40 fathom level on first north vein, 40 fathoms from winze.

7. 4 men driving a crosscut from Roman gravel, 6 fathom level, to Sawpit vein.

50 men on tribute in various parts.

There are 30 boys and girls on the floors.

The jigging machines and buddles are not covered in.

The men change upon the boilers.

There is a club to which the men pay 6*d.* per month, receiving 5*s.* per week when sick; they pay also 8*d.* per month to the doctor, receiving medical care only for themselves and not for their families.

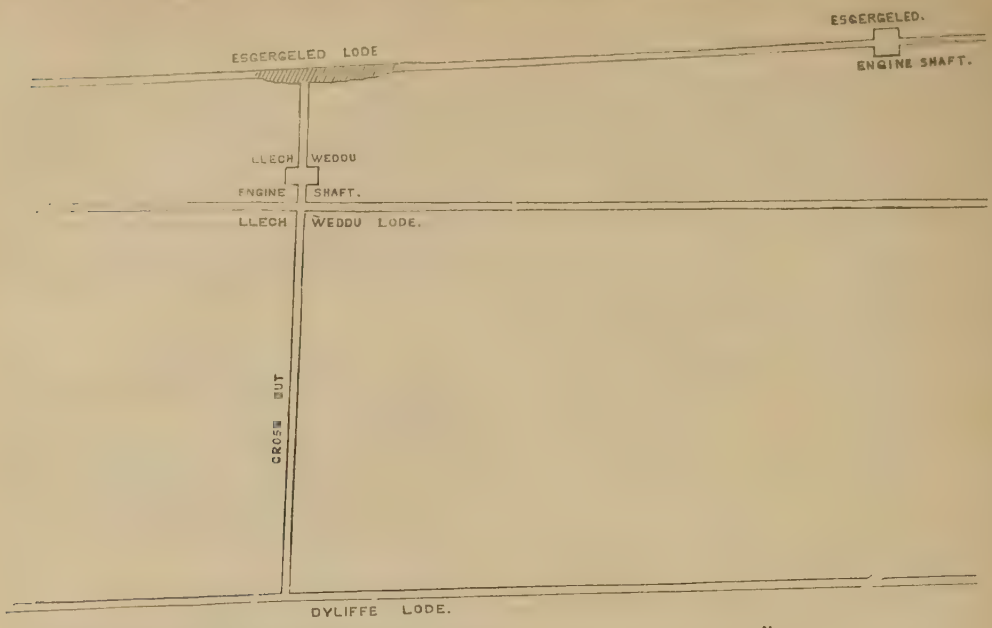
(*See lithographic section on Llechweddu Lode.*)

Diliffe Mines.

Large lead mines about 10 miles from Machynlleth. John Bright, Esq., M.P., chairman of the Company, and Messrs. Taylors, managers. 250 men underground when in full operation.

The workings are upon three nearly parallel lodes, converging as they run westward, each one worked upon from independent shafts, and forming a distinct mine.

Sketch map showing position of lodes, and the workings on Esgergaled lode from Llechwed-du engine shaft.



I. *Llechwedd-du-Lode.*—This is the middle lode. From the accompanying section it will be seen that the mine is worked and ventilated by three shafts.

1. *Engine shaft* is 250 fathoms east of the western boundary, and sunk to the 95 fathom level, the bottom level of the mine. It is a perpendicular shaft, 10 feet long by 8 feet wide, and used for pamping and drawing purposes. Ladders are placed in this shaft, but the men ride up and down in the drawing cage described hereafter.

2. *Whim shaft,* 50 fathoms east of the engine shaft, sunk on the course of the lode to the 85 fathom level, and underlaying north 1½ feet per fathom. It is 7 feet long by 5 wide, not used for any purpose, but kept open for ventilation.

3. *Eastern shaft,* 170 fathoms east of the Whim shaft, is an air shaft sunk to the 35 fathoms level, cutting into the old stopes which reach from this level to near the 75 fathom level.

Workings.—The upper part of the mine has been worked out by former proprietors.

The present party are driving as follows :—

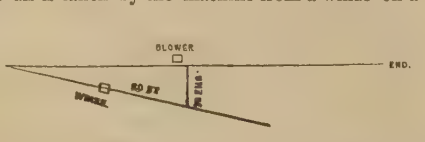
1. 95 *fathom level east.* 6 men. 10 fathoms beyond a rise to the 85. Size of end, 7 feet high, 5 feet wide. 3 shifts of 8 hours.

2. 90 *fathom level west.* 6 men. 30 fathoms beyond a rise to the 85. Suspended owing to the water being in.

3. 85 *fathom level east.* 6 men. 10 fathoms beyond winze to 95. This end just over the 95 end.

4. 75 *fathom level east.* 6 men. 80 fathoms beyond a winze to the 85 level. 3 shifts of 8 hours. The air in this end is bad. To assist the men a blowing machine is placed in the level, 50 fathoms from the end, which is worked by a boy, two boys being attached to this party for the purpose; so that the machine is working 16 in every 24 hours.

The air is taken by the machine from a winze on a side lode.



Sample W. 72, was taken in the end, while the blower was not at work, and after it had been idle for some time, but as the men were working. Temperature, 60° F.; and sample W. 73, after the machine had been worked for some time. Temperature, 57° F.

Pairs of men to the number of 32 belong to stopes in the bottom of the 95 level; but these men all stopped owing to the water being in. A pair of 12 men stoping in the bottom of the 35 level, 45 fathoms west from air shaft.

II. *Dyliffe lode* is the south lode, being 350 fathoms south of the Llechwedd-du-lode. The surface of the country rises towards the south, and a crosscut has been driven from Llechwedd-du to the Dyliffe, cutting the latter at the 60 fathom level. The men walk, and the ores are carried through this tunnel. There are 38 men working underground in this part.

There are two shafts.

1. *Waller's or Boundary shaft,* close to the western boundary. It is perpendicular. 72 fathoms deep and 8 feet in diameter. Used as a pumping and drawing shaft.

2. *Engine shaft,* 212 fathoms east of boundary shaft, and 120 fathoms from eastern boundary, is also perpendicular, 85 fathoms deep, and varies from 7 to 10 feet in diameter.

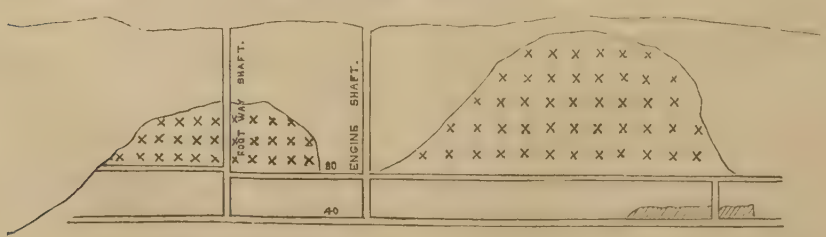
The workings are

1. *Two crosscuts* from boundary shaft south to cut the lode. One at the 62 is 3 fathoms in, driving by 6 men, the other at the 72 is 5 fathoms in, also driving by 6 men.

2. 85 *fathom level west.* 6 men. 35 fathoms from engine shaft. No rise. Sample W. 74 taken here.

3. 75 *fathom level west.* 6 men. 96 fathoms from engine shaft. A communication just opened with the 65 over the end. Before this the end was very close.

Section on Esgergaled Lode.



Old workings.

Present workings.

Scale 40 fathoms to an inch.

III. *Esgergaled lode* is 40 fathoms north from Llechwedd-du lode. There are 14 men working underground.

It is worked in two parts.

1. *Western part*, worked by a crosscut from Llechwedd-du engine shaft at the 25 fathom level. The crosscut is 40 fathoms long, and the lode is worked away east for 20 fathoms and west 2 fathoms. The workings are ventilated by a duck machine worked by the pump rods in the shaft. Sample W. 71, taken from the western end half an hour after a hole had been fired.

2. *Eastern part*, worked from the Esgergaled engine shaft, which is 100 fathoms east of the crosscut. The lode has been worked to the 30 fathom level by the former proprietors. The present party have driven a 40 fathom level 80 fathoms east of engine shaft and 60 fathoms west. The drivings are now stopped; 14 men are stoping away the ground east and west of a winze in the eastern end of the bottom level. The engine shaft is perpendicular, 9 feet long by 6 wide. A footway shaft also goes to the 40 fathom level, 30 fathoms west of engine shaft; it is perpendicular, 6 feet long and 4 feet wide. The ladders are in 5 yard lengths, inclining about 2 feet.

State of the levels.—The levels in all cases were driven 7 feet high, and averaging 5 feet wide. Places visited clear of stuff. This produced a good effect upon the ventilation of the mine. The ladders were all in a very good condition, and the timbering also firm.

Machinery.—Very good winding machinery in use. In all the levels tramroads are laid down. The waggons are filled at the places the mineral is being worked; and these waggons are raised to the surface in an iron cage, similar to the cages in use at the best collieries. These cages are all fitted with Aytoun's patent catches, which are self-acting when the rope breaks. The load is drawn by steel wire ropes 1″ diameter, having a breaking strain of 27 tons, and costing 65*s.* per cwt. One rope has been in use for two years. A very ingenious contrivance is in use to prevent accidents from over winding. The rope after passing over the pulley on the poppet heads, passes through a strong iron ring, and has at its end a short piece of iron chain, which is attached to the chain by means of a spring hook, so arranged that when the hook is drawn through the ring, the lower part being larger than the hook is compressed in passing through it, causing the upper part to open when the pin which holds the chain gives way, and the cage becoming detached falls down until caught by the safety catch.

Drawings of cage and hook are appended.

Dressing Floors.—Very well laid out for ensuring greatest convenience to the workpeople. They are very well provided with good dressing houses, a very small number indeed being exposed to the weather.

Changing House.—A very commodious house is provided for the men to change in. Well lighted and ventilated.

The cottages of South Wales are very little, if any, better than those found in North Wales.

In the neighbourhood of Dyliffe, in consequence of the scarcity of cottages, those in existence are very much crowded. In many cases lodgers are taken, where there is not really room for the members of the family, giving rise to much overcrowding,

I also found cases where two sets of men, working in different coirs, slept in the same bed.

As might be expected, fever was raging to a great extent in the district.

Camborne, Cornwall,
My Lord, 1st Nov. 1863.

I have visited the mines in the Isle of Man, and some of the mines of the Cumberland and Cleveland districts, for the purpose of taking samples of air, according to directions received from your lordship, and beg now to submit my report upon the same, together with sections of the workings at Laxey and Greenside mines.

I am, &c.,
The Right Hon. Lord Kinnaird, K.T. C. Twite.
Chairman of Royal
Mines Commission.

Foxdale Mine.

Lead mine, giving employment to about 200 men.

The workings are upon one lode, which is very wide, and of a very soft character.

The mine is ventilated by two shafts.

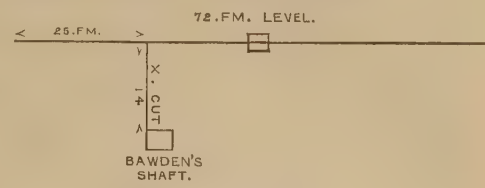
1. Engine shaft, 10 feet long by 8 feet wide, divided into two parts, one of which is used as a pumping shaft, and the other as a drawing shaft.

2. Bawden's shaft, sinking to the 86 fathom level, 11 feet long by 8 feet wide, to be used as a pumping and drawing shaft. Both shafts are perpendicular.

These shafts are perpendicular, and are about 100 fathoms apart.

Air was taken as follows:—

W. 75 from the western end of the 72 fathom level driving on the south part of the vein. The end is 25 fathoms beyond Bawden's shaft, and 40 fathoms beyond a communication with the levels above and below.



W. 76 from the stopes between the 72 and 86 fathom levels. 6 men in the stopes. Ground opened through.

W. 77 from and of cross cut driving south to Bawden's shaft in the 86 fathom level. The mouth of cross cut is 95 fathom west of engine shaft, and there are communications open both with level above and level below. 4 men in 2 cores of 8 hours.

W. 78 from the western end of the 100 fathom level, 35 fathoms from the engine shaft driving by 6 men in 3 cores.

W. 79 from the eastern end of the 86 fathom level, 90 fathoms from engine shaft, 30 fathoms from rise, and 60 from winze, end driving by 2 men.

W. 80 from the eastern end of the 72 fathom level, 15 fathoms beyond a rise, driving by 2 men. The men had just left their work.

The levels are all driven high. The lode being soft necessitates the use of a great deal of timber: this appeared to be generally in good state.

The ladders in engine shaft, and in the rises were all sound, and inclined at an angle of 18°.

The boilers are provided with water gauges and steam gauges.

The men change at home.

Laxey Mines.

Very large lead and copper mines under the management of Captain Rowe. The workings are all upon one vein, and reach a depth of 212 fathoms.

The vein is wide, and the levels all driven good height, averaging 7 feet. The ground being hard very little timbering is required.

A large proportion of the men were working in the stopes, raising ore, and consequently a large amount of blasting was going on, and a great deal of smoke found in the mine.

The ventilation was effected by two shafts, one the engine shaft, also used as a drawing shaft, going to the 212 fathom level; the other only used for winding, going also to the same level. The ladder way in the latter shaft is not cased off securely.

Samples of air taken as follows:—

W. 81, from the stopes in the roof in the southern part of the 100 fathom level, 2 parties of 4 men were working here. The working was 7 feet above the level, the men standing and working upon the stuff which had been broken from above.

W. 82 from the southern end of the 165 fathom level, 2 parties of men working here. Sample taken 15 minutes after a shot had been fired. Air was brought into the end from a distance by means of air pipes, but the current was very feeble.

W. 83, from the north end of the 212 fathom level. The men had left work some time, but another party was about to commence, if not prevented by surface duties.

W. 84, from the bottom of engine shaft, in the 212 fathom level.

W. 85, from the northern end of the 110 fathom level, air pipes were also laid in this level, but very little air indeed came through them.

The surface arrangements were very well marked. All the ore is dressed by men and boys, and is mostly done under cover.

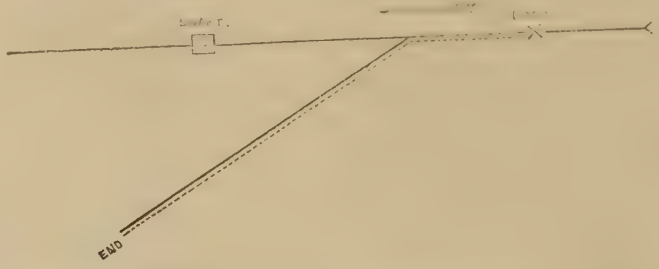
Coniston Mine.

About a mile from Coniston village, under the management of Mr. Barret. The workings are upon four parallel lodes, the workings upon each connected with the workings upon the other by means of cross cuts driven from the adit level. Upon the first vein or old mine the workings

are carried to a depth of 150 fathoms. The principal operations are in the 110, the 130, and 150 fathom levels.

In the 150, only a few fathoms of ground have been driven from the engine shaft. In the 130, a series of sumps are in course of sinking, varying from 9 to 14 fathoms in depth, which will be intercepted by the 150 fathom level at some future time. Two shafts down to this level. Sample W. 87 was taken from the deepest of those sumps, 30 fathoms from new engine shaft. The sump was 12 feet long by 4 feet wide, and there were 3 men engaged in sinking it, working 8 hours per day. Temperature 64°.

W. 86 was taken from end of a side cross cut, called Grey Craig Cross Cut, driven from the Grey Craig level between its mouth and a shaft communicating with the surface, the distance between being 110 fathoms.



A door is placed in the main level, 80 fathoms from its mouth, and pipes carried from there to the end, a distance of 150 fathoms, two men working here 8 hours per day.

Temperature 55°.

The men blast by straws.

Ladder roads.—In the shafts good, inclining 18°. They are in the engine shaft, which is divided from the kibble shaft by a 5-inch wooden casing.

Several of the ladders in the winzes in an insecure state. The deep sumps in course of sinking were without ladders, and the pieces of timber put in to assist the men in climbing were much too far apart, and very insecure. In several levels old sumps left quite open in the roadway, and as the smoke laid very heavy in the mine, these were sources of danger.

The men change at home.

The dressing floors only partly enclosed.

Tilberthwaite Mine.

Also under Mr. Barrett's management, about two miles from Coniston.

The operations consist in driving a long adit, the end of which is 550 fathoms from the mouth; and being driven by six men working in three shifts of eight hours each.

Ventilation is assisted by pipes five inches square, connected with a water jet at surface, having a fall of 30 feet.

No timber required.

Sample W. 87b taken one hour after blasting.

Goldscope Mine.

About three miles from Keswick, and about one mile from Derwentwater; under the management of Mr. B. Plummer.

The Goldscope vein is a very large one, making in some places, 18 to 20 feet wide.

The mine is worked by one shaft, 90 fathoms deep, communicating with the surface. There is also an adit level opening to the hill side, and also communicating with some old workings in other veins.

The ground is very difficult to keep open after the lode is worked away, requiring heavy timber; and as the dry rot affects it very much here, the timber requires renewing very often.

The shaft is small, so that only a small kibble can be worked. The ladders between the pumps and kibble are not cased of, and this is the general footway below the 60. The winzes small. In the places where the men put in their own ladders or semples they were badly placed.

Samples of air taken as follows:—

W. 88. In the stopes below the 60 fathom level, 2 men. No shot had been fired here, but the place smoky from men below. The whole width of level taken away, only a plank to walk upon.

W. 89, from the south end of the 90 fathom level; here from the shaft two side levels driven, leaving bar of ground between. End 6½ feet high by 4 feet wide, 6 fathoms from shaft. 2 men.

W. 90, from the bottom of the shaft. 3 men.

W. 91, from the south end of the 60 fathom level, 2 men just going to fire; this end is 22 fathoms from winze, and beyond the stopes where W. 88 was taken. In consequence of there being no road over these stopes the end was full of deads.

Lodging houses are provided on the mine, and largely used by the men. The accommodation consists of a sitting room and two bedrooms; in the first of these, which is 15 feet long, 9 feet wide, and 9 feet high in centre, there are three beds, in each of which two men sleep; it is lighted and ventilated by a small window 2 feet high by 1½ feet wide. In the other room, 20 feet square and 12 feet high in the centre, there were nine beds, in each of which two men slept.

This room had a larger window, and there was also a hole in the wall, about eight inches diameter. Neither of the windows would open.

The house was of stone, the walls unplastered, but whitewashed. The roof was not ceiled.

The rooms were dark, dirty, and close, the bedsteads of wood, and the bedding consisted of coarse linen bags filled with straw or chaff, a blanket or two, and the men's overcoats.

In the sitting room, a good fire provided. There was no place provided where the men could wash themselves, neither did the men appear to change their clothes on coming up from the mine.

Castlenook.

Adjoining Goldscope, and under the same management.

Samples, W. 92 from the bottom of the shaft, 28 fathoms deep, sinking by six men in two shifts.

W. 93, south end of the 10 fathom level, driving by four men in two shifts, nine fathoms from rise. End 6½ feet high by 4 wide. Stuff at least 4 feet high, for a length of 12 to 14 feet from end.

The men use the lodging house at Goldscope.

Greenside Mine.

Near Ullswater, a large lead mine, worked by a series of adits driven in from the hill side.

The workings are upon one large vein, which varies in width from 2 feet to 20 feet, and in some places reaches a width of 40, and even 70 feet. The ore is found in ribs in the vein, and is worked out, leaving the poorer parts standing.

The ground is hard, requiring little timber, is very dry, and the workings dusty.

Samples of air taken:—

W. 94, from the south end of engine pump, between the Low Horse and the 36 fathom level, 12 fathoms below the horse level. The working was 23 feet wide; two men working.

W. 95, from a rise three fathoms above level, worked by two men.

W. 96, from the headings north of engine sump, 20 fathoms below the horse level, five fathoms from current of air.

W. 97, from sump below 36 fathom level, north of engine sump; four men working, one hour after shot.

Visited also the end of the Glenroy level, which is carried 200 fathoms beyond ventilation. Only one shift work here; The men had just left, and the end was full of smoke. It is undoubtedly a very close place.

There were very few men at work in the mines, owing to its being Monday, and a very rough, stormy morning. The men live long distances, 8, 10, or 12 miles from the mine, owing to the want of houses near; they go home Friday and return on the Monday. There are lodging houses provided for them to sleep in during the week. Visited one which was 12 × 14 × 10 feet, and contains 16 men; it was deficient in ventilation.

VIII.

REPORT ON MINES IN THE ALSTON MOOR DISTRICT. By Captain W. H. Rowe.

Mines Newtownards Co. Down,
My Lord, Ireland, 10th February 1863.

At your request I have lately visited and reported upon the lead mines of Alston Moor, the rocks of which it is scarcely necessary to say are geologically termed the Carboniferous Limestone and Millstone Grit. Throughout this well-known district the hills are literally "riddled" by the adit or day level system of mining, either crossing or on the course of the veins. These levels, smaller drifts, and workings are in some cases of great extent, and so connected that it is possible to find one's way from one side of and through a ridge of hills, to the other side, a distance probably of more than 3 miles, attaining a "cover" or depth from surface of from 20 to 100 fathoms.

Levels or working, some distance from the main current, are either ventilated by the double drift plan, communicating, if above, by rises about every 20 fathoms, or, which is the same in principle, bringing the draught through air-tight boxes or pipes as the workings advance. This last is generally the method adopted to ventilate the forehead or forebreast, and, together with other contrivances for forcing air to the workings, have been referred to in my reports.

It may not be out of place to remark in conclusion, that anyone accustomed to mines, where the health and safety of the workman are not overlooked, cannot but be struck with the rude and neglected state of the travelling ways in most of the mines of Alston Moor.

I remain my Lord,
Your very obedient and faithful servant,
(Signed) W. H. Rowe.

Right Hon. Lord Kinnaird.

Nentsbury Green Lead Mine employs 8 men below ground and 6 at surface, and is an adit or day level, the mouth of which is close to and at the level of the High Road from Alston to Nenthead, near and not many yards above and to the east of the Nent river. The level is driven in a north-easterly direction (on what is called the Hagsfoot vein) for a distance of 400 fathoms, height 6 feet, width 4 feet, arched and timbered where necessary also rails for waggons. Three cross veins are intersected by this level "Old Carrs," "Middle," and "Wellgill cross vein," the latter is at the extremity of the distance named, and is that on which the main level is continued both north and south 400 fathoms in each direction, these communicate in the first instance with the "High rise" day level, and southward into the Broomsberry day level. On this last driving about 200 fathoms south, and in and about the Wellgill vein are 3 partnerships of men (2 in each), raising ore: in every case not far from the main level, where there is a current or draught passing in one way or other (north or southward) according to the direction of the wind or state of the atmosphere outside. I should here state that at about 30 fathoms west of the extremity of the N.E. driving is a shaft to the surface (about 50 fathoms to the top), so far, therefore, as the main level is concerned, this is an addition in the matter of ventilation. The point of most interest in this mine is that of the fourth or last partnership of men (2 only). These are driving a level eastward from the Wellgill vein, about 8 fathoms above the main day level, and driven about 50 fathoms, with the intention of intersecting a vein named the Brownhill cross vein, supposed to be about 5 fathoms further east; the arrangement for giving air to this forehead is a "trap door" directing the draught into iron pipes (5 inches diameter) fixed at the main level, and continued to within a few yards of the forehead; the air coming from the end of the pipe was scarcely perceptible, temperature of air at the forehead 59°, that of the rock dry 57°; the men work 8 hours, blasting immediately before leaving, the place remaining idle for the rest of the day; size of the working 5 feet 6 inches high, and 4 feet wide; climbing way from the main level is up a rise about 13 fathoms, (6 by 5 feet) old wooden staved ladders insecurely fixed on platforms at about every 15 feet, partly rotten and broken; the way is then along a small drift to the top of the *pass*, 5 fathoms below which is the east driving described, the lower part of which is used to convey the broken stuff to the main level. Poles or sticks are fixed across the upper part of this pass at every 3 or 4 feet, so as to reach from one to the other instead of ladders. There is no shed or covering at the washing floors, and the hands are only occasionally at work.

Grassfield Lead Mine is an old adit level mine about half a mile south of the former, and employing the same number of men at surface and below-ground; the main level is driven about 400 fathoms in a southerly direction into the hill, several surface shafts communicating with it and its branches. Between the mouth of the level and the southernmost shaft, little more than half-way from the former, are 4 men, rising into the limestone in search of lead ore. A zig-zag hole (3 feet by 2), about 4 fathoms in height, water percolating through the ground from some old working above, bringing with it the softer parts of the rock, and making the place very insecure, timber insufficient, the air is however good, probably on account of the proximity of old workings and crevices, which may indirectly communicate with the surface, the temperature of air 58½ in the extreme end of the working (4 feet 6 inches by 2 feet 6 inches wide), about 6 or 7 fathoms from the main current or draught. Another party of 4 men at the western extremity of this right, and adjoining the "Galligill Syke" mine, are working 5 fathoms below an adit level, close to the forehead, which is distant from the mouth of the level in a south-west direction 120 fathoms; there is no communication affording natural means of ventilation here. An air machine worked by a boy is stationed about 30 fathoms from the mouth, it is simply an iron fly-wheel (5 feet diameter), encircled by a belt working a circular fan, sheave of which is 3½ inches, pipes (5 inches dia.) are conducting the air from the machine to the top of the sump, but not continued down, and the blast is weak; no ladders in this sinking, which is 5 feet by 4 feet, 3 inch rope and windlass in fair condition. Temperature of rock at bottom of sinking 56·30, air 58, the roof of the level is for the most part secure. There are no "shops" connected with these mines, and the dressing department at Grassfield is only preparatory, the stuff to be finished is taken to the Nentsbury Green washing floors.

Galligill Syke Lead Mine, 3 miles east of Alston, and ¼ of a mile south of the Nent river, 25 men working below ground and 1 man and 9 boys on the "washing floors," consists of 2 veins running east and west, about 17 fathoms apart, worked by means of adit levels extended west into the hill about 360 fathoms. The main level through which the mine is entered is commenced on the northernmost of the veins, and at a distance of 110 fathoms turns south (a cross cut across) to the southernmost, the first level, however, continues on, and by means of another cross cut at a higher level 200 fathoms from the first cross cut, a communication is effected with the extreme west workings on the south vein; thus far is the track of the draught or current, which now turns back again to the east on the south vein drivings, &c. till within 25 fathoms of the first cross cut where there is a sump to a level 13½ fathoms deeper, another sump is sunk to this level further east a short distance which serves as the ladder road to this low level, the current goes down the first sump and along the low level eastward 110 fathoms to and through a shaft to the surface (shaft 20 fathoms deep), which is termed the air shaft. This describes the general ventilation of the mine. The majority of the men are working within a short distance of the first named sump on the south vein above the higher level. An average specimen of these workings is a party of 3 men, about 10 fathoms above level and draught; temperature of air here was 59°, the drift in which they are working 5½ feet high and 2½ feet wide; the average depth from surface to this part of the mine is about 40 fathoms. In the deeper level 4 men are driving a forehead west of sump 35 fathoms, level 5½ feet high and 3 feet wide, temperature of air in forehead 56°, no air machine. The ladder way to this level (before referred to), is 5 feet diameter; the ladders are made of 2 inch by ⅝ iron ⅝ round iron staves, 1 foot wide and 1 foot apart, 6 in number, 14 feet long, each bolted together, light wooden stays at each joint, but no platforms or "sollar" for the whole length of 13½ fathoms; both sump and ladders perpendicular. The timber supporting the roof over the sump is in fair condition, and this may be said of the timberwork through the levels generally, which are high good levels. A wooden house on the washing floors serves as a shelter for the boys, but is not a sufficient protection from bad weather.

Hudgill Burn Lead Mine, mouth of the adit level about ¾ of a mile N.W. of Galligill Syke Mine. This level is driven in a south and south-easterly direction intersecting several veins, on which are old drivings and workings of great extent; on the east this level is holed (or said to be), to the Galligill Syke mine; there is a perceptible draught going in that direction, and from the great extent of old workings and number of branch drifts the present workings are well ventilated. A line drawn

from the mouth of the level in a south-west direction 300 fathoms would represent the adit cross-cut to the veins, from this another in a south-east direction 360 fathoms, running obliquely through the several veins (four in number), would reach the innermost workings now in operation. This is a sump about 5 fathoms in depth, not far from the regular draught at the bottom of which is a 5ross cut north 4 fathoms, then a drift east and west 8 fathoms in each direction; here the temperature of air was 35½, that of the rock 52°; 4 men are driving and stoping the sole of the drift; there are no ladders in the sump, the men go down and up by means of a windlass; going back again north-west, and scattered over a distance of 175 fathoms in the old workings on the different veins are 4 more companies of men, making the total number working above, below, and in this level 16 men, the depth from surface about 30 fathoms. An average of these places was a drift 5½ feet by 3 feet, about 8 fathoms from draught; temperature of air 53° and 52°. The main level will average about 6 feet high by 4 feet wide, ground firm, or where necessary, supported. West of the mouth of this level about 220 fathoms is a shaft sunk from surface about 38 fathoms deep, at the bottom of which 9 men are engaged boring towards the forehead of a deep level, which has been driven south from a Whimsey shaft, on the line of what is called the "Teesdale cross vein," a distance of 190 fathoms; this level is drained by and is a continuation of what is known as the "deep level from Lovelady shield shaft." The object of "boring" I believe is to drain the shaft as well as endeavour to discover its position in regard to a *rise* made from the forehead of the "deep" level. No men were working during my visit to the mine in this level, in the expectation that the boring would soon inform them the relative position, when a communication could afterwards be more readily effected. About 40 fathoms north of the Whimsey shaft is a ladder-road through a *rise* 5 feet diameter; the ladders and stages are at short distances. The washing department is of no importance, a man and 2 boys dressing ore in the summer season. There are no "shops" connected with either of these mines.

These mines were examined by me on 23rd September 1862.

Alston, 26th September, 1862.

Bentfield Lead Mine.—This mine may be described as now comprising an adit or day level about 550 fathoms in length, on an average about 7 feet high and 4½ feet wide, arched for a good distance at the entrance, and in those places where ore ground has been wrought, and also a 25 fathom level, which has been reached by means of a hydraulic engine, drawing or pumping the water from a shaft, through which the stuff is also drawn in small skips working in guide rods. This the engine shaft is situated about the centre of the above distance, or about 280 fathoms from the mouth of the day level in a westerly direction; continuing in the same direction till within 50 fathoms of the extreme end, is a shaft communicating with the surface, from the mouth of the day level to and up through this shaft is the direction the draught or current of air takes under ordinary conditions of weather. In very fine and settled weather it comes down this shaft and goes out at the mouth; near the engine shaft is a "rise" or hole to the surface, but from being the way the pipes are conveyed to the engine, and other causes, does not affect in any way the draught between the points stated.

The present workings are all below the adit level, principally above the 25 fathom level, which has been driven about 25 fathoms east and 15 fathoms west of the shaft; in the roof of the latter are three partnerships of men, numbering 14 men altogether, and above the former are two men only; where these men work is a "rise" communicating with the day level about 20 fathoms east of the engine shaft. The direction of the draught, which I found weak in these workings, was through the engine shaft till it arrived to the roof or ceiling of the west workings, along which it is attracted by "deads" filling up the middle of the excavated ground, down through a small passage left open between the deads and unwrought ground along the 25 fathom level and up the last rise; the width of the workings, which is the size of the vein at that point, is 10 feet wide; west of shaft about 6 fathoms, and about midway between the two levels, I took sample of air marked "a," the temperature of the air 60°. The travelling or rather climbing way is through the engine shaft alongside the pumps; wooden ladders and staves, about 14 feet long, at an angle of about 80, "sollars" or platforms broken, no "casing" between the ladder way and the pumps, &c., staves of ladders 10 inches apart. Eight men are engaged sinking in two places further east than these workings, drawing the stuff by an ordinary windlass, but these do not require remarking upon.

The whole of the men employed below-ground in Bentfield Mine is 24, and 2 boys, earning wages from 12*s.* to 15*s.* per week, and 6*s.* to 9*s.* boys. There are also 12 hands on the dressing floors, but no covering or protection from the weather. A "shop" or sleeping room is over the smithy, 16 feet square, 8 feet high, in which 6 men and 1 boy sleep in 4 beds. A small window in front, 2 feet 10 inches square, roof unsound in many places. The rest of the men live in the vicinity of the mine.

Coal Cleugh Lead Mines.—West Allen River, Northiumberland, employs 250 miners The main low adit level is first a cross-cut southward upwards of a mile in length, then continued on the principal veins to a similar extent westward, the length from the level mouth to the inner-most vein, and west on this vein to the end and boundary, is about 2¼ miles, an excellent tram road, and levels well secured by arches, &c., throughout the main level and its branches; the great bulk of the men go and come from their work in waggons (called "vessels") for that purpose (as in most of the mines of the district), through this main level. By following the general direction and track of the draught we shall give a fair idea of the position of the levels as well. Entering at the level mouth, it goes along the cross-cut 620 fathoms to the flank level, to the first principal vein, viz., "Coal Cleugh" level and vein; here the current is divided, one part continuing through the cross-cut 330 fathoms further to the level and workings on "Barney Craig" vein, the other going west 500 or 600 fathoms on the Coal Cleugh vein level, and up through a whimsey shaft west of Coal Cleugh village. On the Barney Craig vein communication is made with Swinhope Mine on the east, and westwards by means of a whimsey shaft with Coal Cleugh top level; in case the current draws towards Swinhope, the draught enters at the latter level, the adit at Coal Cleugh village, then down the sump, and to east workings; by means of other surface shafts, shallower drifts, rises, and old workings of great extent, the draught is spht into a number of channels or divisions not easy to describe, nor are the details of which, I presume, necessary at present. The levels are of the ordinary size, waggon roads about 7 by 4 feet, others 5·6 by 3 feet, rises to workings and between levels 6 by 5 feet wide. I subjoin a sketch of an air machine generally used in this mine, (and worked by a boy), in order to give air to a rise or drift, before a communication has been made to cause a regular or steady current. When, however, there is a draught at the foot of a rise, for instance, the following plan is relied on to give air instead of a machine: the rise s divided or portioned into three divisions, the middle one is the climbing way, the passes on each side for the broken stuff to come through at the bottom of the rise, supposing the draught going in any direction, a trap door if placed between the climbing way and one of the passes, which when properly made, together with the casing on each side of the climbing way, on the principle of *bratticing*, does very well under certain conditions.

At the west end on "Barney Craig" vein I visited a rise upplied by a machine 25 fathoms distant, (where there is a draught), rise was only 7 feet above roof of level, and is 9 feet long by 4 feet wide; 4 men work here, (in two shifts of 8 hours per day; barometer here 28·32, temperature of air 67°, (thermometer touching the rock 63°); samples of air in bottle and tube E. Another rise further eastward also supplied with air by a machine, about 10 fathoms or 12 distant, height of rise 30 feet, no ladders, pieces of timber fixed across one end about every 4 feet, rise open and 9 feet long by 4 feet wide; barometer near roof of rise 28·26, temperature of air 70°, (thermometer leaning against rock 66°; samples of air in tube and bottle, both marked F. Tube of air G, was taken from an average of the "Engine Strings" workings in draught; barometer 28·32, temperature of air 63, thermometer on rock 60°. On the Barney Craig vein eastward, 20 fathoms above level, in draught, and 4 feet from roof of stopes, working 4 feet wide, the temperature of air and rock the same as last; the tube H was taken, barometer 28·08.

At the roof of a rise on the vein first named, 45 fathoms above level, barometer 27·98, temperature of air 63°, thermometer on rock 60°, the bottle I was taken here; ladders almost perpendicular, wooden staves 9 inches apart, no platforms for 18 fathoms; 4 men here. The bottle of air J, was taken from a driving going east on "Sun String," near Coal Cleugh vein, level 5 feet high and 6 feet wide, 8 fathoms from draught, temperature of air 60°, thermometer on rock 57°, barometer 28·1; 4 men working here.

There are no "shops" on this mine; miners coming from a distance lodge in the houses in the neighbourhood of the mine from Monday till Friday. One of these lodging houses I examined; it was clean, rooms airy and large. On

the washing floors there are good sheds for the hands to take their meals in, and also parts of the floors, grates for instance are covered.

The depth from surface to the inner workings of the Coal Cleugh low level is about 100 and 120 fathoms.

Derwent Lead Mines, Northumberland. The limited time afforded to me in my visit to these mines only enabled me to examine some underground workings of the principal section named "Taylors and Jeffries" shafts (on 3 parallel east and west veins,) and about 370 fathoms apart; the former shaft is sunk from surface to the depth of 136 fathoms, the latter about 125 fathoms these shafts are communicated with each other at the depth (at Taylors) of 75, and also at 100 fathoms deep, viz., by the "30 fathom level" below adit, and "50 fathom level." The mine is usually entered by an adit cross cut south opposite Jeffries shaft to a ladder road on the northernmost vein, which following the course and dip of some old workings, leads to the "50 fathom level," the angle of the ladders and way will probably average about 70°, platform at various distances, seldom over 15 or 20 feet apart, wooden staves and some well worn; below the 50 fathom level at Jeffrie's the ladder-road is through the engine shaft to the 80 fathom level, sollars or platform from 20 to 30 feet apart, shaft perpendicular, ladders at an angle of about 80°; at the 80 fathom level is a separate sump or winze for a footway to the bottom or 95 fathom level (ladders are however continued through the engine shaft as well). The ground over the winze top not having been sufficiently supported, a heavy fall of rock has made the footway for the present exceedingly unsafe. The 95 fathom level is driven west of Jeffrie's shaft, and this winze nearly 60 fathoms, level about 6 feet high, 4 feet wide, no machine or means of giving air to this forehead of any kind, 2 men are driving the forehead. Barometer here 29.4, temperature of air 66. Thermometer leaning against rock (which is dry) 64°. Specimen of air contained in bottle marked K. At the 80 fathom level a party of men are commencing to rise from the end of a cross cut north, ground heavy and wet. Returning again to the 50 fathom level, I then visited the 60 and 50 fathom levels east of Taylor's shaft; two foreheads are being driven at the latter level eastward on separate veins, one is 13 fathoms from draught, the other 20 fathoms, at this latter (the north level) driving by 2 men, temperature of air was 65°, barometer 29.12, thermometer leaning on rock 64°, sample of air in bottle marked L, levels 7 feet high, 5 feet wide.

The number of hands employed at the Derwent mines is 264, 120 of which are on surface.

This mine visited October 3rd 1862.

Brownley Hill Lead Mine, 4 miles west of Alston, and west side of Nent River, 42 miners, 5 waggoners; 5 men and 25 boys on dressing floors. An adit level going first eastward 230 fathoms, then northward (to Brownley Hill Vein) 175 fathoms, eastward (on the vein) 335 fathoms, to a north and south vein (called "Brownley Hill High Cross Vein") then southward on this vein 350 fathoms to an air shaft from surface 50 fathoms deep; in this last distance above and below level are the principal workings; the forehead is 50 fathoms farther south, ventilated by bringing an air course along the level from the bottom of the rise and continued to within a few feet of the forehead, by this means the general "suck" or draught of the mine has to come to the mouth of this air course, and back through it to air shaft; at the forehead barometer was 28.64; temperature of air 56°, rock dry, samples of air in bottles and tube S; 2 men work here. In a driving from the foot of a sump 4 fathoms deep, 8 fathoms northward (2 men). Barometer 28.72, Thermometer 62°, tube of air T, rock dry. Ore workings 8 fathoms above main level, 20 fathoms or more in length, several fathoms in height and about 30 feet wide, temperature 63°; barometer 28.68, tube of air O. Sump 20 fathoms deep (to "4 fathoms limestone") a level is being driven south of this sump 17 fathoms to forehead, supplied with air by a hand air machine, barometer here 28.84, thermometer 60°, thermometer in water 56°, (4 men). 4 men are also driving this level north of sump, a rise is however holed to the main level at forehead causing a current where they are working. Levels average 6 feet high, 4 feet wide. The main level is a little larger and is a good safe level, the greatest depth from surface to this "Brownley Hill" main adit level, is 90 fathoms.

On the dressing floors are sheds for the hands to take their meals in.

Mine visited 19th November, 1862.

Dougang Lead Mine, Nenthead, 20 pickmen and 10 hands on washing floors. The main adit level on the "Brigalburn" and "Dougang" veins is driven westward about 550 fathoms; depth from surface at the forehead 90 fathoms. A whimsey shaft back 120 fathoms from the forehead is 60 fathoms deep (from surface to level): though on the whole a tolerably good level it is in many places, where arched, small and crushed at the roof and sides, the nature of the ground being similar in this respect to the porphyries of this, the Newtownards lead mines; after a while contact with the air making it to swell or expand, and necessitating the arching to be renewed, or the level would be closed. The most important point in this mine is the main level forehead or rather forebreast, being 18 feet high and 20 feet wide, now driving by 6 men. The "deads" from this forebreast go to fill up behind, leaving an arched way for the main level about 6 by 4 feet, and a drift about 12 feet above, 4 feet high, 2 feet wide, for the air way. I examined this air drift for some distance and could find no observable draught or current going in any direction; the cause is probably either a stoppage in the air drift or shaft, the distance from a proper current, or the many other interruptions such a plan of ventilation is liable to. Temperature of air 60°; barometer 28·24, rock dry; specimens of air in 2 tubes "H H." Near the main level, and east of the "whimsey shaft" is a rise about 2½ fathoms high to a drift or working on a branch of the vein running about E.S.E.; forehead of drift about 10 fathoms from main level, and is about 2 feet wide; roof taking down back from forehead for a height of 15 feet; another drift at the top of this working leads again to the workings on main vein over main level; the draught enters by the first rise and through the higher drift returns to main level. Thermometer in forehead 58°; barometer 28·24; samples of air in two tubes marked H. 4 men work here. The rest of the men are working nearer the mouth of level, and also clearing a shaft and drift 3 fathoms deep at the mouth of another adit level, 400 fathoms to the east in good air.

Dowpot Syke Lead Mine, 2 miles S.E. of Alston; 4 men and 1 boy below ground. An adit level driven eastward 300 fathoms in length; at about half this distance is a rise to surface, the bottom of this rise is closed with the exception of air-boxes coming through and continued to a side drift running alongside the main level to within 50 fathoms of the forehead. At this point is an ordinary fan blast worked by a boy, and supplying the working with air. These are up a rise at the forehead, the first about 5 fathoms, 2 men driving a forehead about 11 fathoms from rise; size of drift not more than 5 ft. 3 in. by 2 ft. 6 in. Barometer 28.82; temperature of air 55°; tube of air Q. Two other men are driving a forehead, eastward from top of rise (10 fathoms above main level); air-boxes are continued to rise top. Barometer in forehead, 7 fathoms from rise, 28·78; thermometer 56°; tube and bottle each marked R: drift about 6 feet high and 4 wide; rise 6 feet by 4 feet; no ladders; pieces of timber in the sides and ends of rise afford the only means of climbing up and down; depth from surface about 20 fathoms.

Guttergill Lead Mine, a short distance south of Dowpot Syke. 8 miners work here, 6 sinking a sump below an adit level, draught passing by sump top to a rise communicating with old workings and surface, sump 5 fathoms deep, about 7 feet by 5 feet. Barometer at bottom of sump 28·96; temperature of air 54°, of water 48°. The other 2 men are driving a drift from the old workings, and rise about 12 fathoms above main level, and about same depth from surface, 10 fathoms from rise, which from the surface is also a ladder road. Barometer in forehead of drift 28·24; thermometer 54°; tube P. Ladder road about 4½ feet square, short and old ladders and sollars, wooden staves; timber-work generally old.

Guttergill and Dowpot Syke visited 18th November 1862; Dougang, 20th November.

Small Clough Adit Level.—Nenthead Lead Mine, about ¾ of a mile S.E. of the village of Nenthead; 130 miners. Workings first visited about ½ a mile in a southerly direction from the level mouth, at the junction of the "Carrs" and "Long Clough" veins; depth from surface at the water blast shaft 62½ fathoms. Driving a forebreast 20 feet high, and 15 feet wide on the Long Clough cross vein southward are 5 men, 6 fathoms from current; space behind is filled with deads as they proceed, leaving the size of an ordinary level or drift on one side, through which the stuff is wheeled, &c. Temperature at forebreast 58½. The next working is 7 fathoms from draught, 4 men taking down roof of a drift on a small E. and W. vein, about 5 feet above roof, and about the same width; drift arched to within a yard or two of forehead; temperature of air 59°; near this is a large open working, in which four men are making a rise towards another flat, height of rise about 12 feet, size about 8×5 feet; temperature of air 59½. Further south are 6 men driving a forebreast northward towards the first-mentioned

place, 19 feet wide and 16 feet high, open behind forebreast for a distance of 10 fathoms. This is ventilated by a branch pipe from the air boxes at the main level about 10 fathoms distant, and 90 fathoms from the blast alluded to; temperature at forebreast 59½. The water-jet fan is supplied by a column of 4-inch pipes 62 fathoms high, the hole through which the jet acts on the blades of a circular fan is ⅝ of an inch in diameter; diameter of fan 1 foot 6 inches, 6 wings 6 inches square, pipes leading from machine 5½ inches diameter. When the water is abundant this blast is powerful, but was weak during our visit, there being not more than about 10 fathoms column of water. The workings not being many fathoms above the main level, the ladder ways need no more notice other than they are wooden staved ladders firmly secured.

In the same level, about 130 fathoms east of the workings before named, is the first cross cut south to the new discovery of ore lately made, being on the course of what is called the "Long Clough Second Sun Vein." A plain hand fan blast fixed in the main level, where there is a regular or steady current, from this, 5-inch pipes lead along the cross cut south 16 fathoms, then in the level east 10 fathoms more, 6 men are employed driving this forehead towards another forehead and level coming west from another cross cut 90 fathoms further east; at the end of the first-named driving the bottle of air marked W was taken. Barometer at 28·50; thermometer 62°. At the mouth of the second cross cut going south is an air rise to a higher level, and to the surface; in this rise is a column of 5-inch pipes, 20 fathoms high; the jet of water at the bottom enters a bell-mouthed pipe, there being no fan as in the other blast. The air pipes are laid along the cross cut south 50 fathoms to the level on the same vein as the last driving, then on to west forehead 40 fathoms further. Here are 6 men driving a level similar to the last about 6 feet by 4 feet. Temperature of air 66; barometer 28·56; bottle of air marked X. Back, east from the end 26 fathoms, 18 men are engaged breaking ore from the roof of the level about 2 fathoms high and same wide, and about 7 or 8 fathoms long. Temperature was also 66 here; barometer 28·58; a sample of the air contained in bottle Y. At this point there is an intermediate branch level or cross cut communicating with the main level, making this working somewhat independant of the blast, which is exclusively intended for the forehead.

The average gettings of the miners in these mines, which may be taken as a specimen of the district generally, are 16*s.* per week full pay, once every three months, but advanced 11*s.* per week monthly. No boys under 14 years of age work below. Size of jumpers used in boring $\frac{11}{16}$ of an inch, copper prickers; instead of safety or straws, "swibs" made of paper are used, which are greased in wet ground. Accidents from blasting are rare. The miners' club fund here is sustained by each member contributing 30*s.* per year, who in the event of accident or sickness receives 7*s.* per week while unable to work. After 65 years of age a member is entitled to 1*l.* per month as a pension.

Above mine visited 19th September and 20th November 1862.

Stow Craig Lead Mine, 6 miles S.E. of Alston, and 2 miles Garrigill village, an adit cross-cut west of the Tyne river, going first west 100 fathoms to a vein running N. W. and S.E., and continued on it in the former direction 300 fathoms. 2 men are driving a drift or level from the top of a rise 17 fathoms high; at the rise top is good air from communications with old upper workings, the drift is driven northward 20 fathoms, and is not above 5 feet high and 2 feet wide. Barometer at forehead 28·84, temperature of air 56°, samples of the air contained in bottle and tube N. Depth from surface at this point about 12 fathoms. The main level requires timbering in many places where the roof is broken down and unsafe. 2 other men are working about 3 fathoms below level close to a rise from a level below, and in good air. A few yards from the foot of a surface shaft 7 fathoms deep north of the adit level are 4 men searching for and raising ore close to some old workings, a rise from a deeper level near where they are working is both an *air-rise* and *pass* for the broken stuff; when full, the air comes through a wooden pipe. Barometer in forehead 4 fathoms from shaft 28·84. Thermometer 48°, tube of air M.

1 man and a boy wash the ore, making 8 men working below and 1 man and 1 boy at surface, the number employed.

Mine visited 17th November 1862.

Dosey Lead Mine, 1¾ miles south of "Stow Craig," on the east side of the Tyne, and about one third of a mile from its source. An adit level on the Dosey vein, 300 fathoms in an E.S.E. direction. Only two men are here working in the sole of a drift on the "Tyne Boggs" vein 60 fathoms from its intersection with the Dosey vein (S.W.) between this point and the forehead; 30 fathoms further a rise and upper drift communicates with the surface, 25 fathoms above good air and ground wet. Barometer 27·86, temperature of air 46°, of water 45°, tube F.F.

Calvert Lead Mine on the west side of the Tyne, about 4 miles from Garrigill village, an adit level going west 150 fathoms to the "Calvert Vein," then in a south-westerly direction 200 fathoms more; the level is continued a greater distance than this but is crushed together at this point; the present works of this mine are only the re-opening this level and putting it in repair, and also commencing a new level higher up the hill which is 12 fathoms only driven as yet in clay &c. Barometer in the first level (where 2 men are working) 27·78. Thermometer 50°, tube of air GG. Height to surface here 60 fathoms. 20 fathoms from where they are clearing level is a rise to old workings, but there being no draught whatever is not likely (as said) to be communicated with surface. 4 men are working in new level. These 6 men and another man and a boy live in a "shop" near the level mouth, room 18 feet by 12 feet, and 8 feet side walls, two double beds, one small window, roof old and unsound, one bed in gable end next the hill near a heap of coals. This part of the house farthest from fire-place very damp.

Lady Vein Lead Mine, an adit level about a quarter of a mile from the source of the Tyne southward, driven east about 350 fathoms; where it is about 30 fathoms from surface a rise is being made from the forehead to an upper drift, and is about 40 fathoms from another rise which communicates with that drift; this upper level leads to a shaft open from surface. By means of air boxes in the lower level continued from the holed rise to the forehead (risefoot being otherwise closed) the draught is conveyed to foot of rise now making, which is about 3 fathoms above roof of level. Barometer here 28·42, thermometer 53°, temperature of water 50°, bottle of air O. 2 men work here, sometimes a few hours only at a time when the air is very "dead." 2 other men are raising ore from the sole of a small drift 6 fathoms from the foot of a shaft 4 fathoms deep in good air. Barometer 28·24, thermometer 48°.

"Shop" 14 feet long by 11 wide, two stories, sleeping room 7 feet high, no window, roof requiring repairs, two men in two beds.

Foregoing mines visited 24th November 1862.

White Lee Lead Mine.—About 2 miles north of Alston, an adit level driven eastward about 18 fathoms, 4 fathoms back from forehead, is an air shaft to surface 25 fathoms; 2 men are driving the forehead 6 feet high, 4 feet wide. Temperature 56°, barometer 28·78, bottle of air BB. Two other men are driving a cross-cut north from the forehead of another adit level going west about 90 fathoms in length, air finding its way through old workings to surface, depth from which being about 15 fathoms. Temperature in cross-cut forehead about same as last.

Clargill Burn Lead Mine, about 100 fathoms S.E. of While Lee, an adit level driven S.E. about 190 fathoms where there is a sump or winze to a drift 8 fathoms below. In this drift, 15 fathoms east, is another sump, 5 fathoms deep; at the foot of this sump, a few yards north, are 2 men working on ore. Temperature here 59°, barometer 28·78, bottle of air CC., draught passing over first sump top, which is about 4 feet square, wooden staved ladders, stapled to side of sump; no platforms; 2 other men are working nearer mouth of main level in good air.

Fell Grove and Crossgill Head Mine, adit levels about 2½ miles S.West of Garrigill village; 4 miners in each. The first level is driven about 90 fathoms west, and about 7 fathoms back from forehead is a sump to a deeper level, 9 fathoms, which is also an adit level 135 fathoms in length. In forehead of first level where men are working temperature was 51°, bottle of air DD. At Crossgill Head the forehead of an adit level is being driven southward, level 160 fathoms in length, 40 fathoms from mouth is a water blast through a small shaft about 6 or 7 fathoms deep; pipes are laid from this to forehead (120 fathoms). Temperature in forehead 52°, bottle of air EE. Blast weak.

Nattrass Lead Mine, adit level 1½ miles S.E. of Alston.—2 men are driving a cross drift southward 2 fathoms above level. Near the commencement of this drift is a rise to a higher level communicating with surface. The drift forehead is nearly 100 fathoms from this rise. It is supposed the fissures in the ground ("Great Limestone") assist to ventilate the drift forehead. Size 4½ high, 3 feet wide. Temperature 62°, Barometer 28·84, sample of air in bottle marked Z. Draught in main level generally goes through level and up rise.

Honey Bee Lead Mine, adit level half a mile S.W. of Nattrass, 2 men driving the forehead. Level 60 fathoms in length driven eastward. Depth from surface at forehead only about 7 fathoms. No rise or air machine. Temperature in end 60°, barometer 28·70, bottle of air marked A A.

The foregoing mines were visited on 24th, 25th, and 26th November 1862.

Rodderup Fell Lead Mine, examined on Friday 26th September 1862, consists of 3 adit levels, the lowest and principal one is on the right bank, and at the level of the Blackburn river, and is first a cross-cut, southward to the main "Rodderup Fell" vein, running about N.E. and S.W.; the level is extended in the first direction 200 fathoms from the cross-cut (which is 700 fathoms in length), and workings of great extent above it, and communicating with an upper level 30 fathoms above, which is driven about 130 fathoms eastward. This the eastern part of the mine is at present abandoned. Taking the end of the great cross-cut as a starting point, there is first the engine shaft, sinking below the level by 16 men, drained by a hydraulic engine, 7 inch pipes are brought from surface 60 fathoms above through a rise close by, the shaft below level is 9 feet diameter, cased and divided in the usual way for ladder road and pumps (9 inches dia.), ladders and good stages at short distances; the reading of barometer at the bottom of engine shaft was 28.78, temperature of air 57°, specimen of air contained in bottle B, good air current at top of shaft. 493 fathoms west of the cross-cut brings us to the forehead of the low level west; the bulk of the men are working above this level within the last 150 fathoms of that distance, and generally not over 10 fathoms above level, or more than 10 fathoms from current; about 4 fathoms above the main level is the air drift at present in advance of the former about 10 fathoms. A rise to the "middle level" (30 fathoms above), and a shaft from surface to the middle level cause a free circulation of air to within 10 fathoms of the low forehead west, this shaft and rise is the westernmost of several communications with the middle level and surface between the forehead and cross-cut, these airways are about 5 by 6 feet, the one just named serves as well for a climbing way to the upper workings, ladders about 9 feet in length, stages at each ladder. The shafts from the surface to the middle level are round and 4 feet diameter. The draught was downward and out through main level. In the forehead of the low level west the temperature of air was 61; barometer 28·66. Bottle marked C and tube C contain samples of the air; another specimen of air in tube D was taken from a working 6 fathoms above level near the air drift. Barometer 28.64, temperature 62, working about 10 feet wide; most of the men go to and from their work in waggons through the main level, which is arched almost for the whole distance from the cross-cut, size of level 6 feet high, 4 feet wide. One end of the passes conveying the broken stuff to the level, about 2½ feet square, is portioned off, and serves in some instances as the climbing road to the ore workings, the dividings, &c. projecting as a footing. The forehead of the middle level going west is not now being driven, and is extended 150 fathoms beyond the end of the low level; 54 men are working on the run of ground nearest the low level forehead, and 42 outside nearer the cross-cut, including the engine shaft; very little is being done at the shallower workings of this mine.

Birchy Bank Lead Mine, 1 mile west of Rodderup Fell. In the great low level cross-cut of the latter mine, about 500 fathoms from mouth, a vein is intersected, but not now worked upon, called the "Victoria Vein," running N.E. and S.W.. This is the vein running into, and being worked by a few men at "Birchy Bank." The adit level is being driven on the vein north-east about 250 fathoms, at the forehead of which is a (crooked) rise 9 fathoms high (a drift communicating with other rises at the top of this one, causes a free circulation of air here) from the end of a cross-cut south 8 fathoms from top of rise, a small drift has been driven east 5 fathoms. 2 men work in this end. Barometer 28.22, thermometer 52; 2 tubes of air taken here and marked J J; ground dry. Other two men are searching for ore about the old workings further west in good air. The main level is not arched, parts of it are supported by light and old timber, not of sufficient strength to keep the ground safe. The 4 men and 1 boy live in a "shop" near the lever mouth, room 17 feet by 11 feet, side walls 7 feet, 2 double beds, house dry.

Arkendale Lead Mines, Yorkshire, in the millstone grit and mountain limestone rocks, examined by me on the 19th, 20th, 21st, and 27th of January, 1863. The first visited was Danby, on the south-west side of Arkengarth Dale. The present principal workings are on a vein running N.W. and S.E., intersected by an adit level, about 250 fathoms southward from the level mouth; the depth from surface at this point is probably about 35 fathoms. The ventilation of this mine is mainly dependent on the fissures or cracks in the limestone and other beds, most of them nearly vertical and not many inches in width, crossing generally the line of the vien; these open joints oftener draw the air from than convey it to the workings, causing a current from the level mouth; and during my visit there was a steady draught from the lower to the upper workings, leading one to imagine there must be other openings, besides natural ones, communicating with the surface. What would favour this opinion is, that coming through the rise leading to an upper drift is a quantity of surface water, at that time perhaps increased by the melting of snow. In the main drift forehead north-west on the vein, 50 fathoms from the rise up which the draught goes, thermometer was 50°, barometer at 27·50, sample of air in bottle G, G, 8 men in this driving (4 per shift of 6 hours), size of drift 5 feet high, 2 feet wide. In the upper drift forehead, about 13 fathoms above adit, going in an opposite direction, 2 men; thermometer was 55°, bottle of air F F. The bulk of the men within a length of 100 fathoms, and a little above this drift, the only climbing road to which is the rise before mentioned. No ladder, and for a perpendicular height of 9 fathoms, it is impossible to carry a lighted candle. Through this water and mud the men have to scramble twice a shift. In ventilation Danby may be considered good.

Stang, about 2 miles N.E. of Arkengarth Dale, is an adit level driven in an easterly direction 350 fathoms. At this point a cross-drift is now driving southward from the top of rise, about 4 fathoms above main level; the forehead is 40 fathoms from rise; no means of ventilation whatever. Barometer 27·30, thermometer 55°; 2 tubes of air marked I I, and bottle H H; drift 5 feet high 2 feet wide. Candles burn dimly; temperature of rock 52°; depth from surface 25 fathoms, or thereabouts. Six men in this drift (4 in one shift and 2 in another). In the ore workings further west, about 3 fathoms above main level, are 12 men working, making 18 men altogether in Stang. In a rise 3 fathoms high (worked by 4 men), 6 feet long and 4 feet wide, thermometer was 58°, barometer at 27·26; tube of air K K. At the top of another rise 9 fathoms high, thermometer was 55°, sample of air in bottle I I. This is the worst ventilated of the Arkendale mines.

Foregill is communicated with another adit level to the north, a draught always going in one direction or another. The present main workings are about 500 fathoms N.E. from the level mouth, the extent of which is about 100 fathoms, going back parallel with the main level southward. The mode of ventilating this part is by a trap-door in the main level, turning the draught into a sump or winze to an under drift 8 fathoms below, which follows, and is communicated with the upper one by sumps, the last of which is 10 fathoms from, but another is now being sunk *at* the forehead of main level. At the bottom of sump 5 fathoms deep, barometer at 28·16; thermometer was 55°. Two tubes of air L L (6 men, 3 a shift). In drift forehead driving towards sump, 8 men and lads (4 a shift). Barometer and thermometer same as last. Two tubes M M. Nearer the level mouth is a forehead driving west, 84 fathoms from the main level, where there is a plain hand fan blast to supply the forehead with air; level is 7 feet high by 5 feet wide. Barometer 27·20; thermometer 58°. Two tubes N N., taken immediately after firing; 6 men, 2 each shift of 6 hours. Altogether about 50 men at Foregill.

Faggergill Adit Level, 528 fathoms, S.E., and 308 fathoms north easterly (nearly one mile in length); 4 men (2 a shift), driving forehead of main level: chasms in limestone affording ample ventilation, a strong draught through one, close to forehead. Barometer 28·54; thermometer 56°. Two tubes of air X X. Depth from surface about 70 fathoms.

Fellend, an adit level driven eastward about 350 fathoms. Six men are driving the forehead of a drift 14 fathoms above main level, which is ventilated by the draught to an air rise, being made to pass the forehead by means of a trap door and air pipes. Current through pipes, strong. Thermometer 56°. Bottle of air O O. Depth from surface about 40 fathoms.

Bunting Level (Old Gang, Swaledale) is communicated with "hard level" on the other, and *east* side of the hill. About 450 fathoms along this level is a cross-cut southward 300 fathoms, where are some workings, with the level continued about 250 fathoms south east on a vein running in that direction. Near the forehead of this level a cross-cut is now driving southward by 4 men (2 a shift). A draught or current passes through a rise 35 fathoms from

this forehead in this way:—Near the end of the first-named cross-cut is a rise to surface 90 fathoms high; thirty fathoms up this rise is an air drift continued along to the other rise, which is about 20 fathoms from the mouth of the cross-cut now driving. Barometer in cross-cut forehead 28·14; thermometer 63°. Two tubes of air S S. No air pipes or means of conveying air to this forehead. The air drift just mentioned is being driven north-west of air shaft about 50 fathoms. About three quarters of this distance a boy works a small fan blast, which is intended to draw fresh air from the rise and force it to the forehead of drift. The air here was very dull, candles burning badly, the shale giving strong indications of carbonic acid gas. Barometer 28; thermometer 58°. Two tubes of air T T. Drift 5 feet high, 2 feet wide; 4 men work here (2 a shift). Altogether, 40 men and lads work in Bunting level, and the places described are the only foreheads of importance now working.

Barberry is an adit level, a short distance south of and parallel with Bunting level. The forehead is about 400 fathoms in a south-east direction from the level mouth. Twenty fathoms from this forehead a hand fan draws air from a rise (to another adit level 30 fathoms above Barberry level), and forces it to forehead. Thermometer here 55°; barometer 28°. Two tubes of air U U; level 6 feet high, 4 feet wide. Air pipes (here and at the other levels) of zinc, 3½ inches diameter. Between this forehead and rise is a cross-cut, being driven by 4 men (2 a shift) northward 20 fathoms from main level. No air pipes. Barometer 28·60, thermometer 57°. One tube V V. Nineteen men and one boy work in Barberry level.

Hurst Mines Lead, near Reeth, Yorkshire, examined 23d Janpary 1863. Prye's Adit Level, on vein running about north-east and south-west. Main level extended in the latter direction from mouth about 220 fathoms. About 90 fathoms back from forehead is an air shaft from surface, depth 23 fathoms. A short distance west of air shaft is a sump 8½ fathoms deep to the low drift, which is driven on towards main forehead about 30 fathoms; 6 fathoms back from this low forehead is another sump from main level. There was no current of air in this sump or drift during my visit, owing to some water being dammed up in the drift, between the two sumps. Four men (2 in a shift) work in this forehead. Barometer 28·40; thermometer 58°. Two tubes of air P P. The main level forehead is nearly 50 fathoms from the western sump. Temperature 54°; barometer 28·36. Very little blasting required, and old workings apparently close at hand (Mr. Twite took samples of air from here). Fourteen men in all work in Prye's level.

Copperthwaite Adit Level, 450 fathoms westerly from level mouth to forehead. At this point is a sump to a low level or drift 15½ fathoms below main level, and driven back east 20 fathoms, 4 men in this forehead (2 a shift). Barometer 28·10; thermometer 54; 2 tubes Q Q. Open ground, air pretty good, drift 5 feet high, 3 feet wide; sumps 4 feet by 3 feet; no ladders. Men generally climb by means of the timber in sides of sump; 2 men work in roof of drift near sump, making altogether 6 men in this low level. Other 6 men in old workings, nearer level mouth. Depth from surface at forehead, 31 fathoms.

Queen's Level, an adit level 660 fathoms from level north-west. 6 men (2 a shift) are driving the forehead of a drift, 12 fathoms above main level, ventilated by the draught going through the rise to a higher level, communicating with surface, having been conveyed by means of air pipes to the forehead; air good. Thermometer 55°, bottle marked W W. No ladders in rise. 12 men work in old workings in Queen's level, making 18 in all.

Keldheads Lead Mines, near Leyburn, Yorkshire. The main forehead of the upper ("Keldheads") adit level, is about 1¼ miles north-west from the level mouth. About 300 fathoms back from the forehead is an air shaft, communicating with the surface, also a water blast or jet, and pipes conveying air to the forehead. Between these, the air shaft and forehead are the principal workings, from 5 to 15 fathoms above the level. An air drift about 8 fathoms above level is continued on, and communicated with the main level, about 35 fathoms from the forehead; 8 men work in the latter (2 every shift of 6 hours). Barometer here 28·74; thermometer 58°, temperature of water issuing from vein 51°; 2 tubes of air Y Y. Zinc air pipes 3¾ inches round, a steady blast at the end of these pipes. About 200 fathoms south of air shaft is a sump to the bottom drift, which is driven towards the shaft and main forehead 180 fathoms, and ventilated by an air way a few yarns below, brought from an engine shaft at the mouth of the adit level (end of air drift, 9 fathoms from forehead) draught coming from air drift, very weak. Temperature of air at low drift forehead 59°; barometer 28·76; 2 tubes of air Z Z; 8 men (2 each shift of 6 hours); 8 other men work in this low level. The sump named is used to draw the stuff to the main level by a windlass. The men go to and come from their work by raising each other by the windlass, a perpendicular height of 17½ fathoms. About 38 men work in the vicinity of the air drift *first* mentioned, making in all, 54 men in this part of Keldheads Mines.

Ashbank Level, Keldheads. An adit going northward from the level mouth, 290 fathoms to an air shaft, communicating with an upper level. The main forehead is 42 fathoms north of this air shaft. An air way 4 fathoms above main level, communicates the shaft with a rise 20 fathoms back from forehead. Temperature of air in main level forehead 38°; barometer 28·94; 2 tubes C C C; 6 men, 2 a shift of 6 hours.

Sample of air marked D D D, was taken from a rise top 4 fathoms above level; 4 men. Thermometer 58°, barometer, 28·92. Depth from surface to forehead of this level 35 fathoms, and the depth from surface to "Keldheads" main level forehead 65 fathoms. The vein runs west of north and east of south. Principal ore working in what are termed the "Fossil" and "Bottom" lime beds of the Mountain Limestone Series.

The rise and other workings were very wet in this level.

West Burton Lead Mine, Yorkshire.—The adit level is driven in an E.S.E. direction about 200 fathoms, depth from surface about 18 fathoms at air shaft, which is about 30 fathoms back from forehead. From this shaft a double drift is carried to about 8 fathoms of forehead. 10 men (in two shifts), are working in the roof about 3 fathoms above level and about over the forehead, working 4 fathoms high and 6 feet wide. Temperature of air here 59°, barometer 28·58, 2 tubes of air A A A. Another party of 6 men are working close to the air rise, 4 fathoms in length 9 feet wide. Thermometer 58°, barometer 28·58, 2 tubes B B B; draught rather strong and going up the air shaft.

The level is not arched, and some of the timber-work requires to be renewed.

Dufton Lead Mines, Westmoreland. Visited 2d and 3rd February, 1863.—Dufton Fell. The adit level in the "Jew limestone" is driven eastward on two east and west veins, about 220 fathoms; the two forebreasts driving parallel with each other and about 6 fathoms apart, the depth from surface about 50 fathoms; these forebreasts are 23 feet wide, 12 feet high, and in the north one, the deads are thrown behind, an arched way 6½ feet high, and 4 feet wide, left for the level, 6 men work here (3 in a shift). Temperature of the air 53½°, barometer at 27·58, 2 tubes of air E E E. In the other forebreast are 8 men (4 a shift.) Temperature 55°, barometer same as other, 1 tube, F F F. In a deep level coming under these workings, driven for a distance of 470 fathoms eastward are 4 men driving a forehead (2 a shift). Thermometer 53½°, barometer at 28, 1 tube of air G G G.

Silverband Low Level, driven eastward about 630 fathoms, principal workings on three parallel east and west veins in "great limestone;" here, as well as in the levels before-named of the Dufton mines, ventilation is dependant on the open joints of the surrounding rock; the largest, or rather the one attracting the greatest current of air, I noticed in the main level at the northernmost workings of this mine, causing a draught almost equal to an open air rise to the surface. In the forehead on the "Slope" vein driving east by 4 men; theremometer 49°, barometer 26·94, 2 tubes of air H H H. At "Remington vein," forehead going east, 4 men, thermometer 53°, barometer 26·90, the two tubes I I I were taken. In forehead going west on "Silverband" vein 4 men. Thermometer 50°, barometer 26·98, 2 tubes of air J J J. I found the air good throughout the Dufton mines, and levels in safe condition. The number of men working in Silverband is 24; at Dufton Fell, 33. The shop at Silverband is a two storey house, about 18 feet long and 14 feet wide; 6 men and 1 boy sleep in 3 beds, side walls of room 8 feet high, one window. The shop at Dufton Fell is also a two storey house; two sleeping rooms; one 20 feet long, 15 feet wide, 8½ feet side-walls, 2 windows, 8 beds (generally, 2 men occupy each bed), the other 12 feet by 15 feet, same height as the last; 4 beds, 1 small window.

Grinton Lead Mine.—A tube of air marked R R. Barometer 28·24, thermometer 52°, was taken from the new level forehead, driving south in clay, 50 fathoms, depth of forehead from surface 6 fathoms.

W. H. Rowe.

18th February 1863.

IX.

RETURNS BY THE REGISTRAR GENERAL.

DEATHS OF MALES aged Ten Years and upwards in each of the Years 1859–61.

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COUNTY OF CUMBERLAND.

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COUNTY OF CORNWALL.

Superintendent Registrar's District.

CAMELFORD.

Registrar's Sub-District.

1. Boscastle.
2. Camelford.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859–61.

Sub-district - 1. Boscastle.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 27	82	Maltster -	Bronchitis, 4 weeks. Certified.
„ 27	84	Agricultural labourer.	General debility. Not certified.
Feb. 13	25	Son of farmer	Influenza. Not certified.
April 4	72	Agric. labourer	Apoplexy, 4 days. Certified.
„ 22	61	Farmer - -	Hernia, 1 day. Peritonitis, 8 days. Certified.
June 20	23	Slate quarryman	Injuries. Accident at Delabole slate quarry. Inquest.
July 10	81	Farmer - -	Not known. No medical attendant.
Aug. 2	31	Slate quarrier -	Congestion of brain, 4 weeks. Effusion, 5 days. Certified.
„ 28	64	Army officer -	Consumption. Not certified.
„ 21	68	Farmer - -	Paralysis, 3 months. Certified.
Sept. 21	78	Agric. labourer	Not known. No medical attendant.
Aug. 22	33	Draper - -	Consumption, 3 years. Certified.
Oct. 2	78	Slate quarrier -	General debility. Not certified.
Nov. 8	75	Cooper - -	Atrophy. Certified.
Dec. 5	56	Farmer - -	Dropsy, 1 month. Certified.
„ 10	65	Agric. labourer	Bronchitis, 6 days. Certified.
1860.			
Jan. 17	82	Farmer - -	Old age. Certified.
„ 23	67	Agric. labourer	Vertigo, 6 months. Exhaustion. Certified.
Jan. 21	75	Carpenter -	Diseased prostate gland. Certified.
Mar. 4	87	Farmer -	Debility. No medical attendant.
„ 8	46	Mason -	Stricture of intestines. Certified.
„ 11	42	Grocer -	Bronchitis, 2 days. Certified.
„ 14	82	Agric. labourer	Hemiphlegia, 4 weeks. Certified.
„ 21	79	Slate quarrier	Old age. Not certified.
Apr. 17	78	Slate quarrier	Bronchitis. Certified.
May 19	67	Agric. labourer	Phthisis, 4 months. Certified.
June 19	32	Slate quarrier	Consumption, 7 years. Not certified.
Oct. 22	76	Slate quarrier	Asthma, 18 months. Dropsy, 3 months. Certified.
„ 28	61	Mason - -	Decline, 2 years. Not certified.
1861.			
Jan. 21	78	Agric. labourer	Ulcerated leg, 2 years. Certified.
„ 24	54	Farmer -	Decline. Certified.
Feb. 9	78	Agric. labourer	Dropsy. Certified.
Mar. 28	40	Quarryman -	Suicide by hanging. Inquest.
May 11	64	Agric. labourer	Phthisis, 6 months. Certified.
„ 9	70	Agric. labourer	Natural causes. Inquest.
„ 22	80	Sailor -	Enlarged prostate, 3 months. Certified.
June 20	49	Agric. labourer	Accident, the wheels of a waggon passing over him. Inquest.
Sept. 19	23	Copper miner	Phthisis. Diarrhœa, 2 weeks. Certified.
Oct. 16	60	Farmer -	Diseased heart. Dropsy, 4 months. Certified.
„ 24	63	Agric. labourer	Phthisis, 8 months. Certified.
„ 24	53	Land agent -	Diseased liver, 18 months. Certified.
Nov. 27	75	Agric. labourer	Unknown. Not certified.
„ 26	37	Draper -	Asthma. Bronchitis, 6 days. Certified.
Dec. 14	58	Blacksmith -	Found dead in Growa Quarry. Inquest.
„ 19	63	Agric. labourer	Phthisis, 2 years. Certified.
„ 24	50	Carpenter -	Phthisis, 12 months. Certified.

Sub-District - 2. Camelford.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 2	69	Farmer - -	Mesenteric disease, 9 months. Certified.
„ 14	28	Labourer -	Accident, by a chain breaking in the Delabole Slate Quarry. Inquest.
Feb. 7	74	Agric. labourer	Bronchitis. Certified.
„ 8	26	Tailor, journeyman.	Consumption. Not certified.
„ 18	55	Linen draper -	Phthisis, Certified.
„ 24	60	High bailiff -	Cancer, stomach, 12 months. Certified.
Mar. 15	36	Farmer -	Diphtheria, 2 days. Certified.
Apr. 1	77	Farmer -	Diseased kidneys. Not certified,
Mar. 29	10	Son of farmer	Diphtheria, 2 days. Not certified.
Apr. 21	61	Chemist -	Erysipelas. Not certified.
May 12	15	Farm servant	Nephritis. Not certified.
„ 26	39	Innkeeper -	Consumption. No medical attendant.
June 26	45	Slate quarrier	Cephalitis, 14 days. Certified.
Aug. 20	55	Agric. labourer	Nephritis, 4 years. Certified.
„ 17	82	Agric. labourer	Apoplexy, 4 days. Certified.
Sept. 2	45	Quarryman -	Accident. Fall of stone in Delabole Slate Quarry. Inquest.
„ 12	14	Son of farmer -	Scarlatina, 14 days.
„ 27	62	Landed proprietor.	Decline. No medical attendant.
„ 28	58	Agric. labourer	Phthisis, 12 months. Certified.
Nov. 8	77	Annuitant -	Diseased bladder, 3 years. Certified.
(unknown)		Mariner -	Drowning. Inquest.
„ 27	88	Blacksmith -	Diarrhœa, 14 days. Certified.
1860			
Jan. 13	71	Road labourer	Diarrhœa. Certified.
„ 6	77	Farmer - -	Accident. Fracture of skull. Inquest.
„ 27	66	Agric. labourer	Phthisis, 7 weeks. Certified.
Feb. 1	16	Farm servant	Scarlatina, 4 days. Certified.
„ 3	35	Master mariner	Consumption, – months. Certified.
„ 22	30	Musician -	Consumption, 6 months. Certified.
Mar. 2	56	Slate quarrier	Phthisis. Certified.
Apr. 1	77	Agric. labourer	Gastritis, 5 weeks. Certified.
„ 2	58	Farmer -	Pneumonia, 6 days. Certified.
„ 13	10	Son of slate quarrier.	Typhoid fever, 3 weeks. Certified.
„ 22	20	Slate quarrier	Phthisis. Certified.
„ 26	73	Farmer -	Paralysis, 3 weeks. Apoplexy 2 days. Certified.
„ 29	45	Tailor - -	Consumption, 1 year. Certified.
May 2	67	Farmer -	Diseased heart. Certified.
„ 5	47	Miller - -	Typhoid fever, 16 days. Certified.
June 3	64	Agric. labourer	Unknown. Not certified.
„ 8	66	Agric. labourer	Diseased heart. Dropsy. Certified.
„ 12	24	Son of farmer -	Phthisis. Certified.
July 1	58	Farmer - -	Diseased heart. Dropsy, 10 months. Certified.
21	21	Shoemaker -	Cephalitis, 10 days. Certified.
Aug. 11	87	Agric. labourer	Age. Certified.
Sept. 1	34	Shoemaker, journeyman.	Tabes mesenterica. Certified.
„ 10	72	Tin streamer -	Diseased heart. Certified.
„ 28	20	Slate quarrier	Phthisis. Certified.
Oct. 8	81	Agric. labourer	General debility. Certified.
„ 20	20	Quarrier -	Accident. Killed in Delabole Quarry. Inquest.
„ 30	42	Slate quarrier	Accident, by a stone falling on him at Delabole Slate Quarry. Inquest.
Nov. 16	77	Agric. abourer	Paralysis, 12 months. Certified.
Dec. 18	80	Barber - -	Age. Certified.
1861.			
Jan. 10	55	Slate quarrier	Phthisis, 15 months. Certified.
„ 17	75	Mason - -	Natural causes. Inquest.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
Jan. 22	85	Farmer -	Diseased heart. Dropsy, 2 months. Certified.
Feb. 19	41	Quarrier -	Accident, by falling into the Delabole Slate Quarry. Inquest.
Mar. 2	72	Agric. labourer	Paralysis, 6 months. Certified.
„ 20	71	Labourer -	Atrophy. Certified.
	unk.	Mariner -	Found drowned. Inquest.
Apr. 10	65	Landed proprietor.	Diseased heart. Palsy. Certified.
„ 12	73	Labourer -	Bronchitis, 3 months. Certified.
„ 12	83	Shoemaker -	Age. Certified.
„ 22	14	Son of slate quarrier.	Phthisis. Certified.
„ 28	23	Labourer -	Injuries received in a fight. Inquest.
May 4	38	Farmer -	Phthisis. Certified.
June 4	77	Agric. labourer	Bronchitis, 6 months. Certified.
„ 7	52	Slate quarrier	Diseased heart. Certified.
July 13	72	Farmer -	Bronchitis, 14 days. Certified.
„ 16	74	House proprietor	Ileus, 1 week. Certified.
„ 19	36	Slate quarrier	Diseased spine, abscess. Dropsy. Certified.
Aug. 5	14	Miller's loader	Congestion of brain, 2 weeks. Certified.
„ 9	68	Mole catcher -	Paralysis, 6 weeks. Certified.
Sept. 12	58	Agric. labourer	Hepatitis. Certified.
Oct. 9	24	Quarrier -	Accident by a chain striking him in Delabole Quarry. Inquest.
„ 25	12	Farm servant	Typhoid fever, 9 days. Certified.
„ 25	53	Farmer -	Hematemesis, 24 hours. Certified.
„ 27	54	Tin and copper miner.	Phthisis, 4 months. Certified.
Dec. 15	61	Farmer -	Phthisis. Certified.
„ 24	32	Slate quarrier	Diseased brain. Coma, 4 days Certified.

Superintendent Registrar's District.

LAUNCESTON.

Registrar's Sub-District.

1. Altarnon.
2. North Petherwin.
3. St. Stephen.
4. Launceston.
5. Northhill.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859–61.

Sub-District - 1. Altarnon.

1859.			
Jan. 16	70	Agric. labourer	Phrenitis, 6 days. Certified.
„ 31	66	Tin streamer -	Consumption. Not certified.
Feb. 7	29	Agric. labourer	Abscess of Thigh. Not certified.
„ 23	46	Agric. labourer	Pneumonia, 6 days. Certified.
Mar. 28	71	Yeoman -	Pneumonia. Not certified.
June 7	73	Agric. labourer	Cancer. Not certified.
May 6	76	Farmer -	Visitation of God. Inquest.
June 30	69	Yeoman -	Seizure. Not certified.
Aug. 11	13	Son of farmer	Phthisis 2 weeks. Fever 14 days. Certified.
Oct. 6	48	Mason - -	Apoplectic fit. Not certified.
„ 9	61	Farmer -	Pneumonia 5 days. Certified.
Nov. 14	80	Blacksmith -	Old age. No medical attendant.
„ 12	60	Mine agent -	Natural causes. Inquest.
1860.			
Feb. 19	70	Tin streamer -	Cancer of face. Not certified.
May 29	81	Agric. labourer	Old age. Not certified.
July 6	21	Carpenter, journeyman.	Fever. Certified.
Oct. 6	58	Farmer - -	Rheumatic gout. Not certified.
Nov. 1	29	Son of farmer	Diseased heart. Dropsy. Not certified.
„ 9	79	Farmer - -	Old age. Not certified,
Dec. 2	80	Yeoman -	Old age. Not certified.
„ 4	56	Cattle dealer -	Pneumonia and bursting of a blood vessel. Not certified.
Nov. 17	36	Miner - -	Visitation of God. Inquest.
1861.			
Jan. 2	30	Farmer - -	Small pox. Not certified.
Feb. 25	81	Farmer - -	Old age. Certified.
Mar. 7	46	Innkeeper -	Bronchitis. Certified.
June 7	41	Miner - -	Accidental death. Inquest.
Mar. 9	82	Chair maker -	Old age. Not certified.
„ 27	65	Yeoman -	Inflammatory fever. Certified.
„ 28	80	Agric. labourer	Old age. Not certified.
May 27	46	Farmer -	Consumption. Not certified.
„ 23	78	Cordwainer -	Old age. Not certified.
„ 18	80	Hawker -	Apoplexy. Inquest.
July 14	76	Mason - -	Old age. Not certified.
„ 29	25	Dom. servant	Consumption. Not certified.
Sept. 11	71	Agric. labourer	Apoplexy. Not certified.
Dec. 24	83	Agric. labourer	Old age. Not certified.

Sub-District - 2. North Petherwin.

1859.			
Feb. 24	82	Agric. labourer	Chronic diarrhœa. Certified.
June 21	78	Yeoman -	Old age. Not certified.
July 19	74	Farmer -	Found dead in a field. Inquest.
„ 24	21	Son of agric. labourer.	Phthisis 12 weeks. Not certified.
Nov. 4	67	Yeoman -	Disease of liver and stomach. Certified.
„ 9	48	Son of Agric. labourer -	Emphysema, 2 years. Certified.
„ 21	72	Farmer -	Dropsy. Not certified.
1860.			
Jan. 9	82	Agric. labourer	Old age. No medical attendant.
„ 16	70	Carpenter, master.	Scirrhus ulceration of stomach. Certified.
„ 22	35	Shoemaker, master -	Fungus hematodes of eye. Scirrhus of liver. Certified.
Feb. 12	48	Agric. labourer	Emphysema, 5 years. Bronchitis. 10 days. Certified.
„ 29	72	Stonemason -	Diarrhœa. Influenza. Certified,
Mar. 12	74	Dealer in marine stores.	Bronchitis. Dropsy. Certified.
„ 24	83	Tailor - -	Old age. Not certified.
Feb. 27	81	Thatcher -	Old age. Not certified,
Apr. 13	75	Yeoman -	Pneumonia. Certified.
„ 23	57	Agric. labourer	Emphysema, 6 years. Bronchitis, 4 months. Certified.
„ 29	77	Yeoman -	Dropsy 4 years. Not certified.
Sept. 4	84	Agric. labourer	Peritonitis. Certified.
„ 24	71	Agric. labourer	Renal disease. Anasarca. Uramia. Certified.
Oct. 14	74	Bargeman -	Asthma. Dropsy. Not certified.
Nov. 4	19	Son of carpenter, master.	Phthisis. Anasarca. Certified.
Dec. 14	70	Agric. labourer	Asthma. Anasarca. Certified.
„ 22	74	Farmer -	Apoplexy. Certified.
„ 23	24	Carpenter -	Carcinoma of the lungs. Certified.
Dec. 31	76	Farmer -	Apoplexy. Certified.
1861.			
Jan. 24	56	Agric. labourer	Wound. Not certified.
„ 30	80	Agric. labourer	Old Age. Not certified.
Mar. 26	49	Farmer -	Apoplexy. Inquest.
Apr. 14	76	Chelsea pensioner.	Bronchitis. Certified.
May 11	83	Butcher -	Visitation of God. Inquest.
„ 12	75	Agric. labourer	Cancer. Certified.
„ 25	24	Agric. labourer	Pleuritis. Pneumonia. Certified.
Oct. 17	31	Dom. servant	Congestion of brain, Inquest.
Nov. 14	64	Agric. labourer	Pneumonia. Certified.
„ 14	37	Agric. labourer	Sudden death. Not certified.
Dec. 3	87	Agric. labourer	Old age. Not certified.

Sub-District - 3. St. Stephen.

1859.			
Jan. 2	60	Farmer -	Phthisis. Not certified.
„ 5	73	Farm labourer	Old age. Not certified.
„ 14	77	Farm labourer	Fever and congestion of brain. Certified.
„ 17	68	Slate quarryman	Pneumonia. Typhus. Not certified.
„ 23	42	Son of farmer	Phthisis. Dropsy. Not certified.
Feb. 2	67	Agric. labourer	Pneumonia. Not certified.
Jan. 31	70	Gentleman -	Disease of heart. Not certified.
Feb. 22	30	Farm labourer	Small pox, 10 days. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Mar. 3	49	Farm labourer	Influenza. Certified.
Apr. 9	37	Farmer -	Peritonitis, 9 days. Certified.
„ 3	50	Cooper - -	Injury of spine; a blow. Inquest.
„ 25	79	Gentleman -	Disease of kidneys. Not certified.
Aug. 18	21	Agric. labourer	Small pox, not vaccinated. Not certified.
Sept. 14	34	Agric. labourer	Fracture, by a wall falling in upon him. Inquest.
Oct. 5	74	Agric. labourer	Dropsy. Not certified.
Nov. 15	78	Garden labourer	Old age. Certified.
„ 22	59	Farm labourer	Apoplexy. Paralysis. Certified.
Oct. 13	10	Son of farmer	Fracture of skull; thrown from horse. Inquest.
Dec. 20	73	Farm labourer	Pneumonia. Not certified.
1860.			
Jan. 2	67	Garden labourer	Bronchitis. Pneumonia, 6 days. Certified.
„ 6	76	Farmer -	Old age. No medical attendant.
„ 22	75	Carpenter -	Anasarca, 1 year. Scirrhus of bladder, 8 months. Certified.
„ 29	68	Blacksmith -	Bronchitis, 3 weeks. Certified.
Feb. 13	10	Son of farmer	Injuries of bowels, jammed in a thrashing machine. Inquest.
Mar. 4	27	Farm labourer	Diseased brain, Certified.
„ 25	79	Farmer -	Old age. Certified.
„ 14	20	Sailor, apprentice	Phthisis. Not certified.
„ 23	79	Farm labourer	Influenza. Certified.
May 7	69	Toll collector	Bronchitis. 3 weeks. Endocarditis, 7 days. Certified.
„ 18	76	Farmer -	Bronchitis. Certified.
„ 25	66	Farm labourer	Bronchitis. Not certified.
„ 26	71	Farm labourer	Phlegmonous erysipelas, 5 days. Certified.
June 2	66	Mason - -	Accident. Drowned. Inquest.
July 6	88	Farmer -	Fever. Certified
Sept. 25	66	Farmer -	Pleuro-pneumonia, 12 days. Certified.
Oct. 13	32	Draper's assistant.	Phthisis. Not certified.
Nov. 26	66	Farm labourer	Fever, 14 weeks. Certified.
Dec. 23	68	Farm labourer	Asthma. Not certified.
1861.			
Jan. 23	71	Farm labourer	Bronchitis. Certified.
Feb. 6	84	Farm labourer	Bronchitis, 3 days. Certified.
„ 22	45	Garden labourer	Fits. Rheumatism in head. Certified.
„ 26	83	Farmer -	Old age. Not certified.
Apr. 12	74	Farm labourer	Bronchitis. Not certified.
„ 11	82	Farm labourer	Paralysis, 2 days. Certified,
„ 22	40	Farmer -	Congestion, liver and lungs. Certified.
May 17	71	Bailiff - -	Gout. Certified.
June 10	69	Farmer -	Cancer of the face, 3 years. Certified.
Sept. 5	16	Son of farm labourer.	Typhoid fever, 7 days. Certified.
Nov. 7	77	Woolcomber -	Paralysis, 7 years. Asthenia. Certified.
Dec. 5	75	Farm labourer	Bronchitis. Certified.
„ 17	76	Farm labourer	Emphysema Bronchitis. Not certified.
„ 31	17	Miller - -	Phthisis. Certified.

Sub-District - 4. Launceston.

1859.			
Jan. 6	83	Painter and glazier.	Old age. Certified.
„ 25	64	Plasterer, master.	Phthisis pulmonalis. Certified.
„ 29	82	Blacksmith, master.	Paralysis. Certified.
Feb. 12	67	Agric. labourer	Heart disease, 6 years. Certified.
„ 19	14	Son of boot-maker.	Struma, 12 years. Certified.
Mar. 16	79	Agric. labourer	Paralysis. Certified.
„ 24	52	Ironmonger, master.	Internal gout. Certified.
„ 31	60	Waggoner -	Pericarditis. Anasarca. Certified.
Apr. 4	35	Agric. labourer	Pneumonia. Hypertrophy of heart. Certified.
May 7	86	Gardener -	Apoplexy. Certified.
„ 13	62	Innkeeper -	Apoplexy. Certified.
1859.			
„ 21	64	Agric. labourer	Pneumonia. Effusion on lungs. Certified.
„ 23	55	Dairyman -	Strangulated hernia. Certified.
June 30	83	Grocer - -	Advanced age. Certified.
July 3	42	Bible Christian minister.	Phthisis pulmonalis, 12 months. Certified.
Aug. 7	65	Miner - -	Phthisis. Certified.
„ 10	39	Labourer -	Phthisis. Certified.
„ 14	77	Gardener -	Colic and constipation. Certified.
„ 20	58	Labourer -	Erysipelas, 4 days. Pneumonia, 2 days. Certified.
Sept 27	24	Sailor - -	Typhoid. Pneumonia, 16 days. Certified.
Oct. 18	33	Wheelwright	Typhus. Ulceration of bowels. Certified.
„ 28	19	Agric. labourer	Phthisis. Certified.
Dec. 25	78	Agric. labourer	Natural decay. Certified.
„ 31	30	Miner - -	Phthisis. Disease of heart. Dropsy. Certified.
1860.			
Jan. 17	66	Carpenter, master	Paralysis. Certified.
„ 28	58	Farmer - -	Diseased brain, 8 weeks. Certified.
Feb. 25	87	Land surveyor	Old age. Not certified.
Jan. 13	57	Agric. labourer	Injuries. Accident, thrashing machine. Inquest.
May 9	75	Agric. labourer	Paralysis. Certified.
„ 19	69	Brewer - -	Gout. Paralysis. Certified.
Aug. 13	19	Farm servant	Phthisis, 12 months. Certified.
June 20	72	Excise officer, superannuated	Congestion of lungs. Apoplexy of lungs. Certified.
Oct. 5	66	Clergyman -	Heart disease, 10 years. Hemoptysis, 10 days. Certified.
„ 8	18	Farm servant	Phthisis. Certified.
Nov. 9	74	Gentleman -	Old age. Jaundice. Certified.
„ 13	68	Cabinet-maker, journeyman.	Phthisis. Certified.
Sept. 30	58	Hatter - -	Accidental death. Inquest.
Nov. 21	57	Labourer - -	Phthisis. Certified.
„ 25	57	Agric labourer	Diseased kidneys, 6 months. Certified.
„ 24	55	Cordwainer, journeyman.	Phthisis. Certified.
Dec. 4	54	Currier - -	Emphysema, 10 years. Pulmonary congestion. Certified.
„ 12	70	Yeoman -	Heart disease, 10 years. Certified.
Nov. 29	77	Tailor, master	Paralysis, 10 days. Certified.
„ 14	70	Agric. labourer	Paralysis. Certified.
1861.			
Jan. 12	83	Agric. labourer	Paralysis. Certified.
„ 15	58	Tanner, journeyman.	Bronchitis. Certified.
„ 30	78	Husbandman -	Diseased kidneys. Certified.
Mar. 17	34	Policeman -	Phthisis. Certified.
Jan. 22	58	Cattle dealer -	Accidental fall underneath a coach. Inquest.
Feb. 16	60	Labourer -	Suicide, by drowning. Inquest.
Apr. 14	47	Agric. labourer	Phthisis. Certified.
1860.			
Oct. 25	11	Son of watch-maker, master.	Hydrocephalus, 14 days. Certified.
1861.			
May 5	17	Coach painter, apprentice.	Phthisis pulmonatilis. Certified.
„ 18	65	Dairyman -	Phthisis pulmonatilis. Certified.
„ 23	65	Carpenter, journeyman	Malignant disease of leg. Asthma. Certified.
„ 25	65	Innkeeper -	Visitation of God. Inquest.
July 15	25	Solicitor -	Pulmonary consumption, 2 years. Certified.
„ 20	80	Agric. labourer	Gradual decay. Certified.
Aug. 30	86	Agric. labourer	Phrenitis. Anasarca. Certified
Sept. 23	78	Cordwainer -	Paralysis. Certified.
„ 28	59	Labourer -	Phthisis. Anasarca. Certified.
Oct. 19	72	Blacksmith -	Glandular diseased bowels. Certified.
Nov. 22	23	Cabinet-maker	Found dead. Natural causes. Inquest.
„ 28	61	Hatter, journeyman.	Emphysema. Certified.

COUNTY OF CORNWALL.

Launceston - 5. Northhill.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 7	72	Yeoman -	Old age. Certified.
„ 9	41	Copper miner	Fever, 1 month. Inflammation of liver and spleen, 1 week. Certified.
„ 20	65	Agric. labourer	Found dead, from natural causes. Inquest.
Feb. 2	84	Mason - -	Old age. Certified,
„ 2	51	Yeoman -	Disease of heart. Certified.
„ 3	77	Farmer - -	Inflammation of liver and jaundice. Certified.
„ 2	72	Farmer - -	Retention of urine, 14 days. Certified.
Mar. 11	60	Tanner - -	Pneumonia, 10 days. Certified.
„ 21	79	Agric. labourer	Old age. Not certified.
„ 21	58	Mason - -	Gangrene of lungs. Certified.
Apr. 5	48	Agric. labourer	Pneumonia, 9 days. Certified.
„ 11	67	Farmer - -	Diseased liver, 2 years. Certified.
„ 14	33	Cordwainer -	Pneumonia, 4 days. Certified.
„ 29	23	Linendraper, apprentice.	Phthisis pulmonalis. Certified.
„ 27	73	Yeoman -	Emphysema, 7 years. Dropsy. Certified.
June 5	54	Farmer and butcher	Gout, 10 years. Ascites, 3 months. Certified.
„ 12	83	Slate quarryman	Old age. Not certified.
July 16	34	Farmer and tailor	Diarrhœa, 5 days. Scarlatina, 3 days. Certified.
„ 20	64	Agric. labourer	Dropsy, 2 months. Certified.
„ 22	87	Carpenter -	Old age. Certified.
Aug. 17	72	Mason - -	Cephalitis. Certified.
„ 19	71	Agric. labourer	Asthma. Diseased heart, 5 years. Certified.
„ 24	54	Agric. labourer	Pneumonia, 9 days. Typhoid, 2 days. Certified.
Sept. 1	31	Labourer -	Phthisis, 2 or 3 years. Certified.
Oct. 1	42	Copper miner-	Phthisis pulmonatis, 3 weeks. Certified.
„ 9	44	Blacksmith -	Diseased heart. Dropsy. Certified.
Nov. 13	79	Agric. labourer	Ulcer of the toe, 5 months. Not certified.
„ 16	82	Agric. labourer	Bronchitis. Certified.
„ 26	27	Copper miner-	Injury to spinal cord, 20 months. Paralysis. Mortification, 3 days. Certified.
„ 26	70	Agric. labourer	Dyspepsia. Atrophy. Certified.
1860.			
Jan. 21	37	Carpenter -	Scrofula. Ulceration of bones, 3 years. Certified.
Feb. 4	52	Agric. labourer	Apoplexy. Certified.
„ 6	78	Yeoman -	Influenza. Certified.
Mar. 20	61	Mine labourer	Influenza, 14 days. Typhoid pneumonia. Certified.
Apr. 17	25	Carpenter, journeyman	Pulmonary consumption. Certified.
„ 22	12	Son of labourer, copper mine.	Phthisis, 6 months. Certified.
„ 13	47	Agric. labourer	Pleuro-pneumonia. Hepatitis. Certified.
May 2	74	Mason - -	Old age. Certified.
Apr. 27	35	Miner - -	Injuries. Accident Holmbush Mine. Inquest.
May 21	65	Agric. labourer	Emphysema. Jaundice. Certified.
June 1	23	Servant -	Hepatitis. Certified.
„ 2	47	Almsman -	Influenza. Convulsion. Certified.
„ 4	43	Miner -	Injuries received at a mine. Inquest.
„ 8	11	Son of yeoman	Albuminuria. Dropsy. Certified.
„ 19	57	Agric. labourer	Diseased heart. Certified.
„ 28	59	Copper miner	Bronchitis, 10 days. Certified.
July 7	16	Miner - -	Diseased brain. Congestion of lungs. Certified.
„ 18	35	Agric. labourer	Emphysema. Pneumonia. Certified.
„ 27	42	Licensed Vict.	Phthisis pulmonalis, 2 years. Certified.
„ 30	45	Copper miner	Hepatitis. Pneumonia. Nephria. Certified.
Aug. 22	10	Son of copper miner	Small pox, 1 week (not vaccinated). Certified.
„ 17	20	Miner - -	Accident, falling down a shaft at Kithill mine. Inquest.
„ 28	66	Cordwainer -	Bronchitis. Diseased heart. Dropsy. Certified.
Sept. 22	21	Miner - -	Accident, killed. Inquest.
Oct. 1	77	Mason - -	Old age. Not certified.
Nov. 9	24	Copper miner	Confluent small pox, 18 days, vaccinated 18 days. Certified.
Nov. 18	21	Carpenter, journeyman.	Consumption. Certified.
Dec. 2	25	Agric. labourer	Pneumonia. Congestion of brain and kidneys. Certified.
„ 25	72	Agric. labourer	Visitation of God. Inquest.
„ 26	73	Yeoman -	Apoplexy. Inquest.
1861.			
Feb. 16	70	Agric. labourer	Cystitis. Certified.
„ 18	24	Labourer, quarry	Cephalitis, 7 weeks. Effusion, 4 days. Certified.
„ 21	54	Miller and farmer.	Diseased heart. Inquest.
„ 24	73	Agric. labourer	Enteritis. Not certified.
Mar. 11	65	Shepherd -	Rheumatism. Old age. Not certified.
Apr. 8	19	Son of blacksmith.	Fever, 14 days. Typhoid, 6 days. Certified.
„ 24	36	Copper miner	Pneumonia, 12 days. Certified.
„ 29	27	Copper miner	Small pox, 11 days; vaccinated 20 years. Certified.
July 23	101	Agric. labourer	Old age. Not certified.
July 9	32	Agric. labourer	Phthisis, 2 years. Certified
Aug. 10	85	Farmer -	Climacteric decay. Certified.
Sept. 15	37	Marine, R.M.	Consumption. Not certified.
„ 19	76	Agric. labourer	Dropsy. Not certified.
„ 29	37	Miner - -	Gastro-enteritis. Inquest
Oct. 18	62	Agric. labourer	Cancer-stomach. Certified.
Dec. 4	52	Copper miner	Pneumonia, 7 days. Certified.
„ 21	72	Farmer - -	Cystitis, 10 years. Certified.

Superintendent Registrar's District.	Registrar's Sub-District.
St. Germans.	1. Antony. 2. St. Germans. 3. Saltash.

Deaths of Males aged 10 Years and upwards in each of the Years 1859–61.

Sub-District - 1. Antony.

1858.			
Dec. 31	74	Agric. labourer	Old age. Certified.
1859.			
Jan. 3	59	Sulphuric acid maker.	Suffocation by the inhalation of nitrous acid gas. Inquest.
„ 4	31	Sulphuric acid maker.	Suffocation by the inhalation of nitrous acid gas. Inquest.
„ 21	40	Agric. labourer	Phlegmonous erysipilas, 5 weeks. Certified.
„ 6	32	Fisherman -	Nephria, 11 months. Asthma. Certified.
„ 10	53	Fisherman -	Ileus, 5 days. Certified.
Mar. 4	86	Dairyman -	Old age. Certified.
Jan. 27	72	Agric. labourer	Erysipelas, 1 month. Certified.
Mar. 9	21	Son of agric. labourer.	Fever, 3 weeks. Certified.
Jan. 26	74	Greenwich pensioner.	Congestion of lungs, 1 week. Certified.
Mar. 16	14	Son of Greenwich pensioner	Inflammation of bowels, 6 weeks. Certified.
Feb. 6	35	Waterman -	Typhoid fever,—weeks. Certified.
Mar. 14	66	Proprietor of houses.	Anthrax. Coma, some months. Certified.
1858.			
Dec. 31	74	Agric. labourer	Old age. Certified.
1859.			
Apr. 6	79	Waterman -	Incontinence of urine. Certified.
„ 15	10	Son of waterman.	Scarlatina, 10 days. Dropsy, 4 days. Certified.
„ 21	29	Seaman, coast guard.	Phthisis, 2 years. Certified.
„ 20	33	Agric. labourer	Congestion of brain, 14 days. ertified.
„ 23	47	Mason, master	Hypertrophy of liver, 3 years. Diseased heart and jaundice, 2 years. Sphacelus of leg, 4 days. Certified.
„ 15	40	Farm labourer	Self murder by hanging. Inquest.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
May 2	14	Labourer -	Retention of urine, and probably diseased bladder, 1 week. Certified.
„ 8	73	Blacksmith -	Heart disease. many months. Certified.
„ 17	30	Blacksmith -	Diseased brain, many years. Certified.
„ 27	76	Paymaster R.N.	Diseased prostate, 4 years. Cystitis, 1 year. Certified.
„ 26	53	Blacksmith -	Accident, killed in a steam engine. Fracture of ribs, aram, and compression of chest. Inquest.
June 17	12	Son of Lieutenant, R.N.	Peritonitis, 4 days. Certified.
„ 14	35	Greenwich pensioner.	Phthisis pulmonalis, 2 years. Certified.
„ 27	62	Agric. labourer	Phthisis pulmonalis, 2 years, Certified.
July 7	60	Superannuated coast guard.	Consumption, many months. Certified.
„ 26	10	Son of Paymaster, R.N.	Brain fever, 14 days. Certified.
Aug. 8	25	Seaman, R.N.	Phthisis, 10 months. Certified.
„ 23	33	Boat builder -	Typhus, 3 weeks. Certified.
„ 26	76	Greenwich pensioner.	General decay. Certified.
„ 25	44	Greenwich pensioner.	Phthisis, 10 months. Certified.
„ 6	71	Pilot - -	Accident. Drowned; boat upset. Inquest.
„ 23	40	Soldier - -	Found drowned. Inquest.
„ 30	82	Agric. labourer	Old age. Certified.
Sept. 6	57	Waterman -	Diseased heart, 12 months. Certified.
„ 18	84	Waterman -	Diarrhœa, 2 months. Certified.
Oct. 10	25	Son of magistrate	Phthisis, 12 months. Certified.
„ 19	77	Agric. labourer	Scrofulous abscess, — months. Certified.
„ 23	81	Waterman -	Old age. Certified.
„ 22	54	Licensed victualler -	Diseased heart, — months. Certified.
„ 28	46	Storekeeper -	Hypertrophy of heart. Syncope. Certified.
Nov. 13	91	Fisherman -	Old age. Certified.
„ 13	62	Shipwright, H.M.'s dockyd.	Phthisis, — months. Certified.
Dec. 10	74	Agric. labourer	Diseased heart. Certified.
„ 21	21	Blacksmith, apprentice.	Phthisis pulmonalis, 1 years. Certified.
1860.			
Jan. 7	24	Baker, journeyman.	Typhus, 14 days. Certified.
„ 12	22	Butcher, journeyman.	Typhus, 14 days. Certified.
„ 17	41	Labourer -	Fever, 1 week. Certified.
„ 23	79	Fisherman -	Old age. Certified.
„ 31	83	Bargeman -	Old age. Certified.
„ 29	72	Foreman of shipwrights, H.M.'s dockyard.	Diarrhœa, — months. Certified.
Feb. 5	84	Greenwich pensioner.	Old age. Certified.
„ 28	47	Agric. labourer	Pneumonia, 3 weeks. Certified.
„ 27	63	Labourer -	Found dead. Asthma. Inquest.
Mar. 9	58	Working jeweller.	Phthisis, 6 months. Certified.
„ 18	69	Waterman -	Bronchitis. — months. Certified.
„ 9	64	Labourer -	Sudden visitation of God. Inquest.
„ 31	31	Seaman rigger R.N., H.M.'s dockyard.	Variola, con., 5 weeks after vaccination. Certified.
„ 31	47	Sailor - -	Accident. Dislocation of neck. Inquest.
Apr. 9	17	Ropemaker's apprentice.	Phthisis, 15 months. Certified.
„ 14	69	Shoemaker, journeyman.	Diseased prostate gland. Certified.
„ 17	49	Boatman -	Diseased brain. Certified.
„ 17	10	Timekeeper -	Phthisis, 2 months. Certified.
„ 13	79	Shoemaker -	Old age. Certified.
May 6	77	Cabinet maker	Old age. Certified.
„ 8	31	Agric. labourer	Variola, confluent, 9 days. Certified.
„ 5	83	Greenwich pensioner.	Fever, 1 week. Certified.
„ 10	26	Labourer -	Pneumonia, 1 week. Certified.
1860.			
May 9	66	Sailor - -	Found dead. Inquest.
„ 13	77	Yeoman -	Stone, 5 months. Certified.
„ 16	23	Ropemaker, journeyman.	Bronchitis. Phthisis, 4 months. Certified.
„ 11	24	Labourer -	Concussion of spine from fighting. Inquest.
„ 11	35	Sailor - -	Found drowned; boat upset. Inquest.
„ 19	78	Labourer, superannuated, H.M.'s dockyd.	Old age. Certified.
„ 25	20	Seaman, R.N.	Phthisis pulmonalis, 3 months. Certified.
„ 29	70	Waterman -	Phthisis. Certified.
„ 11	unk.	Sailor -	Found drowned; boat upset. Inquest.
„ 11	unk.	Sailor -	Found drowned; boat upset. Inquest.
June 11	84	Agric. labourer	Old age. Certified.
„ 11	85	Master, R.N. -	Diseased brain. Certified.
May 11	unk.	Sailor - -	Found drowned; boat upset. Inquest.
June 21	69	Superannuated boatswain, R.N.	Old age. Certified.
„ 29	35	Greenwich pensioner.	Phthisis, many months. Certified.
July 8	67	Carpenter -	Diseased heart. Certified.
„ 9	70	Sawyer -	Diseased heart, 12 months. Anasarca, 3 months. Certified.
„ 12	52	Labourer -	Phthisis, 9 months. Certified.
„ 18	40	Agric. labourer	Variola, confluent, 9 days. Certified.
„ 17	67	Admiral, R.N.	General debility, 16 months. Certified.
„ 15	65	Labourer -	Apoplexy. Inquest.
„ 19	22	Son of ropemaker's labourer.	Phthisis pulmonalis, 6 months. Certified.
„ 25	15	Son of agricultural labourer.	Phthisis, 5 months. Certified.
Aug. 27	60	Greenwich pensioner.	Diseased heart, many months. Certified.
Sept. 8	32	Labourer, ordnance works.	Phthisis, 11 months. Certified.
„ 13	67	Boat builder -	Phthisis pulmonalis, 1 year. Certified.
„ 26	57	Agric. labourer	Inflammation of the lymphatics, 6 months. Abscess. Certified.
Oct. 13	78	Waterman -	Old age. Certified.
Nov. 14	51	Blacksmith -	Phthisis, 2 years. Certified.
„ 19	86	Waterman -	Old age. Certified.
„ 29	23	Shipwright, H.M.'s dockyd.	Abscess in the loins. Asthma, 13 months. Certified.
Dec. 5	42	Agric. labourer	Diseased heart, some months. Certified.
„ 4	45	Greenwich pensioner.	Abscess of the groin, 6 weeks. Certified.
„ 8	65	Coal merchant	Jaundice, 2 months. Certified.
„ 25	80	Agric. labourer	Phthisis, many months. Certified.
„ 30	87	Greenwich pensioner.	Old age. Certified.
„ 29	39	Master mariner	Drowned; boat upset. Inquest.
1861.			
Jan. 5	81	Seaman, merchant service	Old age. Certified.
„ 6	70	Agric. labourer	Bronchitis, — months. Certified.
„ 9	46	Agric. labourer	Diseased heart, several years. Certified.
1860.			
Dec. 29	26	Sailor - -	Drowned; boat upset. Inquest.
„ 29	37	Sailor - -	Drowned; boat upset. Inquest.
„ 29	18	Sailor - -	Drowned; boat upset. Inquest.
„ 29	18	Sailor -	Drowned; boat upset. Inquest.
1861			
Jan. 15	70	Agric. labourer	Old age. Certified.
„ 29	24	Labourer -	Congestion of spine, and phthisis, 2 months. Certified.
„ 28	78	Labourer -	General debility, 2 years. Certified.
„ 28	64	Sailor, merchant service.	Apoplexy, 5 days. Certified.
Feb. 6	60	Clock and watch maker.	Diseased brain. Apoplexy. Certified.
„ 25	15	Son of master mariner.	Sore throat, 2 months. Spasms of glottis. Certified.
„ 21	62	Captain, R.N.	Diseased liver. Certified.
„ 25	24	Labourer, H.M.'s dockyard.	Phthisis, 2 months. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
Mar. 14	39	Waterman -	Phthisis, some years. Certified.
„ 9	59	Carpenter, R.N.	Apoplexy. Inquest.
„ 24	25	Labourer -	Meningitis, 1 week. Convulsions, 5 hours. Certified.
„ 22	75	Superannuated inland revenue officer.	Old age. Certified.
Apr. 9	82	Agric. labourer	Old age. Jaundice. Certified.
„ 15	61	Waterman -	Pneumonia, 4 months. Dropsy, 2 months. Certified.
„ 28	60	Mason, journeyman.	Diseased brain, — months. Certified.
May 12	69	Agric. labourer	Diseased stomach, — months. Certified.
„ 19	60	Major, R.M. -	Diseased heart. Pneumonia, 1 week. Congestion of brain. Certified.
„ 24	78	Greenwich pensioner.	Decay of nature, 6 months. Certified.
„ 23	57	Mason, master	Diseased brain, — months. Certified.
„ 29	75	Agric. labourer	Diseased brain, — months. Certified.
June 4	66	Farmer -	Cancer of pharynx, post mortem, 8 months. Certified.
„ 12	82	Butcher, master	Old age. Certified,
„ 18	60	Shipwright H.M.'s dockyd.	Diseased liver, 3 months. Certified.
July 2	76	Mason, journeyman.	Paralysis, — months. Certified.
„ 7	60	Gentleman -	Diseased heart, — months. Certified.
„ 14	78	Gardener, journeyman.	Paralysis, — months. Certified.
„ 11	40	Greenwich pensioner.	Apoplexy, 10 days. Certified.
„ 29	43	Labourer, H.M's dockyd.	Paralysis, 20 years. Apoplexy. Certified.
Aug. 31	28	Labourer -	Typhoid fever, 2 months. Phthisis. Certified.
Sept. 15	76	Superannuated ropemaker, H.M.'s dockyd.	Decay of nature, 1 month. Certified.
Oct. 10	27	Ropemaker, H.M.'s dockyd.	Phthisis, 2 years. Certified.
Oct. 29	66	Mason, journeyman.	Diseased heart, — months, Certified.
Nov. 1	85	Greenwich pensioner.	Old age. Certified.
„ 8	30	Cooper, journeyman.	Diseased brain, 2 years. Certified.
„ 7	27	Seaman, R.N.	Phthisis, 5 months. Certified.
„ 13	64	Licensed victualler.	Decay of nature, 2 weeks. Certified.
„ 15	88	Carpenter, master.	Decay of nature, 2 weeks. Certified.
„ 16	74	Carver and gilder, master.	Bronchitis, some months. Certified.
„ 22	16	Tailor, apprentice.	Diseased heart, many months. Certified.
„ 24	74	Greenwich pensioner.	Diseased heart. Debility, 1 month. Certified.
„ 29	26	Soldier, R.A.	Diseased heart. Inquest.
Dec. 10	40	Carpenter, master.	Epilepsy, diseased heart, and congestion of lungs, 3 days. Certified.
„ 25	52	Greenwich pensioner and waterman.	Bronchitis. Asthma, 34 days. Certified.
„ 30	65	Agric. labourer	Phthisis, many months. Certified.

Sub-District - 2. St. Germans.

1859.			
Jan. 11	68	Farmer -	Diseased heart, some years. Erysipelas, 3 weeks. Certified.
„ 21	75	Farm labourer	Erysipelas, 10 weeks. Not certified.
„ 19	25	Son of farmer	Consumption, 14 months. Not certified.
Feb. 1	88	Farm labourer	Old age. Not certified.
Mar. 10	88	Labourer -	Apoplexy. Not certified.
Apr. 2	56	Farm labourer	Peritonitis, 3 months. Certified.
„ 18	44	Farmer -	Diseased lungs. Tumour on liver. Not certified.
1859.			
Apr. 21	35	Draper's assistant.	Phthisis. Certified.
„ 25	51	Farmer -	Delirium, causing cerebral apoplexy, 6 days. Certified.
„ 11	42	Farmer -	Visitation of God. Fractured leg 3 weeks before death. Inquest.
May 4	48	Railwaylabourer	Phthisis 1 year. Hemopytysis. Certified.
June 5	20	Seaman -	Accident. Drowned while bathing, under water 12 hours. Inquest.
„ 27	21	Farm labourer	Phthisis. Not certified.
July 17	63	Grocer -	Epilepsy, 40 years. Certified.
„ 22	18	Son of coast guardsman.	Dropsy, 12 months. Not certified.
Aug. 6	62	Landed proprietor.	Paralysis. Certified.
„ 4	50	Wheelwright-	Dislocation of vertebræ. Inquest.
Sept. 8	81	Farm labourer	Age. Certified.
„ 12	38	Gardener -	Meningitis, 2 months. Effusion, 1 week. Certified.
Oct. 15	67	Farm labourer	Diseased brain, 3½ years. Certified.
„ 28	90	Farmer -	Old age. Certified.
Nov. 30	21	Blacksmith, journeyman.	Phthisis, 8 weeks. Certified.
Dec. 6	38	Farm labourer	Diseased brain, 6 months. Certified.
„ 24	73	Butcher, master	Asthma, 5 weeks. Not certified.
„ 29	23	Farm labourer	Phthisis, 3 months. Certified.
1860			
Jan. 5	79	Farm labourer	Decay of nature. Certified.
„ 6	76	Farm labourer	Decay of nature. Certified.
„ 8	73	Quarryman -	Fistula in perinæo, 20 years. Certified.
Mar. 4	50	Farmer -	Peritonitis. Certified.
Apr. 25	21	Seaman, merchant service	Hemoptysis, 10 months. Phthisis, 3 years. Certified.
June 12	unk.	Seaman -	Supposed shipwrecked. Inquest.
July 3	60	Farm labourer	Hydrothorax, several months. Certified.
„ 17	16	Seaman, R.N.	Phthisis, 9 weeks. Certified.
„ 18	67	Yeoman -	Prostate disease, — years. Certified.
„ 21	53	Farm labourer	Phthisis, 2 months. Certified.
„ 21	80	Boatman -	Diseased heart, — years. Dropsy, 5 weeks. Certified.
Aug. 11	65	Carpenter, master.	Apoplexy, 19 days. Certified.
Nov. 16	52	Cordwainer, master.	Intestinal obstruction, 1 week. Certified.
Dec. 24	57	Cordwainer, master.	Diseased brain. Certified.
„ 27	67	Farmer -	Peritonitis, 10 days. Certified.
1861			
Jan. 7	74	Farm labourer	Apoplexy, 10 days. Certified.
„ 7	56	Farm labourer	Bronchitis, 4 days. Congestion. Certified.
„ 18	66	Merchant -	Diseased heart. Angina pectoris, 24 hours. Certified.
„ 31	37	Farm labourer	Peritonitis, 6 months. Certified.
Feb. 12	10	Son of railway labourer.	Phthisis, 3 months. Certified.
„ 11	25	Carpenter, journeyman.	Phthisis, 5 years. Certified.
„ 8	29	Merchantseaman	Phthisis, 5 years. Certified.
„ 18	20	Shipwright, apprentice.	Phthisis, 1 year. Certified.
May 16	15	Son of Carpenter, master.	Diseased heart. Rheumatism, 4½ months. Certified.
June 14	18	Mason -	Confluent small pox, 11 days. Certified.
Oct. 6	84	Farm labourer	Old age. Not certified.
Nov. 28	40	Farmer -	Injury, fall from his horse, 19 days. Cerebritis, 10 days. Certified.
Dec. 26	68	Shoemaker, master -	Muco-Enteritis. Certified.
„ 26	81	Farmer -	Decay of nature. Certified.

COUNTY OF CORNWALL.

Sub-District - 3. Saltash.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 4	87	Agric. labourer	Fever, 3 weeks. Certified.
„ 21	62	Carpenter -	Arterial ossification. Certified.
„ 23	80	Blacksmith -	Age. Certified.
„ 30	69	Merchant -	Enlarged prostate. Pneumonia, 1 week. Certified,
Feb. 3	63	Shipwright, H.M.'s dockyd.	Fever, 14 days. Certified.
„ 7	88	Agric. labourer	Natural decay. Not certified.
„ 24	66	Farmer -	Pneumonia, 10 days. Certified.
„ 2	42	Labourer -	Accidental. Inquest.
Mar. 13	71	Boot and shoemaker.	Ascites, 4 months. Paracentisis abdominis. Certified.
„ 6	66	Agric. labourer and sexton.	Diseased heart. Certified.
„ 13	77	Gardener -	Congestion of lungs, 6 weeks. Diseased heart, 5 years. Certified.
„ 29	40	Railway labourer	Typhoid fever, 18 days. Certified.
1858.			
Dec. 28	81	Pensioner H.M.'s dockyard.	Fever, 10 days. Pneumonia, 4 days. Certified.
1859.			
Apr. 4	76	Agric. labourer	Chronic bronchitis, 7 years. Acute. 10 days. Certified.
„ 16	33	Seaman, R.N.	Phthisis, 12 months. Certified.
„ 19	65	Blacksmith -	Chronic bronchitis, sub-acute, 2 weeks. Certified.
„ 29	50	Butcher -	Cancer of the cheek, 1 year. Certified.
May 6	21	Railway guard	Accident, killed on the Cornwall Railway. Fracture of skull, Concussion of brain. Inquest.
„ 6	31	Driver of engine Cornwall Railway.	Accident. Drowned and suffocated, by an engine falling off a viaduct belonging to the Cornwall Railway, into a creek of salt water and mud. Inquest.
„ 6	24	Engineman, Cornwall Railway.	Accident. Drowned and suffocated, by an engine falling off a viaduct belonging to the Cornwall Railway, into a creek of salt water and mud. Inquest.
„ 25	71	Farmer -	Febris continua. Congestion of lungs. Certified.
June 11	26	Butcher -	Pulmonary congestion, 2 days. Hemoptysis, 8 days. Tuberculosi, 5 years. Certified.
July 1	71	Farmer -	Pneumonia, 4 days. Certified.
„ 21	77	Hatter -	Senile fever, 1 week. Certified.
Aug. 2	41	Carpenter -	Phthisis, 9 months. Certified.
July 29	28	Miner -	Diarrhœa, 7 days. Certified.
Aug. 14	12	Farm labourer	Accident. Drowned, bathing. Inquest.
„ 18	87	Boatman -	Natural decay. Not certified.
Sept. 3	58	Seaman, R.N.	Suffocated and drowned. Inquest.
„ 24	75	Agric. labourer	Senile fever, 2 months. Certified.
„ 29	63	Agric. labourer	Diseased heart. Diarrhœa. Certified.
Oct. 17	83	Agric. labourer	Diarrhœa, 1 week. Certified.
„ 18	80	Agric. labourer	Senile fever, 14 days. Certified.
„ 31	80	Greenwich pensioner.	Senile fever, 3 months. Certified.
Nov. 9	74	Agric. labourer	Senile fever, 5 weeks. Certified.
„ 10	68	Agric. labourer	Cephalitis, 3 weeks. Certified.
„ 24	41	Market gardener	Sudden. Diseased heart. Inquest.
„ 10	66	Labourer -	Sudden. Visitation of God. Inquest.
„ 5	23	Seaman, R.N.	Suffocated by drowning. Inquest.
„ 28	72	Schoolmaster-	Acute bronchitis, 7 days. Chronobronchitis, 10 years. Certified
Dec. 5	51	Agric. labourer	Pneumonia, 1 year. Certified.
Nov. 29	82	Farmer -	Diseased kidneys. Enlarged prostate. Certified.
„ 30	87	Agric. labourer	Old age. Certified.
Dec. 12	44	Agric. labourer	Phthisis, 9 months. Certified.
„ 20	24	Bargeman -	Psoa abscess, 2 years. Congestion of lungs, 4 days. Certified.
1860.			
Jan. 3	68	Tailor -	Debility. Certified.
„ 5	65	Labourer -	Accidental fall. Concussion of spine, 12 hours. Inquest.
„ 3	59	County magistrate.	Diseased heart. Emphysema. Certified.
1860.			
Jan. 7	31	Butcher -	Diabetes, 3 months. Certified.
Feb. 1	23	Seaman, R.N.	Phthisis pulmonalis, 2 years. Certified.
„ 5	65	Harness mender	Diseased heart, long standing. Certified.
„ 26	64	Boatman -	Emphysema. Bronchitis. Certified.
Mar. 3	55	Agric. labourer	Pneumonia, 2 weeks. Certified.
„ 8	67	Shoemaker, master.	Diseased heart. Anasarca. Certified.
Apr. 17	84	Farmer -	Mild fever, 8 weeks. Bronchitis 1 week. Certified.
May 7	78	Sailor, R.N. -	Old age. Certified.
„ 8	35	Miner -	Phthisis. Certified.
„ 10	40	Miner -	Psoas abscess, 3 years. Certified.
„ 28	10	Son of agric. labourer.	Hydrocephalus. Not certified.
June 6	55	Gentleman -	Phthisis. Ulcerated intestines, 3 months. Certified.
May 7	40	Pensioner, Greenwich.	Diseased heart. Dropsy. Certified.
„ 10	45	Merchant -	Phthisis, 2 years. Certified.
„ 25	17	Farm servant	Phthisis, 4 months. Certified.
July 16	23	Seaman, R.N.	Dysentery, — months. Certified.
Aug. 14	23	Miner - -	Abscess, iliac. Enteritis, 14 days. Certified.
July 28	22	Agric. labourer	Pneumonia, 3 weeks. Typhus 2 weeks. Certified.
Aug. 13	66	Agric. labourer	Diseased heart. Dropsy, 6 months. Certified.
„ 14	73	Yeoman -	Bronchitis. Congestion of lungs. Certified.
Sept. 4	45	Agric. labourer	Rheumatics. Diseased heart. — weeks. Certified.
„ 7	19	Bargeman -	Suffocation by drowning. Inquest.
„ 22	75	Agric. labourer	Consumption, 9 months. Certified.
„ 29	76	Fisherman -	Cardiac disease,—years. Certified.
„ 26	21	Shoemaker, journeyman.	Fever. Abscess of lungs, 5 weeks. Certified.
„ 21	34	Stoker, R.N.	Drowned. Inquest.
Oct. 10	81	Watchman -	Senile infirmities. Certified.
„ 11	40	Greenwich pensioner.	Disordered brain, 2 years. Convulsed, 2 months. Certified.
„ 16	30	Mason - -	Paraplegia. Certified.
„ 21	75	Agric. labourer	Age. Certified.
„ 22	59	Agric. labourer	Bronchitis. Certified.
„ 20	75	Agric. labourer	Apoplexy, 3 months. Certified.
Nov. 4	36	Son of Greenwich pensioner.	Congestion of lungs, 4 days. Certified.
„ 11	95	Farmer -	Fever, 2 weeks. Certified.
„ 23	33	Farm labourer	Fever. Pneumonia, 5 days. Certified.
„ 25	62	General dealer	Fever, 13 weeks. Certified.
„ 28	67	Wheelwright	Bronchitis, 2 years. Certified.
Dec. 1	26	Butcher -	Phthisis, 2 years, Cardiac disease. Dropsy. Certified.
„ 21	44	Farm labourer	Diabetes, several years. Certified.
1861.			
unk.	unk.	Sailor - -	By drowning. Inquest.
Jan. 15	47	Farmer -	Disease of heart. Bronchitis, 9 months. Albuminuria, 2 months. Certified.
„ 20	66	General labour.	Acute bronchitis, 5 days. Certified.
Feb. 18	56	Farm labourer	Fever, 7 days. Pleuro-pneumonia, 4 days. Certified.
Mar. 2	68	Market gardener.	Phthisis pulmonalis, 2 years. Certified.
Feb. 22	84	Farm labourer	Natural decay. Certified.
Mar. 14	84	Farrier and farm labourer.	Phthisis pulmonalis, 18 months. Certified.
„ 19	73	Mason -	Fever, 10 days.
„ 31	53	Pensioner, R.N.	Drowned by accident. Inquest.
Apr. 2	63	Ropemaker, H.M.'s dockyd.	Peritonitis, 3 months. Post mortem. Certified.
„ 14	28	Son of labourer	Pneumonia, 4 weeks. Certified.
„ 20	21	Carpenter, journeyman.	Phthisis pulmonalis, 7 months. Certified.
May 11	30	Brickmaker.	Diseased heart. Rheumatics, 7 months. Dropsy, 1 month. Certified.
„ 23	63	Shoemaker, master.	Diseased liver and stomach, 1 year. Certified.
June 8	42	Fisherman -	Diseased heart and lungs. Diarrhœa, 4 days. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
June 9	27	Not stated -	Visitation of God. Inquest.
July 2	31	Labourer, H.M.'s dockyd.	Phthisis pulmonalis, 9 months. Certified.
,, 24	56	Seaman -	Visitation of God. Inquest.
,, 22	40	Bargeman -	Accidentally drowned, boat upset. Inquest.
Sept. 2	63	Mason, master	Fever, 19 days. Certified.
Aug. 28	82	House steward	Fractured thigh bone. Certified.
Sept. 29	72	Pensioner, H.M.'s dockyd.	Diseased prostate with retention of urine.
Oct. 11	76	Farm labourer	Old age. Certified.
,, 16	24	Mason, journeyman.	Fever, 3 weeks. Retention of urine, 5 days. Certified.
,, 16	10	Son of seaman, R.N.	Fever, 10 days. Certified.
,, 26	41	Farmer -	Cancer of jaw, 1 year. Certified.
Nov. 4	26	Miner - -	Accidentally killed in a mine. Inquest.
,, 12	87	Butcher and farmer.	Natural decay. Certified.
,, 23	25	Farm labourer	Phthisis pulmonalis, 1 year. Certified.
Dec. 1	68	Pensioner, H.M.'s dockyd.	Fever. Pulmonary congestion. Certified.
,, 19	72	Bargeman -	Bronchitis, 3 years. Acute, 6 weeks. Certified.
,, 20	69	Pensioner, H.M..s dockyd.	Apoplexy, 3 days. Certified.

Superintendent Registrar's District.	Registrar's Sub-District.
LISKEARD.	1. Callington. 2. Liskeard. 3. Looe. 4. Lerrin.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS, IN EACH OF THE YEARS 1859-61.

Sub-District - 1. Callington.

1859.			
Jan. 23	24	Copper miner	Small-pox, 10 days (confluent), never inoculated or vaccinated. Certified.
,, 19	46	Miner - -	Lacerated wound in the throat, caused by the explosion of gunpowder in a mine. Certified.
,, 24	79	Agric. labourer	Old age. Not certified.
,, 25	89	Agric. labourer	Old age. Not certified.
,, 31	26	Journeyman blacksmith.	Phthisis, 12 months. Certified.
Feb. 9	65	Woodman -	Hypercardia. Congestion of lungs. Pleuro-pneumonia of the right side. Certified.
,, 4	26	Copper miner	Pleuro-pneumonia, 5 days. Certified.
,, 12	30	Tin and copper miner.	Phthisis pulmonalis, 17 months. Certified.
,, 11	72	Agric. labourer	Age. Cachexia. Scirrhus of stomach. Certified.
Mar. 6	17	Son of farmer	Consumption, 6 months. Certified.
,, 3	48	Miner - -	Injuries, accidental, received by fall from a ladder. Inquest.
,, 8	19	Miner - -	Accident, falling down a shaft. Inquest.
,, 9	63	Copper miner	Asthma, 10 years. Bronchitis, 2 months. Certified.
,, 13	32	Coal yard labourer.	Typhoid fever, 2 weeks. Cerebral effusion, 19 hours. Certified.
,, 14	30	Miner - -	Accidentally killed. Inquest.
,, 14	17	Miner - -	Injuries received by accident at Phœnix mine. Inquest.
,, 16	15	Miner - -	Injuries. Accident at Drake Wall mine. Inquest.
,, 23	82	Farmer -	Old age. Congestion of brain. Certified.
Apr. 11	25	Copper miner, labourer.	Purpura hæmorrhagica. Certified.
,, 23	61	Copper miner	Senile phthisis. Certified.
1859			
Apr. 24	67	Farmer -	Tumour of neck. Congestion of brain. Certified.
,, 28	14	Carpenter, master.	Bronchitis. Edema of lungs. Certified.
,, 27	28	Copper miner	Pneumonia.
,, 27	80	Farmer -	Bronchitis. Certified.
May 5	49	Farmer -	Injury of intestine; kick of a horse. Inquest.
,, 7	17	Miner - -	Injury. Accident received at Wheal Calstock Consols Mine. Inquest.
,, 19	77	Tin and copper miner.	Asthma. Bronchitis. Certified.
,, 15	22	Quarryman -	Injury. Accident received at the Cheesewring Quarries. Inquest.
,, 28	60	Farmer -	Bronchitis. Edema of lungs. Certified.
,, 30	32	Agric. labourer	Emphysema. Diseased liver and kidney, 1 month. Certified.
,, 30	60	Tin and copper miner.	Cirrhosis of liver. Ascites. Certified.
June 5	50	Miller - -	Found dead. Natural causes. Inquest.
,, 8	53	Mine agent -	Visitation of God. Inquest.
,, 13	39	Agric. labourer	Rheumatism. Inflammation of brain, 5 days. Certified.
,, 5	55	Tin and copper miner.	Consumption. Certified.
,, 25	14	Son of Tin and copper miner.	Rheumatic fever. Diseased heart. Certified.
,, 26	22	Copper miner.	Phthisis. Certified.
July 8	41	Tin and copper miner.	Phthisis pulmonalis, 15 months. Certified.
,, 9	42	Shoemaker, journeyman.	Gastritis, 5 days. Excessive vomiting. Peritonitis. Certified.
,, 12	57	Copper miner	Bronchitis, 5 days. Certified.
,, 23	85	Yeoman -	Decay of nature. Certified.
,, 24	63	Copper miner	Apoplexy. Certified.
,, 17	40	Miner - -	Injuries. Accident at Drakeswall's Mine. Inquest.
Aug. 5	11	Son of bargeman	Consumption. Hemorrhage. Certified.
,, 1	34	Miner - -	Injuries. Accident at Drakewall's Mine. Inquest.
,, 5	31	Blacksmith -	Enteritis. Not certified.
,, 14	79	Agric. labourer	Old age. Not certified.
,, 13	60	Agric. labourer	Typhus, 5 weeks. Certified.
,, 14	72	Agric. labourer	Age. Certified.
,, 30	79	Pensioner and Agric. labourer	Apoplexy, 3 days. Certified.
Sept. 1	30	Policeman -	Phthisis. Certified.
,, 3	70	Labourer -	Natural causes. Inquest.
,, 6	30	Gardener -	Consumption. Certified.
,, 17	47	Copper miner	Pneumonia, 8 days. Hepatization. Certified.
,, 21	22	Miner - -	Accident in a mine. 20 tons of lead ore fell on his body. Inquest.
,, 22	45	Copper miner	Consumption, 3 years. Certified.
,, 19	48	Dissenting minister.	Pulmonary consumption. Hemoptysis. Certified.
,, 25	38	Master mason	Phthisis. Certified.
,, 23	23	Mason - -	Gun-shot wound. Accident. Inquest.
,, 30	20	Copper miner	Enteritis. Not certified.
Oct. 22	57	Agric. labourer	Bronchitis, 7 days. Certified.
,, 23	69	Cutler - -	Old age. Certified.
,, 30	58	Yeoman -	Bronchitis. Certified.
,, 31	33	Tin and copper miner.	Enteritis, 7 weeks. Certified.
Nov. 2	56	Tin miner -	Phthisis, 2 years. Not certified.
,, 15	73	Agric. labourer	Diseased heart. Anasarca. Certified.
Dec. 1	10	Son of carpenter	Typhoid fever, 3 weeks. Certified.
,, 3	63	Agric. labourer	Diseased heart, 2 years. Certified.
,, 23	33	Farmer -	Scrofula. Caries. Influenza. Certified.
,, 25	14	Son of shoemaker.	Typhus, 3 weeks. Certified.
,, 25	12	Son of maltster	Pneumonia. Certified.
,, 14	44	Miner - -	Accident. Killed in a mine. Fracture of ribs. Inquest.
,, 27	81	Tailor, master	Old age. Not certified.
,, 26	24	Tin and copper miner.	Consumption. Certified.
1860.			
Jan. 2	52	Yeoman -	Nervous exhaustion, 6 weeks. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Jan. 6	18	Copper miner	Typhus. Certified.
„ 8	69	Copper miner	Decline. Certified.
„ 11	69	Gentleman -	Apoplexy, 10 months. Necrosis. Certified.
„ 14	45	Agric.labourer	Influenza. Congestion of lungs. Certified.
Feb. 4	37	Sawyer -	Influenza. Erysipelas. Congestion of kidneys. Certified.
„ 2	20	Copper miner	Phthisis. Certified.
Jan. 24	18	Copper miner	Typhus, 6 weeks. Purpura hemorrhagica. Certified.
Feb. 7	89	Agric.labourer	Gangrene. Senilis. Certified.
„ 9	59	Copper miner	Chronic bronchitis. Certified.
„ 16	70	Agric.labourer	Bronchitis. Certified.
„ 20	73	Copper miner	Natural decay. Certified.
„ 16	49	Master shoemaker.	Emphysema. Bronchitis. Purulent expectoration. Certified.
22	60	Agric.labourer	Valvular disease of the heart. Certified.
„ 19	65	Draper - -	Sudden. Diseased heart. Inquest.
„ 22	59	Farmer - -	Accident. Killed in a mine. Fracture of skull. Inquest.
1859.			
Sept. 1	30	Policeman -	Phthisis. Certified.
1860.			
Feb. 29	28	Innkeeper -	Apoplexy, 4 days. Certified.
„ 9	22	Son of mine agent.	Phthisis. Certified.
Mar. 29	53	Farmer - -	Apoplexy. Certified.
„ 31	15	Son of copper miner.	Pulmonary consumption. Certified.
Apr. 19	39	Shoemaker, master.	Diseased heart. Congestion of lungs. Certified.
„ 3	20	Copper miner	Consumption. Certified.
„ 18	16	Son of farmer	Tetanus, 5 days. Certified.
„ 18	26	Miner - -	Accident at Drakewell Mine. Inquest.
„ 23	19	Farmer - -	Small pox, 2 days. Diarrhœa. Certified.
„ 26	42	Shoemaker, master.	Phthisis pulmonalis. Certified.
„ 26	46	Lead miner -	Phthisis pulmonalis. Certified.
„ 25	45	Stone cutter -	Phthisis pulmonalis. Certified.
„ 20	17	Miner - -	Accident. Injuries at Drakewall Mine. Inquest.
„ 26	75	Farmer - -	Old age. Certified.
„ 29	20	Farmer - -	Phthisis pulmonalis. Certified.
June 5	78	Farmer - -	Apoplexy. Paralysis. Certified.
„ 3	35	Miner - -	Tetanus from injuries at a mine. Inquest.
„ 10	63	Tin and copper miner.	Diseased lungs. Hemorrhage, 2 months. Certified.
„ 15	17	Copper miner	Explosion of a hole in a copper mine. Laceration of scalp, &c. Inquest.
„ 22	61	Copper miner	Diseased liver. Dropsy. Certified.
„ 27	62	Agric.labourer	Albuminuria. Certified.
July 6	85	Scaffold man, H.M.'s dockyard.	Ascites. Certified.
„ 4	30	Lead miner -	Phthisis. Certified.
„ 18	99	Agric.labourer	Old age. Certified.
„ 19	60	Copper miner	Bronchitis, 3 months. Certified.
„ 25	21	Copper miner	Phthisis, 2 years. Certified.
„ 25	74	Agric.labourer	Bronchitis. Emphysema. Pneumonia. Certified.
„ 21	21	Agric.labourer	Phthisis. Certified.
Aug. 3	71	Agric.labourer	Bronchitis. Certified.
July 23	27	Copper miner	Pneumonia. Certified.
Aug. 9	32	Tin and copper miner.	Hemoptysis. Certified.
July 24	54	Miner - -	Hemoptysis. Inquest.
„ 12	43	Agric.labourer	Phthisis. Certified.
May 11	16	Son of copper miner.	Phthisis, 9 months. Certified.
Aug 25	67	Farmer - -	Diseased heart, 5 years. Dropsy, 6 months. Certified.
„ 26	29	Agric.labourer	Phthisis pulmonalis. Certified.
„ 25	22	Miner - -	Injuries. Accident received at Drakewall Mine. Inquest.
„ 26	30	Engineman, tin mine.	Phthisis. Certified.
Sept. 1	20	Copper miner	Consumption. Certified.
Aug 25	35	Engineer - -	Accident. Drowned. Inquest.
Sept. 13	29	Copper miner	Killed in a copper mine; explosion of gunpowder. Inquest.
1860.			
Sept. 21	71	Farmer - -	Congestion of brain. Paralysis. Certified.
„ 29	22	Carpenter, journeyman.	Phthisis pulmonalis. Certified.
Oct. 15	76	Farmer - -	Apoplexy. Certified.
„ 31	64	Copper miner	Typhus. Certified.
Nov. 7	65	Copper miner	Bronchitis, 6 months. Certified.
„ 17	30	Agric.labourer	Fever. Pneumonia. Nephria. Certified.
„ 8	52	Tin and copper miner.	Bronchitis. Pneumonia. Not certified.
1861.			
Jan. 5	80	Yeoman -	Pneumonia, 10 days. Certified.
„ 14	69	Agric.labourer	Diseased kidneys. Certified.
Feb. 3	64	Agric. labourer	Emphysema. Bronchitis. Certified.
„ 3	92	Farmer - -	Old age. Certified.
„ 9	51	Copper mine agent.	Spasms of stomach. Certified.
„ 15	51	Copper miner	Consumption. Certified.
„ 9	42	Copper miner	Scurvy. Not certified.
Mar. 27	80	Agric. labourer	Congestion of brain, kidneys. Certified.
„ 15	71	Quarrier -	Old age. Not certified.
„ 29	26	Master butcher	Nephria. Ascites. Certified.
Apr. 2	19	Son of agric. labourer.	Typhus. Congestion of brain. Certified.
„ 2	38	Tin and copper miner	Phthisis pulmonalis. Certified.
„ 14	65	Agric. labourer	Asthma. Disease of the heart. Dropsy. Certified.
„ 25	36	Copper miner	Cachexia. Certified.
May 2	26	Farmer - -	Phthisis. Hemoptysis. Delirium, 14 days. Certified.
Apr. 27	14	Son of agric. labourer.	Gastro-enteritis. Certified.
May 16	82	Farmer - -	Disease of the heart. Certified.
„ 23	40	Carpenter, journeyman	Phthisis. Certified.
„ 21	69	Agric. labourer	Emphysema. Disease of the heart. Anasarca. Certified.
June 26	98	Clergyman -	Old age. Certified.
„ 13	91	Farmer -	Old age. Certified.
July 5	25	Copper miner	Phthisis. Certified.
„ 8	61	Yeoman -	Dropsy. Certified.
„ 10	79	Blacksmith, journeyman	Old age. Certified.
„ 22	88	Pensioner -	Old age. Certified.
„ 14	60	Labourer -	Epilepsy. Certified.
„ 21	44	Carpenter, master	Carbuncle. Certified.
Sept. 15	25	Copper miner	Injury from the blasting of rocks, 20 hours. Inquest.
Oct. 15	15	Miner - -	Found dead, supposed in a fit. Inquest.
„ 27	57	Lead mine agent	Bronchitis. Certified.
„ 27	40	Tin and copper miner	Phthisis pulmonalis, 2 years. Certified.
„ 29	66	Agric. labourer	Dropsy. Certified.
Nov. 18	14	Son of a miner	Disease of the heart. Inquest.
Dec. 6	19	Copper miner	Phthisis, 4 months. Certified.
„ 16	74	Farmer -	Cancer of lip, 3 years. Certified.
„ 22	67	Copper miner	Hematemesis. Certified.
„ 27	10	Son of agric. labourer	Enteritis, 7 days. Certified.
„ 27	53	Mason, master	Necrosis, — years. Certified.

Sub-District - 2. Liskeard.

1859.			
Jan. 8	70	Farmer - -	Asthma. Certified.
„ 11	42	Copper miner	Phthisis. Certified.
„ 5	76	Farmer - -	Bronchitis. Not certified.
„ 14	76	Agric. labourer	Decay of nature. Not certified.
„ 22	12	Son of labourer	Typhus fever. Certified.
„ 17	20	Miner - -	Suffocation in a mine by the fumes of gunpowder. Inquest.
„ 27	58	Labourer -	Bronchitis. Certified.
„ 29	52	Copper miner	Consumption Not certified.
„ 23	53	Miller - -	Cancer. Certified.
Feb. 10	68	Copper miner	Decay of nature. Certified.
„ 15	68	Gentleman -	Erysipelas. Certified.
„ 23	58	Labourer -	Fever. Certified.
Mar. 3	62	Agric. labourer	Diseased liver. Certified.
„ 4	45	Lead miner -	Pneumonia, 5 days. Certified.
Feb. 16	73	Labourer -	Mortification. Not certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Mar. 4	27	Tailor - -	Phthisis. Certified.
Feb. 27	47	Miller - -	Fracture of skull, accidental fall from his horse. Inquest.
Mar. 14	85	Agric. labourer	Old age. Not certified.
„ 14	27	Miner -	Accidentally killed in a lead mine, fracture of leg and thigh, laceration of scalp. Inquest.
„ 29	71	Woolcomber -	Heart disease. Certified.
1858.			
Dec. 14	76	Agric. labourer	Decay of nature. Certified.
1859.			
Apr. 2	56	Copper miner	Pulmonary disease. Hemoptysis. Certified.
„ 9	19	Copper miner	Two carbuncles and an abscess. Certified.
„ 13	38	Agric. labourer	Obstruction in the bowels. Certified.
„ 13	45	Copper miner	Diseased lungs. Certified.
„ 25	64	Lead miner -	Chronic bronchitis. Certified.
„ 12	71	Farm labourer	Sudden visitation of God. Inquest.
May 8	75	Miner - -	Phthisis. Certified.
„ 18	53	Copper miner	Disease of the kidneys. Certified.
Apr. 19	63	Mason - -	Phthisis. Certified.
May 7	53	Miner - -	Phthisis. Certified.
June 20	44	Miner - -	Consumption. Certified.
„ 26	39	Farmer - -	Phthisis. Certified.
„ 21	33	A locomotive engine-man on the Cornwall railway.	Accidentally killed by an engine wheel passing over his body at the Liskeard station.
July 7	31	Lead miner -	Pneumonia. Certified.
„ 19	81	Farmer - -	Old age. Certified.
„ 17	82	Saddler - -	Hung himself. Suicide. Inquest.
„ 18	18	Miner - -	Contusion of body, fall of rock. Inquest.
„ 24	19	Lead miner -	Phthisis. Certified.
„ 25	54	Lead miner -	Phthisis. Certified.
Aug. 3	70	Auctioneer -	Stricture of rectum. Certified.
„ 4	57	Granite mason	Typhus. Certified.
„ 11	72	Grocer - -	Decay of nature. Certified.
„ 21	58	Toll-gate keeper	Paralysis. Certified.
Sept. 2	23	Draper - -	Consumption. Certified.
„ 12	59	Mason - -	Consumption. Not certified.
„ 3	66	Miner - -	Diseased heart. Certified.
„ 11	80	Agric. labourer	Debility. Certified.
„ 25	65	Servant -	Pleurisy. Certified.
„ 30	36	Carpenter -	Phthisis. Certified.
Oct. 4	48	Confectioner -	Asthma, sudden. Inquest.
„ 9	46	Copper miner	Consumption. Certified.
„ 15	21	Miner - -	Fracture of skull, fell down a mine. Inquest.
„ 16	68	Farmer - -	Sudden. Disease of the heart. Inquest.
Nov. 2	59	Farmer - -	Pneumonia. Certified.
„ 24	15	Miner - -	Accidentally blown up with gunpowder deceased had in his pocket, 18 hours. Inquest.
„ 8	45	Hairdresser -	Aneurism of aorta. Certified.
„ 28	71	Farmer -	Diseased liver. Certified.
„ 22	62	Lead miner -	Phthisis. Certified.
Dec. 4	24	Lead miner -	Diabetes. Certified.
„ 7	71	Copper miner	Decay of nature. Certified.
„ 6	53	Mine agent -	Chronic bronchitis. Certified.
„ 12	75	Farmer - -	Retention of urine. Certified.
„ 31	15	Son of labourer	Hydrocephalus. Certified. -
1860.			
Jan. 6	70	Farmer - -	Cancer. Certified.
„ 3	54	Farmer - -	Accident by thrashing machine. Concussion of brain, 3 days. Inquest.
„ 13	55	Miner - -	Phthisis. Certified.
Feb. 1	59	Copper miner	Apoplexy. Certified.
„ 2	26	Lead miner -	Pleurisy. Certified.
„ 3	42	Agric. labourer	Diseased heart. Certified.
Jan. 26	73	Miller's labour.	Old age. Certified.
„ 29	53	Cordwainer -	Cancer of bowels. Certified.
Feb. 6	28	Railway labourer.	Accident. Knocked down by engine on Cornwall railway. Inquest.
„ 16	55	Lead miner -	Phthisis. Certified.
„ 23	20	School assist.	Obstruction of bowels. Not certified.
„ 26	18	Son of ironmonger.	Phrenitis. Certified.
„ 26	50	Labourer -	Found dead. Inquest.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Mar. 6	20	Lead miner -	Phthisis. Certified.
„ 12	27	Lead miner -	Internal abscesses. Not certified.
„ 14	61	Labourer -	Fits. Certified.
„ 14	62	Agric. labourer	Apoplexy. No medical attendant.
„ 21	29	Miner - -	Accident. Explosion of steam engine boiler. Fractures, scalds. tetanus. Inquest.
April 6	17	Son of carpenter	Pneumonia. Fever. Certified.
„ 16	71	Agric. labourer	Dropsy. Not certified.
Mar. 27	74	Agric. labourer	Asthma. Certified.
Apr. 24	40	Copper miner	Pneumonia. Certified.
„ 26	73	Farmer -	Diseased heart. Certified.
„ 26	62	Agric. labourer	Fever. Pneumonia. Certified.
May 2	64	Farmer -	Cancer of the stomach. Not certified.
„ 5	85	Agric. labourer	Old age. Not certified.
Apr. 30	65	Blacksmith -	Bronchitis. Certified.
May 6	79	Agric. labourer	Old age. Not certified.
„ 15	56	Agric. labourer	Consumption. Not certified.
„ 14	48	Copper miner	Diseased lungs. Certified.
„ 22	15	Son of agric. labourer.	Typhus fever. Certified.
„ 27	64	Agric. labourer	Phthisis. Certified.
„ 28	29	Lead miner -	Phthisis. Certified.
„ 31	42	Carpenter -	Carcinoma. Certified.
June 2	19	Copper miner	Peritonitis. Certified.
„ 4	72	Agric. labourer	Decay of nature. Not certified.
„ 12	48	Tailor - -	Pneumonia. Certified.
„ 4	43	Attorney -	Inanition. Certified.
„ 15	66	Carpenter -	Paralysis. Certified.
„ 13	80	Farmer - -	Old age. No medical attendant.
July 7	62	Farmer - -	Phthisis. Certified.
„ 13	81	Surgeon -	Age. Certified.
„ 19	79	Agric. labourer	Age. Certified.
Aug. 9	30	Copper miner	Phthisis. Certified.
July 22	15	Son of lead miner	Typhus. Certified.
Aug 16	51	Mason - -	Fever. Certified.
„ 21	35	Agric. labourer	Phthisis. Certified.
„ 19	21	Clockmaker -	Typhus. Cerebral effusion, 10 hours. Certified.
Sep. 3	23	Lead miner -	Consumption. Certified.
„ 8	23	Lead miner -	Disease of kidneys. Certified.
„ 8	54	Farmer - -	Enteritis. Not certified.
„ 7	36	Copper miner	Accident in copper mine, explosion of powder, 4 hours. Inquest.
Aug 26	74	Labourer -	Debility. Certified.
Oct. 22	60	Copper mine agent.	Cancer. Certified.
„ 25	35	Copper miner	Consumption. Not certified.
„ 30	87	Labourer -	Old age. Certified.
Nov. 3	31	Mason - -	Dropsy. Certified.
„ 6	66	Farmer - -	Bleeding from the stomach. Certified.
„ 15	68	Agric. labourer	Dropsy. Certified.
„ 15	70	Agric. labourer	Dropsy. Certified.
„ 18	48	Copper miner	Diseased liver. Not certified.
„ 7	23	Miner - -	Fracture of skull, 1 hour. Inquest.
„ 22	23	Labourer, railway.	Hemoptysis. Certified.
„ 20	10	Son of lead miner	Pneumonia. Certified.
„ 24	54	Farmer - -	Consumption. Not certified.
„ 27	76	Mason - -	Paralysis. Certified.
„ 30	67	Lead miner -	Decay of nature. Not certified.
Dec. 6	44	Copper miner	Phthisis. Certified.
„ 9	97	Labourer -	Old age. No medical attendant.
„ 7	75	Innkeeper -	Dropsy. Certified.
„ 13	82	Farmer - -	Old age. Not certified.
„ 19	18	Son of blacksmith.	Phthisis. Certified.
„ 26	44	Copper miner	Typhus. Not certified.
„ 25	52	Farmer - -	Diseased heart. Certified.
„ 31	56	Cordwainer -	Debility. Certified.
1861.			
Jan. 4	73	Agric. labourer	Pneumonia. Not certified.
„ 5	36	Lead miner -	Consumption. Certified.
„ 7	22	Lead miner -	Consumption. No medical attend.
„ 8	52	Mine clerk -	Diseased heart. Certified.
„ 13	85	Farmer - -	Old age. No medical attendant.
„ 15	72	Agric. labourer	Old age. Certified.
„ 17	69	Farmer - -	Dropsy. Certified.
„ 31	62	Farmer - -	Pneumonia. Certified.
Feb. 4	39	Copper miner	Pulmonary consumption. Certified.
„ 10	64	Agric. labourer	Apoplexy. Inquest.
„ 20	52	Lead miner -	Consumption. Certified.
„ 18	11	Son of lead miner	Accident. Run over by cart. Inquest.
„ 24	18	Son of copper miner -	Phthisis. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
Feb. 24	75	Agric. labourer	Paralysis. Certified.
Jan. 13	80	Agric. labourer	Old age. Certified.
Mar. 5	25	Lead miner -	Consumption. Certified.
„ 2	48	Veterinary surgeon - -	Fall from his horse, 27 hours. Inquest.
„ 7	71	Agric. labourer	Senile decay. Certified.
„ 17	38	Lead miner -	Diseased heart. Certified.
Jan. 29	22	Labourer -	Phthisis. Certified.
Feb. 1	36	Railway labourer	Phthisis. Certified.
„ 7	97	Not stated -	Fever and old age. Certified.
Mar. 25	57	Miner - -	Pulmonary consumption. Certified.
„ 18	14	Son of farmer	Accident. Killed in a mine. Fracture of skull. Inquest.
„ 29	17	Son of miner	Consumption. Certified.
„ 25	13	Son of labourer	Pneumonia. Not certified.
Apr. 19	23	Son of agric. labourer -	Phthisis. Certified.
May 5	38	Copper miner	Small-pox. Certified.
Apr. 24	52	Copper miner	Fall from an engine boiler. Concussion of brain, 2 days. Inquest.
„ 25	38	Labourer -	Explosion of powder in a mill, 3 days. Inquest.
„ 30	42	Copper miner	Concussion of brain. Inquest.
May 11	57	Grocer & draper	Diseased lungs. Certified.
„ 22	19	Son of miner	Pneumonia. Certified.
„ 25	73	Labourer -	Palsy. Certified.
„ 28	49	Gardener -	Cirrhosis. Hepatitis. Certified.
June 4	18	Son of miner -	Phthisis. Certified.
„ 8	63	Agric. labourer	Dropsy. Certified.
„ 12	52	Copper miner	Diseased spine. Certified.
„ 9	16	Son of cooper	Consumption. Certified.
„ 16	63	Farmer -	Enteritis. Certified.
„ 19	64	Gardener -	Decay of nature. Certified.
„ 18	67	Gardener -	Enteritis. Not certified.
„ 21	32	Labourer -	Apoplexy. Inquest.
July 3	12	Son of labourer	Enteritis. Certified.
„ 7	50	Labourer -	Jaundice. Certified.
„ 10	19	Son of shoemaker.	Variola. Certified.
„ 12	59	Mine clerk -	Softening of brain. Certified.
„ 15	53	Yeoman -	Suppression of urine. Certified.
„ 20	78	Labourer -	Gangrena senilis. Certified.
„ 29	83	Cordwainer -	Diseased heart. Certified.
Aug. 1	13	Son of servant	Crushed in a water wheel, 5 days. Inquest.
„ 12	11	Son of farmer	Consumption. Not certified.
„ 18	75	Cordwainer -	Abscess of the liver. Certified.
„ 22	20	Lead miner -	Measles. Certified.
„ 28	38	Lead miner -	Consumption. Certified.
Sept. 12	13	Son of tea dealer	Diseased spine. Certified.
„ 18	47	Farmer -	Self-murder by hanging. Inquest.
„ 22	41	Attorney's clerk	Consumption. Certified.
„ 1	12	Son of labourer	Fall from his horse. Inquest.
Oct. 19	44	Horsekeeper -	Pulmonary consumption. Certified.
„ 23	77	Labourer -	Old age. Certified.
„ 26	83	Labourer -	Suicide by hanging. Inquest.
Nov. 8	60	Cordwainer -	Chronic bronchitis. Certified.
„ 7	27	Miner - -	Killed in a lead mine, fractures. Inquest.
„ 16	79	Farmer -	Pneumonia. Certified.
„ 22	23	Miner - -	A rock fell on him, instant. Inquest.
„ 22	31	Mason - -	Gun-shot wound, 3 days. Inquest.
Nov. 29	82	Tin streamer	Senile decay. Certified.
Dec. 12	73	Labourer -	Pneumonia, 6 days. Certified.
„ 13	59	Lead miner -	Mesenteric disease. Certified.
„ 20	47	Copper miner	Diseased heart. Certified.
„ 23	82	Agric. labourer	Decay of nature. Not certified.
„ 28	46	Copper miner	Phthisis, 13 months. Certified.
„ 31	76	Thatcher -	Bronchitis. Certified.
„ 28	75	Hawker -	Diseased liver. Certified.

Sub-District - 3. Looe.

1859.			
Jan. 12	62	Farmer -	Hydrothorax. Certified.
„ 24	80	Labourer- -	Sudden death, natural causes. Inquest.
Feb. 8	70	General labourer	Unknown. Not certified.
„ 15	75	Miller and bargeman.	Asthma. Not certified.
„ 26	78	Farm labourer	Paralysis. Not certified.
„ 22	12	Son of blacksmith.	Pneumonia. Certified.
1859			
Feb. 28	65	Farm labourer	Dropsy on the chest. Not certified.
Apr. 4	64	Proprietor of land.	Diseased heart. Certified.
„ 15	18	Son of shoemaker.	Consumption. Not certified.
„ 24	82	Farmer -	Hydrothorax, 3 weeks. Certified.
„ 21	11	Son of labourer	Accident, killed in a bone mill. Inquest.
May 4	32	House carpenter	Consumption. Not certified.
„ 15	13	Farm servant	Accident, killed in a thrashing machine. Inquest.
June 18	33	Labourer -	Apoplexy. Inquest.
Aug. 11	55	Gardener -	Scrofulous disease of knee. Certified.
Sept. 24	16	Son of mason	Consumption. Not certified.
„ 29	65	Gentleman -	Palsy, 3 years. Apoplexy, 3 days. Certified.
Oct. 29	80	Farm labourer	Intussusceptio, 29 days. Certified.
Nov. 1	13	Son of labourer	Accident, drowned. Inquest.
„ 12	68	Limeburner -	Palsy, 3d attack. Not ceetified.
„ 21	unk.	Sailor - -	Found drowned on the beach. Inquest.
„ 9	76	General merchant.	Erysipelas from a wound. Not certified.
Dec. 15	19	Son of carpenter	Consumption. Not certified.
„ 23	39	Rope maker -	Natural decay. Not certified.
„ 23	36	Seaman, merchant service.	Albuminuria, 3 months. Certified.
„ 27	18	Carpenter's apprentice.	Consumption. Not certified.
1860.			
Jan. 7	76	Mason - -	Paralysis, 11 months. Certified.
„ 24	84	Carpenter -	Palsy. Certified.
Feb. 9	81	Farm labourer	Bronchitis, 3 weeks. Certified.
„ 19	72	Shoemaker -	Jaundice Certified.
„ 20	22	Farm labourer	Diphtheria. Certified.
Mar. 14	71	Farmer -	Diseased heart, 2 years. Certified.
Apr. 10	62	Farm labourer	Pneumonia. Certified.
„ 27	35	Farm labourer	Lumbar abscess. Certified.
„ 30	52	Farm labourer	Consumption, 6 months. Certified.
„ 26	49	Seaman, R.N.	Abscess of thigh joint. Certified.
May 4	81	Draper - -	Natural decay. Certified
„ 10	72	Carpenter -	Consumption. Not certified.
„ 12	79	Carpenter -	Congestion of brain, 2 hours. Certified.
June 1	76	Fisherman -	Natural decay. Not certified.
„ 6	77	Gardener -	Natural decay. Not certified.
„ 19	77	Farmer -	Natural decay. Certified.
„ 27	60	Farm labourer	Apoplexy. Certified.
July 6	26	Farm labourer	Obstruction of bowels. Not certified.
„ 18	66	Seaman, merchant service.	Paralysis. Extravasation of urine, 5 days. Certified.
„ 21	83	Farm labourer	Injury from a fall, 5 weeks. Certified.
Aug. 5	18	Son of labourer	Scarlet fever, 3 days. Certified.
„ 24	71	Farmer -	Paralysis, small intestines. Not certified.
„ 25	70	Mason -	Paralysis, 2 years. Certified.
Sept. 7	43	Labourer -	Gastric fever, 3 weeks. Certified.
„ 16	74	Farm labourer	Pneumonia. Dropsy. Not certified.
„ 19	82	Farm labourer	Natural decay. No medical attendant.
„ 27	90	Farmer - -	Natural decay. No medical attendant.
Oct. 29	60	Labourer -	Diseased heart. Inquest.
„ 10	77	Farmer - -	Diarrhœa. Certified.
Nov. 18	37	Farm labourer	Diseased kidneys, 3 years. Certified.
Dec. 10	77	Mason, journeyman.	Natural decay. Not certified.
„ 19	52	Farmer -	Consumption. Not certified.
„ 25	61	Farmer -	Apoplexy. Inquest.
1861.			
Jan. 3	88	Seaman, R.N.	Natural decay. Not certified.
„ 22	88	Farm labourer	Natural decay. No medical attendant.
„ 27	83	Watchmaker -	Natural decay. Not certified.
„ 31	47	Master mariner	Cancer of face. 4 months. Certified.
Feb. 2	28	Poultry dealer	Asthma. Effusion of blood on chest. Inquest.
„ 12	61	Mason, journeyman.	Diseased kidneys. Certified.
„ 18	73	Superannuated coastguard.	Asthma. Certified.
„ 21	44	Shoemaker, master.	Necrosis, Anasarca. Certified

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1861			
Mar. 6	71	General labourer.	Meningitis, 6 weeks. Carbuncle, 4 weeks. Certified.
„ 23	66	Farmer -	Paralysis, 13 months. Not certified.
„ 30	74	Farm labourer	Paralysis, 4 months. Not certified.
Apr. 12	77	Farm labourer	Colic, 7 days. Not certified.
„ 16	83	Farmer -	Apoplexy, 6 days. Certified.
„ 27	66	Superannuated coastguard.	Diseased kidneys. Not certified.
„ 27	83	Seaman, merchant service.	Natural decay. Not certified.
May 1	77	Superannuated coastguard.	Congestion of brain, 2 days. Certified.
June 5	23	Carpenter, journeyman.	Pulmonary consumption. Certified.
„ 9	24	Seaman, R.N.	Consumption. No medical attendant.
July 12	73	Seaman, merchant service.	Apoplexy, 48 hours. Certified.
„ 26	71	Farm labourer	Invagination of the bowel. Certified.
Aug. 1	11	Son of labourer	Gastric fever, 32 days. Hemorrhage from bowels. 3 days. Certified.
„ 13	22	Farm labourer	Consumption, 8 months Certified.
„ 23	65	Surgeon -	Diseased liver. Dropsy. Certified.
„ 25	15	Son of fisherman.	Lumbar abscess, 6 months. Certified.
„ 31	55	Sawyer -	Phthisis, 6 months. Certified.
Nov. 27	44	Seaman, merchant service.	Cancer of stomach. Not certified.
Dec. 2	23	Lead miner -	Diseased lungs. Certified.
„ 9	81	Seaman, merchant service.	Paralysis, 6 weeks. Certified.
„ 8	74	Farmer -	Sudden death. Inquest.

Sub-district - 4. Lerrin.

1858.			
Dec. 26	16	Son, coastguard service	Pneumonia. Not certified.
May 15	53	Farmer -	Ileus. Not certified.
1859.			
Apr. 5	80	Farmer -	Old age. Not certified.
May 8	81	Master mariner	Old age. Not certified.
June 16	27	Son of agricultural labourer.	Pneumonia. Not certified.
July 15	78	Farmer -	Ascites, 6 weeks. Certified.
Aug. 27	22	Carpenter, journeyman.	Phthisis, 4 months Certified.
Sept. 13	71	Agric. labourer	Age. Not certified.
Oct. 12	81	Butcher -	Age. Not certified.
„ 31	79	Farm labourer	Old age. Not certified.
Nov. 16	15	Son of shipwright.	Convulsion, 48 hours. Certified.
Dec. 9	81	Farm labourer	Old age. Not certified.
„ 15	52	Farm labourer	Dropsy. Certified.
„ 20	81	Farmer -	Dropsy. Not certified.
1860.			
Jan. 3	67	Farm labourer	Diseased heart. Not certified.
„ 4	44	Carpenter, master.	Phthisis. Not certified.
„ 8	53	Farm labourer	Phthisis. Not certified.
„ 23	74	Farmer and miller.	Cystitis. Bronchitis. Certified.
Feb. 28	55	Bargeman -	Consumption. Not certified.
Mar. 2	19	Wheelwright, apprentice.	Nephritis. Certified.
Jan. 28	19	Son of farmer	Phthisis. Not certified.
Mar. 12	78	Farmer -	Sudden visitation of God. Inquest.
„ 29	77	Master mariner	Nephritis. Not certified.
May 3	84	Bargeman -	Old age. Not certified.
„ 21	76	Grocer -	Congestion of lungs. Certified.
Apr. 27	21	Tailor, journeyman.	Consumption. Not certified.
„ 28	62	Farm labourer	Congestion of lungs. Certified.
June 15	75	Farm labourer	Old age. Not certified.
„ 28	72	Farmer -	Diseased prostate. Certified.
July 5	64	Farm labourer	Natural decay. Not certified.
Aug. 28	55	Farmer -	Paralysis. Not certified.
	Unknown	fisherman	Drowned. Inquest.
26	56	Farmer -	Pneumonia. Not certified.
1860.			
Dec. 12	10	Son of blacksmith, master.	Quinsey. Not certified.
„ 22	81	Farm labourer	Bronchitis. Certified.
1861.			
Feb. 23	73	Farmer -	Dropsy. Not certified.
Mar. 22	82	Farmer -	Paralysis, 7 days. Not certified.
Apr. 27	40	Farm labourer	Phthisis. Certified.
May 4	80	Farmer -	Decay of nature. Not certified.
Apr. 17	12	Son of seaman, merchant service.	Unknown. Not certified.
June 2	70	Farm labourer	Bronchitis. Certified.
July 6	75	Farm labourer	Hemoptysis. Certified.
„ 10	10	Son of labourer	Accident. Drowned. Inquest.
„ 16	19	Shipwright, apprentice.	Tetanus. Not certified.
Aug. 12	70	Farmer -	Rheumatic gout. Not certified.
„ 27	21	Draper -	Consumption. Not certified.
Sept. 5	70	Fisherman -	Diseased liver. Certified
Nov. 7	26	Farm labourer	Phthisis. Certified.
„ 24	67	Farmer -	Unknown. Certified.
Dec. 20	50	Farm labourer	Internal abscess. No medical attendant.

Superintendent Registrar's District.	Registrar's Sub-Districts.
Bodmin.	1. Lanlivery. 2. St. Mabyn. 3. Bodmin. 4. Egloshayle.

Deaths of Males aged 10 Years and upwards in each of the Years 1859–61.

Sub-District - 1. Lanlivery.

1859.			
Jan. 1	79	Farmer -	Old age. Not certified.
Feb. 7	69	House proprietor	Apoplexy, 2 days. Certified.
„ 2	30	Stone dresser -	Phthisis pulmonalis, 3 years. Not certified.
„ 18	45	Farmer -	Consumption, 2 years. Not certified.
Mar. 9	18	Shoemaker's apprentice.	Disease of heart. Certified.
„ 21	70	Shoemaker -	Suicide, by cutting his throat. Inquest.
„ 23	23	Farm labourer	Measles. Not certified.
„ 21	33	Tailor, master	Consumption, 9 months. Not certified.
1858.			
Dec. 31	82	Farmer -	Old age. Not certified.
1859.			
Mar. 31	16	Iron miner -	Rheumatic fever, 14 days. Certified.
Apr. 8	62	Farm labourer	Pleurisy. Hemorrhage, 2 months. Certified.
„ 21	29	Copper miner -	Consumption, 16 months. Not certified.
May 13	66	Farm labourer	Hypertrophy of heart. Certified.
„ 22	51	Iron miner -	Pulmonary consumption. Certified.
„ 8	47	Farmer -	Injuries, jammed between two clay waggons. Inquest.
June 11	78	Bargeman -	Palsy. Not certified.
„ 9	66	Farm labourer	Asthma. Not certified.
Oct. 3	14	Son of labourer	Natural causes. Inquest.
„ 17	81	Farm labourer	Decay of nature. Certified.
„ 23	80	Stone quarryman.	Inflammation of throat. Not certified.
Nov. 1	28	Copper miner	Diseased heart, 8 months. Certified.
„ 18	76	Farm labourer	Old age. No medical attendant.
„ 22	75	Accountant -	Strangulated ventral hernia. Certified.
„ 24	15	Son of farmer	Diabetes. Atrophy. Not certified
Dec. 24	56	Farm labourer	Palsy. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Jan. 3	42	Farm labourer	Phthisis, 12 months. Certified.
„ 18	60	Blacksmith, master.	Apoplexy. Certified.
„ 30	20	Farm servant	Scarlatina. Certified.
„ 30	54	Copper miner	Consumption. Not certified.
Feb. 23	82	Farmer	Old age. Not certified.
„ 24	71	Farm labourer	Gout in stomach. Not certified.
„ 29	52	Carpenter, master.	Phthisis, 6 months. Certified.
Mar. 6	24	Stone dresser	Ophthalmia. Not certified.
„ 24	79	Fundholder	Congestion of lungs, 14 days. Certified.
„ 19	50	Butler	Gout. Exhaustion. Certified.
Apr. 16	82	Carpenter	Old age. Not certified.
„ 17	13	Labourer	Fall of a stone roller. Inquest.
„ 25	74	Copper mine agent.	Paralysis, 7 weeks. Certified.
„ 23	87	Farm labourer	Old age. Not certified.
June 3	54	Farm labourer	Congestion of kidneys. Epilepsy. Certified.
„ 27	52	Iron and copper miner.	Effusion on chest. Asthma. Certified.
July 4	20	Errand boy	Consumption. Certified.
„ 12	70	Farm labourer	Phthisis pulmonalis. Certified.
Sept. 8	27	Engine worker, copper mine.	Consumption. Not certified.
„ 24	73	Farmer	Rupture, many years. Certified.
„ 27	46	Tin streamer	Diarrhœa, 10 days. Not certified.
Nov. 7	40	Labourer	Natural causes. Inquest.
„ 15	72	Potter, journeyman.	Enteritis, 3 days. Certified.
„ 19	78	Farmer	Diabetes. Certified.
Dec. 2	70	Farmer	Decay of nature. Certified.
„ 4	71	Painter, master	Bronchitis. Certified.
„ 5	81	Farmer	Paralysis. Not certified.
„ 10	45	Innkeeper	Apoplexy. Certified.
„ 14	26	Railway guard	Crushed in the doorway of a railway van. Inquest.
„ 26	82	Gardener	Bronchitis, 2 months. Apoplexy. Certified.
1861.			
Jan. 1	73	Farmer	Dropsy. Not certified.
„ 17	74	Chelsea pensioner.	Influenza, 1 month. Certified.
„ 20	57	Railway gauger	Congestion of lungs, 1 month. Certified.
Feb. 15	48	Farm labourer	Fever. Certified.
„ 7	24	Tailor, journeyman.	Consumption. Not certified.
Mar. 4	40	Sawyer	Typhus. Certified.
„ 28	64	Farm labourer	Influenza. Certified.
„ 26	80	Thatcher	Paralysis. Certified.
Apr. 1	59	Tin streamer	Chronic rheumatism. Not certified.
May 8	62	Copper miner	Hemorrhage. Debility, 6 weeks. Certified.
„ 16	56	Painter	Natural causes. Inquest.
June 18	75	Carpenter, master.	Paralysis. Certified.
„ 16	88	Farmer	Old age. No medical attendant.
„ 27	84	Farmer	Paralysis. No medical attendant.
July 6	49	Maltster, master	Diseased heart. Rheumatism, 4 weeks. Certified.
„ 17	16	Son of farm labourer.	Enlarged heart, 2 months. Hydrothorax, 8 days. Certified.
Aug 15	67	Copper miner	Phthisis pulmonalis. Certified.
„ 22	76	Farm labourer	Old age. Not certified.
Sept. 1	78	Carpenter, master.	General debility. Certified.
Oct. 18	82	Dom. servant	Influenza, 1 month. Certified.
„ 14	55	Farmer and mason.	Paralysis. Not certified.
„ 25	49	Lead miner	Pulmonary consumption, 2 years. Certified.
Nov. 1	23	Cabinet maker	Diseased heart. Asthma, 1 week. Certified.
Dec. 10	52	Innkeeper and farmer.	Ruptured blood vessel in the lungs. Certified.
„ 14	21	Shoemaker, journeyman.	Cephalitis. Coma, 10 days. Certified.
„ 19	19	Son of stonemason.	Accident by the wheel of a tram waggon passing over him. Inquest.
„ 24	72	Carpenter, RN.	Diseased heart. Certified.

Sub-District - 2. St. Mabyn.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Mar. 5	52	Miller	Phthisis pulmonalis. Certified.
Jan. 20	81	Road labourer	Hernia. Certified.
1858.			
Dec. 31	17	Cordwainer	Diseased heart. Dropsy. Certified.
1859.			
Apr. 28	15	Blacksmith	Obstruction of bowels. Certified.
Mar. 14	63	Rector of Helland.	Carbuncle. Certified.
Apr. 14	58	Agric. labourer	Diseased heart. Certified.
July 6	90	Land proprietor	Old age. Not certified.
Sept. 5	82	Farmer	Diseased heart. Not certified.
May 4	84	Land proprietor	Nephria. Certified.
„ 9	41	Son of land proprietor.	Diseased brain. Apoplexy. 5 days. Certified.
Sept. 30	24	Sawyer	Phthisis pulmonalis. Certified.
Nov. 25	28	Son of farmer	Scarlet fever. Not certified.
Dec. 9	10	Son of innkeeper.	Enteritis, 3 weeks. Ulceration, 3 days. Certified.
„ 27	65	Road labourer	Inflammation. Certified.
1860.			
Jan. 12	87	Road labourer	Diseased brain Delirium. Certified.
Feb. 3	91	Farm labourer	Old age. No medical attendant.
„ 4	75	Farmer	Apoplexy. Paralysis, 3 days. Certified.
Jan. 13	20	Miner	Accident, by rubbish falling on him in Treveddoc mine. Inquest.
1859.			
Dec. 14	82	Wood labourer	Paralysis. Certified.
1860.			
Mar. 23	80	Farm labourer	Old age. Certified.
May 10	29	Innkeeper	Phthisis. Certified.
„ 25	90	Farmer	Old age. Certified.
„ 12	48	Farmer	Paralysis. Not certified.
Apr. 29	26	Chelsea pensioner.	Phthisis. Certified.
July 11	77	Landed proprietor.	Paralysis. Certified.
Aug. 14	61	Farmer	Cancer of stomach. Certified.
Apr. 30	67	Farm labourer	Hepatitis. Certified.
Sept. 30	78	Gardener	Dropsy, 6 months. Certified.
Oct. 5	63	Farm labourer	Diseased heart. Dropsy. Certified.
„ 2	29	Labourer	Accident, fall of ground on him in Treveddoc mine. Inquest.
„ 2	25	Labourer	Accident, fall of ground on him in Treveddoc mine. Inquest.
Dec. 25	81	Road labourer	Dropsy. Certified.
1861.			
Jan. 2	17	Domestic servant.	Bronchitis. Not certified.
„ 10	10	Son of farmer	Diphtheria, 14 days. Certified.
„ 12	68	Farm labourer	Old age. Not certified.
Mar. 24	83	Landed proprietor.	Diseased brain. Certified.
Apr. 1	84	Labourer	Decay of nature. Certified.
„ 28	76	Labourer	Apoplexy. Certified.
„ 27	67	Carpenter	Dropsy. Certified.
May 16	52	Farmer	Natural Causes. Certified.
„ 15	80	Farmer	Old age. Not certified.
June 22	44	Son of captain, R.N.	Phthisis pulmonalis. Certified.
May 14	44	Mason	Accident, fall from a horse. Certified.
Aug. 10	72	Mason	Decay of nature. Not certified.
„ 13	74	Landed proprietor.	Diseased brain. Certified.
Sept. 14	72	Farm labourer	Water complaint. Not certified.
„ 12	78	Farm labourer	Dropsy. Not certified.
„ 17	46	Farm labourer	Unknown. Not certified.

Sub-District - 3. Bodmin.

1859.			
Jan. 19	76	Boot and shoemaker.	Old age. Certified.
„ 30	58	Farmer	Natural decay. Inquest.
Feb. 8	64	Farm labourer	Diseased brain. Coma. Certified.
Jan. 31	21	Printer	Tuberculous. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Feb. 20	45	Innkeeper -	Paralysis. Certified.
„ 11	55	Mason - -	Epilepsy. Abscess on brain. Certified.
„ 25	83	Solicitor -	Bronchitis. Certified.
Apr. 5	60	Blockmaker -	Apoplexy Post mortem. Certified.
„ 21	33	Grocer -	Diseased brain and membrane. Certified.
„ 23	30	Solicitor -	Phthisis pulmonalis. Certified.
„ 28	49	Mason, master	Pneumonia. Certified.
May 21	55	Waggoner -	Accident, killed by the wheel of a waggon passing over him. Inquest.
„ 25	12	Son of blacksmith.	Injuries, clothes being entangled in a mill wheel. Inquest.
„ 21	39	Blacksmith -	Paralysis.
„ 21	32	Farm servant	Phthisis pulmonalis. Certified.
„ 9	28	Carpenter, journeyman.	Phthisis pulmonalis. Certified.
„ 16	12	Son of tailor -	Meningitis. Certified.
June 2	20	Farm servant	Phthisis pulmonalis. Certified.
May 27	61	Farmer -	Phthisis pulmonalis. Not certified.
June 2	48	Carrier -	Paralysis. Certified.
„ 17	76	Farmer -	Chronic Bronchitis. Certified.
„ 27	68	Toll collector	Old age. Certified.
„ 6	69	Innkeeper -	Old age. Not certified.
„ 30	50	Labourer -	Natural causes. Inquest.
July 1	56	Merchant -	Diseased lungs. Inquest.
„ 17	11	Son of farmer	Abscess of liver. Certified,
„ 17	51	Shoemaker, journeyman.	Diseased liver. Certified.
„ 28	64	Farm labourer	Pneumonia, Not certified.
Aug. 5	55	Miner - -	Paralysis. Certified.
„ 2	19	Linendraper's assistant.	Phthisis pulmonalis. Certified.
July 22	67	Copper miner	Apoplexy. Certified.
Aug. 14	63	Gardener -	Old age. Certified.
„ 8	54	Woolstapler -	Gout, metastasis to stomach. Certified.
„ 14	46	Wood labourer	Strictural disease of the stomach. Certified.
„ 5	78	Farmer - -	Fever. Certified.
„ 16	42	Farmer - -	Visitation of God. Inquest.
Sept. 9	85	Farmer - -	Old age. No medical attendant.
„ 6	62	Bailiff, county court.	Bright's disease. Certified.
„ 3	22	Tin miner -	Confluent small pox, not vaccinated. Fever. Certified.
„ 18	66	Shoemaker -	Paralysis. Certified.
„ 23	83	Farmer - -	Old age. Certified.
„ 26	83	Gardener -	Old age. Certified.
Oct. 13	21	Farm labourer	Debility. Phthisis. Not certified.
„ 2	25	Currier - -	Broncho-pneumonia. Certified.
„ 14	67	Farm labourer	Diseased liver. Certified.
„ 24	72	Labourer -	Disease of the heart. Inquest.
„ 20	68	Miner -	Chronic bronchitis. Certified.
„ 27	59	Farmer - -	Apoplexy. Certified.
„ 20	46	Painter -	Apoplexy. Certified.
„ 30	90	Brazier, journeyman.	Old age. Certified.
Nov. 11	72	Carpenter, journeyman.	Apoplexy. Certified.
„ 14	83	Groom - -	Old age. Not certified.
„ 29	30	Pensioner, shoemaker.	Phthisis pulmonalis. Not certified.
„ 19	43	Linendraper -	Strictural disease of stomach. Certified.
Dec. 5	52	Groom -	Palsy. Certified.
Nov. 23	34	Copper miner	Dropsy. Certified.
Dec. 4	68	Farm labourer	Old age. Not certified.
„ 11	66	Gardener, master	Chronic disease of stomach. Certified.
„ 23	21	Son of farmer	Phthisis pulmonalis. Certified.
„ 26	42	Fishmonger -	Disease of the heart. Dropsy. Certified.
„ 29	74	Farm labourer	Gangrene senilis. Certified.
1860.			
Jan. 28	35	Miner -	Paralysis. Certified.
Feb. 9	13	Son of farmer	Ascites. Hydrocephalus. Certified.
Jan. 30	70	Farm labourer	Schirrus of stomach. Certified.
„ 30	38	Farm labourer	Albuminuria. Dropsy. Certified.
Feb. 14	61	Miner -	Natural causes. Inquest.
„ 28	16	Miller's assistant	Scarlatina. Certified.
„ 24	65	Labourer -	Suicide, cut throat. Inquest.
„ 29	30	Farm labourer	Disease of the brain. Certified.
„ 27	46	Farm labourer	Paralysis. Certified.
Mar. 1	67	Farmer - -	Typhus fever. Not certified.
1860.			
Mar. 19	80	Farmer and butcher.	Old age. No medical attendant.
„ 26	55	Farm labourer	Paralysis. Certified.
„ 10	48	Whitesmith -	Disease of the heart. Dropsy. Certified.
Apr. 4	56	Farmer - -	Phthisis pulmonalis. Certified.
„ 7	38	Shoemaker -	Found dead. Suffocation. Inquest.
„ 9	45	Confectioner -	Paralysis. Certified.
Mar. 29	68	Waggoner -	Nephria. Certified.
Apr. 14	50	Hostler - -	Diseased brain. Post mortem. Certified.
„ 23	80	Carpenter -	Old age. Certified.
„ 27	70	Miner - -	Old age. Certified.
May 5	45	Miner - -	Diarrhœa. Certified.
Apr. 30	56	Mine purser -	Bronchitis. Certified.
May 4	73	Tinman -	Gastro-enteritis. Certified.
„ 20	82	Tin streamer -	Paralysis, 10 days. Certified.
June 6	75	Tin streamer -	Old age. not certified.
„ 6	40	Farm labourer	Disease of the heart. Certified.
„ 20	67	Wool sorter -	Paralysis. Certified.
July 8	49	Farm labourer	Disease of the heart. Certified.
„ 12	78	Shoemaker, master.	Paralysis. Certified.
„ 7	18	Linendraper, apprentice.	Inflammation of brain. Certified.
„ 9	28	Tailor -	Epilepsy. Certified.
„ 18	44	Farm labourer	Phthisis pulmonalis. Certified.
„ 15	72	Chelsea pensioner.	Hepatitis. Certified.
„ 31	70	Farmer - -	Paralysis. Certified.
Aug. 29	16	Coachbuilder, apprentice.	Convulsions. Certified.
„ 22	58	Stonemason, journeyman.	Paralysis. Certified.
Sept. 8	28	Mason, journeyman.	Phthisis pulmonalis. Certified.
„ 21	70	Innkeeper -	Softening of brain. Certified.
„ 23	52	Fisherman -	Broncho-pneumonia. Post mortem. Certified.
Oct. 11	70	Chief warder, prison.	Diseased kidneys. Certified.
„ 10	29	Shoemaker -	Paralysis. Certified.
„ 18	57	Butcher -	Fever. Disease of the heart. Post mortem. Certified.
„ 21	58	Blacksmith -	Diseased brain. Certified.
„ 30	82	Farm labourer	Old age. Not certified.
Nov. 4	71	Mason - -	Apoplexy. Certified.
„ 23	76	Farm labourer	Old age. Certified.
„ 8	77	Land proprietor	Natural decay. Certified.
„ 23	19	Copper miner	Fever. Certified.
Dec. 1	37	Mine labourer	Phthisis. Pneumonia. Certified.
„ 10	18	Saddler's apprentice.	Diphtheria. Certified.
„ 27	77	Farm labourer	Old age. Certified.
„ 1	71	Farm labourer	Diarrhœa. Certified.
„ 11	72	Painter and glazier, master.	Palsy. Certified.
1861.			
Jan. 12	39	Labourer -	Paralysis. Certified.
„ 14	51	Hotel porter -	Apoplexy. Inquest.
Feb. 2	41	Attorney's clerk	Phthisis pulmonalis. Certified.
Jan. 26	64	Shoemaker, master.	Diseased liver. Certified.
Feb. 11	35	Tin and copper miner	Phthisis pulmonalis. Certified.
„ 15	83	Carpenter, master.	Paralysis. Certified.
„ 15	40	Seaman -	Paralysis. Certified.
„ 14	50	Watchmaker -	Diarrhœa. Disease of intestinal glands. Certified.
„ 22	77	Farmer - -	Old age. Certified.
„ 26	60	Farm labourer	Phthisis pulmonalis. Certified.
Mar. 14	59	Farm labourer	Diseased heart. Inquest.
„ 23	22	Miner - -	Exhaustion. Certified.
„ 21	39	Wheelwright -	Phthisis pulmonalis. Certified.
„ 24	21	Seaman, R.N.	Phthisis pulmonalis. Certified.
„ 29	68	General labourer	Diseased heart. Dropsy. Certified.
Apr. 11	40	Ostler - -	Phthisis pulmonalis. Certified.
May 2	13	Son of copper miner.	Natural causes. Certified.
„ 12	77	Farm labourer	Diseased heart. Dropsy. Certified.
„ 22	32	Shoemaker -	Phthisis pulmonalis. Certified.
„ 22	42	Labourer -	Phthisis pulmonalis. Certified.
„ 17	41	Labourer -	Maniacal exhaustion. Certified.
„ 27	68	Fisherman -	Diseased brain. Certified.
„ 17	84	Farm labourer	Paralysis, 4 days. Certified.
June 7	46	Labourer -	Paralysis. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
June 8	81	Farmer - -	Old age. Not certified.
Apr. 26	25	Idiot - -	Accident. Drowned. Inquest.
June 20	85	Farm labourer	Exhaustion. Certified.
„ 18	74	Tailor, master	Paralysis. Certified.
„ 26	53	General labourer	Dropsy. Nephria. Certified.
„ 30	13	Not stated -	Epilepsy. Certified.
July 24	64	Mine agent -	Diseased heart. Certified.
„ 27	50	Farm labourer	Asthenia. Certified.
„ 14	38	Railway station master.	Phthisis pulmonalis. Certified.
„ 17	23	Farm labourer	Tumour. Peritonitis. Certified.
Aug. 16	31	Not stated -	Suffocated while in an epileptic fit. Certified.
„ 14	80	Retailer of potatoes.	Paralysis. Certified.
Sept. 4	52	Stonemason -	Maniacal exhaustion. Certified.
„ 5	38	Not stated -	Diarrhœa. Certified.
„ 29	39	Messenger -	Delirium tremens. Certified.
Oct. 20	70	Mine agent -	Diseased heart. Certified.
„ 18	56	Miner - -	General exhaustion. Certified.
„ 14	66	Mason, journeyman.	Dropsy. Certified.
„ 29	57	Miner - -	Ascites. Certified.
Nov. 10	80	Innkeeper -	Old age. Certified.
„ 27	87	Patten maker	Old age. Not certified.
„ 13	79	Chelsea pensioner.	Old age. Certified.
„ 20	53	Tin streamer -	Paralysis. Certified.
Dec. 2	63	Gentleman -	Injury by a fall. Inquest.
„ 6	74	Clergyman -	Paralysis. Certified.
„ 11	14	Son of farmer	Diabetes. Certified.
„ 9	56	Roper - -	Diseased brain. Certified.
„ 17	37	Joiner - -	Palsy. Certified.
„ 10	84	Labourer -	Apoplexy. Certified.
„ 17	25	Labourer -	Phthisis pulmonalis. Certified.
„ 17	30	Labourer -	Ulceration of larynx. Certified.

Sub-district - 4. Egloshayle.

1859.			
Jan. 23	69	Shoemaker -	Natural decay. Not certified.
Feb. 4	68	Storekeeper -	Natural decay. Not certified.
Mar. 17	80	Agric. labourer	Natural decay. Not certified.
„ 20	12	Son of wood ranger.	Inflammation. Not certified.
Apr. 2	74	Agric. labourer	Visitation of God. Inquest.
„ 13	14	Son of blacksmith.	Nephritis. Certified.
May 12	80	Farmer -	Natural decay. Not certified.
„ 11	48	Labourer -	Accident. Killed falling down a shaft in Trewarn United Mine. Inquest.
„ 11	22	Mine agent -	Accident. Killed falling down a shaft in Trewarn United Mine. Inquest.
June 29	82	Agric. labourer	Natural decay. Not certified.
July 15	72	Yeoman -	Pneumonia. Certified.
Aug. 6	82	Miller - -	Natural decay. Not certified.
Sept. 9	86	Yeoman -	Natural decay. Not certified.
Aug. 20	81	Agric. labourer	Natural decay. Not certified.
„ 3	66	Agric. labourer	Dropsy. Certified.
Unknown		Supposed mariner.	Drowning. Inquest.
Unknown		Supposed mariner.	Drowning. Inquest.
Unknown		Supposed mariner.	Drowning. Inquest.
Unknown		Supposed mariner.	Drowning. Inquest.
Unknown		Supposed mariner.	Drowning. Inquest.
Nov. 20	78	Labourer -	Natural causes. Inquest.
„ 10	81	Yeoman -	Natural decay. Not certified.
Unknown		Supposed mariner.	Drowning. Inquest.
Unknown		Supposed mariner.	Drowning. Inquest.
Unknown		Supposed mariner.	Drowning. Inquest.
Unknown		Supposed mariner.	Drowning. Inquest.
Nov. 17	84	Master mariner	Natural decay. Not certified.
„ 30	35	Master mariner	Consumption. Certified.
Dec. 20	85	Tailor - -	Natural decay. Not certified.
„ 28	32	Agric. labourer	Consumption. Certified.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Jan. 6	74	Coast guard -	Natural decay. Not certified.
„ 19	72	Farm labourer	Apoplexy. Certified.
„ 17	83	Innkeeper -	Natural decay. Not certified.
„ 17	58	Agric. labourer	Enteritis. Certified.
„ 15	42	Bargeman. -	Tumour in bowels. Certified.
Feb. 10	84	Agric. labourer	Diseased heart. Certified.
„ 15	77	Gardener -	Pneumonia. Certified.
„ 27	76	Carpenter -	Palsy. Certified.
Mar. 3	81	Mariner -	Natural decay. Not certified.
„ 20	82	Farmer -	Natural decay. Not certified.
„ 28	55	Agric. labourer	Enteritis. Certified.
„ 12	33	Farmer -	Fall from a waggon. Enteritis. Certified.
Apr. 15	65	Farmer -	Rupture of blood-vessel. Certified.
„ 28	73	Blacksmith -	Influenza. Certified.
„ 24	77	Agric. labourer	Dropsy. Certified.
May 15	78	Yeoman -	Cancer. Certified.
June 9	73	Master mariner	Cramp and spasms in stomach. Certified.
„ 18	88	Agric. labourer	Natural decay. Not certified.
July 8	21	Mariner, merchant service.	Consumption. Certified.
Aug. 26	84	Yeoman -	Natural decay. Not certified.
Oct. 9	56	Shipbuilder -	Natural causes. Inquest.
„ 4	47	Farmer -	Consumption. Certified.
Dec. 12	20	Son of agric. labourer.	Dropsy. Certified.
„ 13	16	Son of mariner, merchant service.	Consumption. Certified.
1861.			
Feb. 6	55	Agric. labourer	Dropsy. Not certified.
„ 21	unk.	Mariner merchant service.	Washed ashore. Inquest.
„ 25	unk.	Master mariner in a foreign service.	Washed ashore. Inquest.
Mar. 2	unk.	Mariner -	Washed ashore. Inquest.
„ 2	unk.	Mariner in a foreign service.	Washed ashore. Inquest.
„ 9	10	Son of farm labourer.	Pneumonia. Certified.
„ 13	unk.	Mariner.	Washed ashore. Inquest.
Apr. 23	82	Farm labourer	Natural Decay. Certified.
June 22	15	Son of labourer	Accident. Drowned bathing. Inquest.
July 22	65	Farmer -	Dropsy. Certified.
Aug. 5	67	Farmer -	Dropsy. Certified.
„ 8	79	Fishmonger -	Breaking blood-vessel. Certified.
„ 27	66	Labourer -	Fall of a rock on his leg. Fracture, &c. Inquest.
„ 26	62	Farmer -	Consumption. Not certified.
„ 20	92	Farm labourer	Natural decay. Certified.
Sep. 10	62	Farm labourer	Decline. Not certified.
Nov. 12	87	Farm labourer	Natural decay. Not medical attendant.
Oct. 16	80	Farm labourer	Natural decay. Certified.
Nov. 2	64	Farm labourer	Diseased heart. Certified.
„ 26	80	Tailor - -	Natural decay. Certified.
„ 20	19	Shoemaker's apprentice.	Decline. Not certified.
Dec. 15	35	Master mariner	Diseased heart caused by overexertion. Not certified.
„ 23	82	Farm labourer	Natural decay. Certified.
„ 8	60	Farm labourer	Typhus. Certified.

Superintendent Registrar's District.	Registrar's Sub-Districts.
St. Columb.	1. Padstow. 2. St. Columb. 3. Newlyn.

Deaths of Males aged 10 Years and Upwards in each of the Years 1859–61.

Sub-district - 1. Padstow.

1859.			
Jan. 18	87	Farmer -	Old age. Not certified.
Feb. 6	54	Master mason	Inflammation on brain. Not certified.
Mar. 3	84	Farmer -	Supposed pulmonary apoplexy. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1859			
Mar. 9	76	Agric. labourer	Old age No medical attendant.
Feb. 20	30	Master miller	Decline, 2 years. Not certified.
„ 26	50	Farmer - -	Decline. Not certified.
May 2	22	Son of agric. labourer -	Decline, 13 months. Not certified.
„ 22	66	Grocer - -	Decline. Not certified.
„ 22	81	Farmer - -	Bronchitis. Not certified.
1858.			
Oct. 10	75	Farmer - -	Inflammatory fever. Not certified.
1859.			
May 25	64	Farmer - -	Seizure, 4 hours. Not certified.
June 12	87	Servant -	Old age. Certified.
July 7	64	Mason - -	Effusion on the brain. Certified.
„ 12	77	Captain, R.N.	Old age. Certified.
„ 24	80	Agric. labourer	Old age. No medical attendant.
„ 13	18	Son of butcher	Decline, 10 months. No medical attendant.
„ 7	27	Collector of customs.	Rheumatism. Diseased heart. Certified.
„ 9	76	Farmer -	Old age. Not certified.
„ 27	71	Nurseryman -	Decline. Not certified.
Aug 27	85	Miller, master	Old age. No medical attendant.
Sept. 5	70	Officer inland revenue.	Hydrothorax. Dropsy. Certified.
Oct. 4	15	Son of agric. labourer.	Rheumatic fever. Certified.
„ 10	55	Farmer -	Concussion of brain, fall from his horse. Inquest.
„ 30	84	Cordwainer, master.	Old age. Certified.
	unk.	Supposed mariner.	Washed ashore. Inquest.
Dec. 1	43	Officer, inland revenue.	Phthisis. Certified.
Nov. 14	78	Agric. labourer	Old age. Not certified.
Dec. 4	64	Master mason	Diseased heart. Certified.
Nov. 23	76	Carpenter, master.	Apoplexy. Certified.
Dec. 11	75	Agric. labourer	Apoplexy. Certified.
„ 22	92	Cordwainer -	Old age. Certified.
„ 23	53	Agric. labourer	Mortification. Certified.
„ 11	77	Agric. labourer	Old age. Certified.
„ 23	32	Agric. labourer	Decline. Not certified.
„ 17	30	Iron miner -	Diseased heart. Not certified.
„ 17	17	Son of agricultural labourer.	Decline. Not certified.
„ 28	78	Independent -	Seizure. 2nd attack. Certified.
„ 29	21	Labourer -	Natural causes. Inquest.
1860.			
Jan. 1	87	Farmer -	Old age. No medical attendant.
„ 31	42	Farmer -	Decline. Not certified.
Feb. 25	67	Tailor, master	Pleurisy. Not certified.
Apr. 10	51	Miller, master	Decline. Not certified.
Mar. 12	60	Bargeman -	Accident. Drowned. Inquest.
Apr. 22	77	Sawyer -	Old age. Not certified.
May 4	39	Agric. labourer	Pneumonia. Certified.
June 18	85	Tailor - -	Influenza. Certified.
July 17	36	Miner - -	Decline. Not certified.
May 10	17	Labourer -	Accident. Falling into the Camel slate quarry. Inquest.
July 27	24	Miner - -	Accident by a rock falling on him in Pawton iron mine. Inquest.
„ 29	41	Farmer -	Abscess in abdomen. Not certified.
Aug. 12	63	Sawyer -	Hepatitis. Ulcer of stomach. Certified.
„ 31	54	Agric. labourer	Abscess in the thigh. Not certified.
Sept. 8	82	Agric. labourer	Old age. Not certified,
Oct. 3	53	Agric. labourer	Consumption. Not certified.
„ 6	76	Blacksmith -	Stoppage in the bowels. Not certified.
„ 9	64	Agric. labourer	Natural causes. Inquest.
„ 16	70	Farmer -	Serous apoplexy. Certified.
„ 10	32	Ship carpenter	Decline. Not certified.
„ 29	11	Son of labourer	Accident. Wheel of a waggon passing over him. Inquest.
„ 26	43	Tailor - -	Pneumonia. Certified.
Nov. 5	25	Shoemaker, journeyman.	Dropsy. Not certified.
Dec. 26	73	Farmer -	Cancer. Not certified.
„ 30	79	Shoemaker -	Bronchitis. Certified.
„ 30	79	Shoemaker -	Bronchitis. Certified.
1861			
Jan. 11	74	Labourer -	Pressure of brain. Not certified.
„ 15	76	Farmer -	Old age. Not certified.
1861.			
Jan. 9	77	Mason - -	Old age. Not certified.
„ 20	41	Miner - -	Decline. Not certified.
„ 9	63	Labourer -	Diseased heart. Not certified.
„ 20	82	Gardener -	Old age. Not certified.
„ 5	74	Mason -	Old age. Not certified.
Feb. 7	83	Farm labourer	Old age. Not certified.
„ 12	53	Labour. farmer	Decline, 2 years. Certified.
„ 15	65	Farmer -	Hydrothorax, 7 weeks. Certified.
„ 25	59	Roper, master	Diseased heart. No medical attendant.
Mar. 15	19	Son of farm labourer.	Decline, 1 year. Certified.
„ 1	83	Clergyman -	Old age. Not certified.
„ 26	79	Farmer -	Paralysis. Not certified.
Apr. 18	64	Printer -	Pressure on the brain. Not certified.
May 7	83	Land proprietor.	Old age. Not certified.
„ 13	35	Son of mason, master.	Debility. Certified.
„ 30	31	Blacksmith -	Decline, 12 months. Certified.
„ 14	60	Farm labourer	Hydrothorax. Certified.
June 4	74	Farm labourer	Enteritis. Not certified.
July 12	88	Farmer -	Old age. No medical attendant.
„ 12	26	Farm labourer	Pressure on the brain. Not certified.
„ 17	72	Gentleman -	Rupture of a blood vessel. Certified.
„ 31	79	Quay porter -	Effusion on brain. Certified.
Aug. 10	40	French polisher	Rupture of blood vessel, caused by incessant drinking. Inquest.
May 29	40	Labourer -	Natural causes. Inquest.
Sept. 3	47	Labourer -	Accident by the wheel of a waggon passing over him. Inquest.
„ 16	72	Farm labourer	Dropsy. Not certified.
Oct. 22	81	Farm labourer	Old age. Not certified.
„ 24	73	Farmer -	A seizure. Debility. Certified.
„ 21	73	Farmer -	Consumption. Not certified.
Nov. 17	65	Seaman, merchant service.	Paralysis. Certified.
„ 19	28	Ship carpenter	Congestion of lungs. Certified.
„ 23	44	Printer - -	Decline. Not certified.

Sub-District. - 2. St. Columb.

1859.			
Jan. 10	71	Farmer -	Gangrene in the foot. Certified.
Mar. 5	68	Retired watchmaker.	Natural decay. Certified.
„ 20	23	Farm labourer	Consumption. Not certified.
„ 19	57	Flour merchant	Diseased heart. Dropsy. Not certified.
„ 22	23	Master miller	Consumption. Not certified.
„ 23	34	Farmer -	Diseased brain following inflammation of the kidneys. Certified.
Apr. 14	66	Farmer -	Congestion of lung. Certified.
„ 28	67	Farmer -	Delirium tremens. Certified.
„ 29	61	Tailor, master	Diseased heart. Dropsy. Not certified.
„ 27	65	Farm labourer	Pneumonia. Not certified.
„ 20	19	Farm servant	Consumption. Certified.
May 27	51	Postboy -	Diseased liver. Not certified.
„ 29	19	Clerk - -	Consumption. Certified.
„ 29	56	Miner - -	Natural causes. Inquest.
June 11	10	Son of steward of steam ship.	Consumption. Certified.
„ 20	61	Farm labourer	Paralysis. Certified.
„ 22	64	Farmer -	Diseased brain. Certified.
„ 28	97	Farm labourer	Apoplexy. Certified.
July 8	63	Master mason	Apoplexy. Certified.
May 31	49	Idiot - -	Paralysis. Certified.
July 12	84	Farm labourer	Affection of bladder. Certified.
„ 18	63	Labourer -	Diseased heart. Inquest.
Aug. 7	75	Farm labourer	Diseased brain. Certified.
„ 14	51	Farmer -	Apoplexy. Inquest.
„ 28	25	Not stated -	Drowned bathing. Inquest.
Sept. 4	66	Road labourer	Asthma. Not certified.
„ 6	66	Farmer -	Diseased stomach. Certified.
„ 14	38	Master maltster	Consumption. Certified.
Nov. 29	28	Tin miner -	Consumption. Certified.
Dec. 1	19	Carpenter's apprentice.	Consumption. Not certified.
„ 1	21	Mariner -	Suffocation by inhaling carbonic acid gas in his sleeping cabin on board a vessel. Inquest.
„ 8	97	Farm labourer	Natural decay. Not certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Dec. 27	77	Farm labourer	Natural decay. Not certified.
„ 26	33	Farmer -	Lock jaw, after amputation of leg. Not certified.
„ 28	66	Farmer -	Apoplexy. Inquest.
1860.			
Jan 15	47	Farm labourer	Asthma. Diseased heart. Certified.
„ 22	75	Farm labourer	Natural decay. Not certified.
„ 31	69	Farm labourer	Bronchitis. Certified.
Feb. 1	75	General labourer	Softening of brain. Mortification. Certified.
„ 2	55	Farm labourer	General decline. Not certified.
„ 28	60	General labourer	Asthma and fits. Not certified.
„ 25	63	Boatman, Coast Guard.	Paralysis. Certified.
Mar. 11	38	Mason, master	Diseased liver and kidneys. Certified.
„ 31	68	Blacksmith, master.	General decline. Not certified.
Apr. 14	73	Farmer -	Pneumonia. Certified.
„ 29	89	Late officer in Customs.	General debility. Certified.
May 1	46	Farm labourer	Consumption. Certified.
„ 13	77	Cabinet maker	Age. Not certified.
„ 16	70	Farm labourer	Age. Certified.
„ 19	91	Farmer -	Age. Certified.
„ 23	65	Tin miner -	General decline. Certified.
„ 29	84	Farm servant	Pneumonia. Certified.
„ 28	62	Blacksmith -	Diseased heart. Certified.
June 1	59	Commission agent.	Effusion of blood on the lungs. Certified.
„ 2	74	Innkeeper -	Apoplexy. Asthma. Certified.
„ 3	74	Labourer -	Diseased heart Certified.
„ 2	83	Farmer -	Natural decay. No medical attendant.
„ 13	21	Son of farmer	Cephalitis. Certified.
„ 12	69	Labourer -	Tumour in the bowels. Certified.
„ 30	45	Miner - -	Apoplexy. Not certified.
July 17	56	Farm labourer	Diseased heart. Not certified.
„ 24	72	Farmer - -	Influenza. Not certified.
„ 23	61	Farmer -	Hepatitis. Certified.
„ 31	57	Woolcomber -	Apoplexy. Certified.
Sept. 14	42	Soldier -	Natural causes. Inquest.
„ 17	63	Farmer -	Diseased heart. Not certified.
„ 28	73	Solicitor -	Cystitis. Diseased brain. Certified.
„ 26	22	Carpenter -	Leg crushed between the beaters and grater of a steam thrashing machine. Inquest.
Nov. 6	82	Land proprietor	Dropsy. Not certified.
Oct. 12	33	Master mariner	Slow typhus. Affection of brain. Certified.
Dec. 18	81	Farmer -	Gangrene foot. Not certified.
Sept. 30	81	Farmer -	Natural decay. Not certified.
1861.			
Jan. 3	79	Farm labourer	Cancer in the neck. Certified.
„ 9	89	Farm labourer	Paralysis. Not Certified.
„ 16	71	Tin miner -	Dropsy. Certified.
„ 26	51	Woolcomber, journeyman.	Pneumonia. Mortification. Certified.
„ 27	85	Farmer -	Natural decay. Not certified.
Feb. 4	74	Labourer -	Bronchitis. Certified.
„ 26	79	Labourer -	Bronchitis. Diseased lungs. Certified.
Mar. 11	84	Farm labourer	Debility and cough. Certified.
„ 17	84	Farm labourer	General debility. Certified.
Feb. 5	69	Farm labourer	Natural decay. Not certified.
Jan. 9	58	Farmer -	Natural decay. Not certified.
Feb. 3	55	Workman on board vessels	Decline. Not certified.
Mar. 26	83	Farmer -	Natural decay. Not certified.
„ 29	92	Farmer -	Natural decay. Not certified.
„ 29	82	Farmer -	Natural decay. Not certified.
Apr. 10	73	Wool merchant	Diarrhœa. Gout. Certified.
„ 10	85	Farm labourer	Natural decay. Not certified.
May 9	41	Farm labourer	Abscess in the groin. Not certified.
„ 17	47	Woolcomber, journeyman.	Diseased liver. Consumption. Certified.
„ 18	85	Blacksmith, master.	Natural decay. Not certified.
June 2	61	Farmer -	Hepatitis. Not certified.
„ 3	35	Farmer -	Brain fever. Certified.
„ 12	86	Farmer -	Natural decay. Not certified.
„ 17	80	Farmer -	Natural decay. Certified.
„ 29	22	Farmer -	Consumption. Certified.
1861			
July 6	15	Son of farm labourer.	Idiopathic tetanus. Certified.
„ 12	63	Farm labourer	Decline. Not certified.
„ 19	71	Farmer -	General debility. Not certified.
Aug. 3	58	Farmer -	Enlargement of heart. Certified.
„ 6	78	Tailor, master	Dropsy. Certified.
„ 10	68	Carpenter, master.	Chronic rheumatism. Not certified.
Sept. 7	86	Farmer -	Old age. Not certified.
„ 21	82	Farmer -	Natural decay. Not certified.
„ 25	65	Farmer -	Low fever. Pneumonia. Not certified.
Oct. 4	34	Carpenter, journeyman.	Consumption. Not certified.
„ 4	35	Draper's assistant.	Consumption. Certified.
„ 15	83	Farmer -	Old age. No medical attendant.
„ 24	74	Farm labourer	General decay. Not certified.
Nov. 19	76	Mason, master	Diseased heart. Certified.
Dec. 24	57	Woolsorter -	Abscess on the back. Not certified.
„ 27	61	Farm labourer	Apoplexy. Certified.

Sub-district - 3. Newlyn.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Feb. 1	12	Son of agric. labourer.	Head crushed between the span beam and the stay of an arm of the cog-wheel of a thrashing machine. Inquest.
May 1	57	Farmer -	Decline. No medical attendant.
June 12	54	Blacksmith -	Lacerated wound of hand. Tetanus. Certified.
July 6	76	Agric. labourer	Old age. Certified.
Aug. 8	84	Farmer -	Old age. Not certified.
Oct. 15	26	Son of carpenter.	Debility. A cripple from infancy. Certified.
„ 23	74	Farmer -	Natural decay. No medical attendant.
„ 29	66	Postmaster -	Apoplexy. Certified.
Nov. 20	69	Gardener, master.	Pleuro-pneumonia. Certified.
„ 28	68	Agric. labourer	Dropsy. Certified.
1860.			
Jan. 29	52	Stone cutter -	Enteritis. Not certified.
Feb. 9	88	Carpenter -	Old age. Not certified.
Mar. 9	15	Son of agric. labourer.	Apoplexy. Certified.
„ 21	30	Lead-mine labourer.	Pulmonary consumption. Certified.
„ 31	71	Farmer -	Diseased heart. Certified.
Apr. 1	40	Agric. labourer	Phthisis. Hæmorrhage. Certified.
„ 11	10	Son of miller -	Fracture of skull. Certified.
„ 26	56	Lead-mine agent	Paralysis. Certified.
June 8	53	Agric. labourer	Debility. Not certified.
May 31	76	Agric. labourer	Natural decay. Not certified.
June 30	45	Carpenter -	Cancer, 2 years. Certified.
July 1	18	Son of lead-mine labourer.	Pulmonary consumption. Certified.
„ 24	50	Mason's assistant.	Killed by a cob wall falling upon him. Inquest.
„ 31	69	Lead - mine agent.	Bronchitis. Pulmonary disease. Certified.
„ 24	32	Mason -	Cystitis. Not certified.
Sept. 3	57	Engine worker	Pulmonary consumption. Certified.
Nov. 11	20	Lead miner -	Small-pox, 14 days. Certified.
„ 21	71	Farmer -	Dropsical effusion. Not certified.
1861.			
Jan. 4	20	Soldier -	Pulmonary disease. Certified,
„ 15	78	Lead miner, labourer.	Natural decay. No medical attendant.
Feb. 6	68	Farm labourer	Dropsical effusion. Certified.
Mar. 23	39	Farm labourer	Consumption. Certified.
May 5	80	Farm labourer	Natural decay. No medical attendant.
„ 7	75	Farmer -	Natural decay. No medical attendant.
July 5	55	Yeoman -	Diseased heart and liver. Certified.
„ 16	54	Lead dresser -	Diseased heart. Certified.
Oct. 5	68	Farm labourer	Hernia. Certified.
Nov 29	71	Agric. labourer	Apoplexy. Inquest.
Dec. 12	79	Blacksmith -	Retention of urine. Certified.
„ 18	68	Lead miner -	Suicide, by hanging. Inquest.

COUNTY OF CORNWALL.

Superintendent Registrar's District.	Registrar's Sub-District.
St. Austell.	1. Fowey. 2. St. Austell. 3. Mevagissey. 4. Grampound.

Deaths of Males aged 10 Years and upwards in each of the Years 1859–61.

Sub-District - 1. Fowey.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 2	73	Sawyer - -	Diseased kidney. Certified.
„ 8	59	Tanner -	Enlarged liver. Certified.
„ 15	64	Agric.labourer	Fever, 3 weeks. Erysipelas, 4 days. Certified.
„ 27	29	Copper miner	Pulmonic disease and hæmorrhage. Certified.
„ 8	55	Copper miner	Pulmonic disease and hydrothorax. Certified.
„ 15	60	Copper miner	Consumption, 12 months. Certified.
„ 25	41	Cordwainer, master.	Diseased lungs. Certified.
Mar. 23	55	Labourer -	Natural causes. Inquest.
Apr. 12	12	Son of miner -	Accident. Killed by falling down the shaft. Inquest.
„ 12	67	Labourer -	Natural decay. Certified.
„ 17	80	Druggist -	Natural causes. Certified.
„ 21	38	Copper miner	Consumption, 8 months. Certified.
„ 26	44	Ship carpenter	Dropsy. Not certified.
May 18	17	Son of wharfinger.	Typhus. Certified.
„ 18	15	Son of miner -	Accident. Killed falling down a shaft in West Fowey Consols Mine. Inquest.
„ 20	87	Agric.labourer	Old age. Not certified.
„ 21	49	Copper miner	Bronchitis. Certified.
„ 27	12	Son of butcher, master.	Typhus. Hydrocephalus, 3 days. Certified.
June 5	55	Copper miner	Fever. Certified.
„ 6	51	Copper miner	Diseased lungs. Gangrene. Certified.
„ 17	68	Shipwright -	Cancer in stomach. Certified.
„ 21	26	Seaman -	Phthisis. Certified.
„ 28	12	Son of copper miner.	Diphtheria. Certified.
July 25	44	Cordwainer, master.	Diphtheria, 2 days. Certified.
Aug. 31	57	Copper miner	Apoplexy. Certified.
„ 26	57	Mine labourer	Asiatic cholera. Certified.
„ 31	69	Copper miner	Consumption, 2 years. Certified.
Sept. 1	14	Son of copper miner.	Enteritis. Certified.
„ 10	79	Agric.labourer	Water on chest, 4 years. Cramp in stomach. Certified.
„ 10	75	Farmer -	Paralysis. Apoplexy. Certified.
„ 17	11	Son of copper miner.	Low fever, 5 weeks. Cancrum oris, 1 week. Certified.
„ 17	13	Son of copper miner.	Scarlatina. Certified.
„ 20	72	Superannuated, Coast Guard.	Natural decay. Not certified.
„ 24	10	Son of copper miner.	Scarlatina, 3 weeks. Congestion of brain, 24 hours. Certified.
„ 30	49	Farmer -	Pericarditis effusion. Certified.
Oct. 17	52	Mine accountant	Atrophy. Certified.
„ 21	11	Son of copper miner.	Scarlatina. Certified.
Nov. 1	20	Copper miner	Pulmonary consumption. Certified.
Oct. 31	22	Copper miner	Typhus fever. Certified.
Nov. 5	54	Farmer -	Pulmonic disease. Rupture of blood vessel. Certified.
„ 5	66	Copper miner	Accident. Killed by falling down the shaft in Par Consols Mine. Inquest.
„ 30	18	Copper miner	Consumption. Certified.
„ 25	86	Proprietor of houses.	Old age. Not certified.
Dec. 5	65	Proprietor of houses.	Consumption. Not certified.
„ 6	68	Farmer - -	Congestion of lungs. Certified.
1859.			
Dec. 8	45	Coast Guard -	Nephritis. Certified.
„ 25	66	Copper miner	Asthma. Not certified.
„ 25	70	Shoemaker, journeyman.	Paralysis. Certified.
„ 28	17	Copper miner	Purpura hæmorrhagica. Certified.
„ 30	69	Copper miner	Tubercle hæmoptysis. Not certified.
1860.			
Jan. 15	57	Copper miner	Dropsy. Certified.
„ 22	21	Miner - -	Accident. Falling down a shaft in the Consols Mine. Inquest.
„ 26	75	Farmer -	Consumption. Not certified.
Feb. 2	58	Copper miner	Diseased lungs. Gout. Certified.
„ 3	77	Copper miner	Diarrhœa. Certified.
„ 1	72	Farm labourer	Natural decay. Certified.
„ 16	32	Mine agent -	Spasms of bowels. Certified.
„ 17	15	Son of labourer	Injuries: kick from a horse. Inquest.
„ 19	66	Farm labourer	Consumption, 18 months. Certified.
„ 22	70	Copper miner	Natural decay. Not certified.
„ 23	87	Shoemaker -	Diseased bladder. Certified.
Mar. 5	66	Copper miner	Hydrothorax. Certified.
„ 10	36	Tailor, journeyman.	Diseased lungs. Certified.
„ 21	75	Blacksmith -	Dropsy. Certified.
„ 24	68	Mine labourer	Pulmonic disease. Certified.
„ 22	45	Post messenger	Ulcerated intestines. Certified.
„ 28	58	Copper miner	Cancer. Certified.
Apr. 2	52	Copper miner	Pulmonic disease. Certified.
„ 4	64	Carpenter -	Congestion of liver and bowels from a fall. Inquest.
„ 8	68	Seaman, R.N.	Dropsy. Certified.
„ 22	64	Copper miner	Pulmonic disease. Certified.
May 3	76	Farmer - -	Water on chest and brain. Certified.
„ 18	37	Copper miner	Dropsy, 6 months. Certified.
„ 25	78	Farm labourer	Water on the chest. Certified.
„ 22	58	House proprietor	Cancer in stomach. Certified.
„ 30	24	Copper miner	Typhus. Certified.
June 15	23	Copper miner	Diseased lungs, 3 months. Certified.
„ 15	14	Son of copper miner.	Effusion of the brain. Certified.
„ 23	25	Shoemaker -	Consumption. Certified.
„ 24	70	Labourer -	Anasarca. Erysipelas. Certified.
July 1	75	Stonemason -	Bronchitis. Certified.
„ 5	16	Son of copper miner.	Typhus fever. Certified.
„ 8	24	Copper miner	Hydrothorax. Certified.
„ 2	85	Mine labourer	Natural decay. Not certified.
„ 9	15	Son of cordwainer.	Fever, 2 weeks. Congestion of brain, 12 hours. Certified.
„ 10	50	Copper miner	Pulmonic disease. Certified.
„ 15	23	Farm labourer	Typhoid fever, 7 weeks. Congestion of lungs. Certified.
„ 5	51	Innkeeper -	Suicide by hanging. Inquest.
„ 8	69	Mariner, master	Bronchitis. Dysentery. Certified.
„ 23	68	Proprietor of houses.	Heart disease, — years. Certified.
„ 24	61	Currier, master	Pulmonic disease. Certified.
Aug. 14	21	Copper miner -	Consumption. Not certified.
Sept. 3	93	Mine agent -	Natural decay. Certified.
„ 6	68	Farmer -	Natural causes. Inquest.
„ 18	17	Son of copper miner.	Consumption, 6 weeks. Certified.
„ 20	21	Seaman, merchant service.	Typhus fever. Certified.
„ 20	22	Farm labourer	Accident; by his hand being caught in a thrashing machine. Inquest.
„ 27	66	Innkeeper and farmer.	Fever and pulmonic disease. Certified.
„ 22	18	Son of cooper, master.	Consumption. Certified.
Oct. 15	55	Copper miner -	Consumption. Certified.
„ 17	29	Grocer and farmer.	Fever. Certified.
„ 17	21	Miner -	Accident. Falling of ground on him in East Crinnis Mine. Inquest.
„ 23	51	Copper miner	Consumption. Certified.
Nov. 21	64	Farmer -	Consumption, 3 years. Certified.
Dec. 18	63	Copper miner -	Pulmonic disease. Certified.
1861			
Jan. 2	35	Son of copper miner.	Lepra, &c. Certified.
„ 3	83	Farmer -	Old age. Not certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1861			
Jan. 15	19	Son of gardener	Consumption, 11 months. Certified.
„ 29	62	Tailor, master	Phthisis, — years. Certified.
„ 22	10	Son of mine agent.	Peritonitis. Certified.
„ 31	34	Mine carpenter	Pulmonic disease. Certified.
Feb. 12	33	Copper miner	Pulmonic disease. Certified.
Mar. 3	76	Carpenter, master.	Cancer of stomach, 7 years. Certified
„ 8	60	Barber, master	Pulmonic disease. Certified.
„ 9	87	Ropemaker, master.	Natural decay. Not certified.
„ 18	78	Mason, journeyman.	Paralysis. Certified.
„ 26	73	Miner -	Visitation of God. Inquest.
Apr. 1	69	Miner -	Pneumonia. Not certified.
„ 3	18	Tin miner -	Malignant smallpox, 17 days Certified.
„ 18	36	Miner -	Accident. Killed in Par Consols Mine. Inquest.
„ 26	69	Mine labourer	Stricture of œsophagus. Certified.
„ 28	32	Shipwright -	Pneumonia. Certified.
May 8	24	Lead smelter -	Pulmonary consumption. Certified.
„ 16	62	Mine labourer	Consumption. Not certified.
„ 23	53	Copper miner -	Consumption, 2 years. Certified.
„ 22	44	Gunner, R.A. -	Dropsy. Not certified.
June 4	23	Copper miner -	Consumption. Certified.
„ 17	45	Copper miner -	Ulceration of stomach. Certified.
„ 20	10	Son of copper miner.	Malignant typhus fever, 30 hours. Certified.
„ 23	45	Tin-plate worker master.	Hydrothorax. Certified.
July 8	38	Solicitor -	Phthisis. Certified.
„ 15	52	Copper miner -	Consumption, 12 months. Certified.
„ 28	50	Ropemaker, journeyman.	Malignant diseased intestines. Certified.
Aug. 9	58	Coast Guard -	Diseased brain. Certified.
„ 17	14	Son of tin dresser	Confluent smallpox. Certified.
„ 18	60	Mine carpenter.	Pulmonary apoplexy. Certified.
„ 25	50	Copper miner -	Pulmonic disease. Certified.
„ 29	91	Agric. labourer	Old age. Certified.
„ 29	66	Mine labourer	Diseased heart, 3 years. Paralysis, 12 hours. Certified.
Sept 10	18	Son of copper miner.	Confluent smallpox. Certified.
„ 15	77	Carpenter, master.	Natural decay. Not certified.
„ 20	75	Mine labourer	Natural decay. Certified.
„ 14	35	Mine agent -	Accident. Wheel of a waggon passing over him. Inquest.
„ 29	19	Miner -	Explosion of gunpowder in West Fowey Consols. Inquest.
Oct. 2	77	Gardener, master.	Diseased heart. Dropsy, Certified.
„ 1	49	Cordwainer, master.	Diabetes. Certified.
„ 5	24	Copper miner -	Confluent smallpox. Certified.
„ 7	69	Farmer -	Hydrothorax. Certified.
„ 18	72	Road labourer	Diseased heart. Anasarca. Certified.
Nov. 7	62	Copper miner -	Pulmonic disease. Certified.
„ 30	23	Copper miner -	Consumption. Certified.
Dec. 1	69	Farm labourer	Epilepsy. Certified.
„ 16	10	Son of copper miner.	Effusion on the brain. Certified.
„ 26	70	Cordwainer, master.	Cystitis. Certified.
„ 25	54	Copper miner -	Consumption, 15 years. Certified.

Sub-District - 2. St. Austell.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 3	80	Tin streamer -	Old age. No medical attendant.
„ 7	44	Gardener -	Organic disease of abdomen, 8 years. Fever, 4 weeks. Certified.
„ 8	32	Tin miner -	Phthisis. Certified.
„ 13	29	Son of saddler	Fit. Not certified.
„ 18	56	Miner -	Consumption, 2 years. Certified.
„ 17	63	Merchant -	Malignant disease of bowels. Certified.
„ 22	68	Tin miner -	Bronchitis. Certified.
„ 28	47	Blacksmith -	Consumption. Not certified.
1859			
Feb. 5	61	Tailor -	Dropsy. Not certified.
„ 14	70	Carpenter -	Cancer of the liver. Certified.
„ 18	35	Farm labourer	Decline. Not certified.
„ 17	67	Miner - -	Inflammation of bowels. Not certified.
„ 19	74	Mine agent -	Cancer of the stomach. Certified.
„ 23	62	Surgeon -	Gout. Epilepsy. Certified.
„ 26	82	Labourer -	Old age. Not certified.
„ 25	23	Farm labourer	Pulmonary consumption, 1 year. Certified.
„ 25	63	Saddler -	Diseased brain, 2 years. Paralysis, 6 hours. Certified.
Mar. 1	12	Son of miller -	Injuries. Accident, falling near a cart wheel in motion, passed over his head. Inquest.
„ 17	80	Labourer -	Paralysis. Certified.
„ 20	79	Labourer -	Diseased brain, some months. Certified.
„ 24	13	Son of labourer	Consumption. Certified.
„ 29	87	Shoemaker -	Old age. Certified.
Apr. 6	77	Farm labourer	Suicide by hanging. Inquest.
„ 8	33	Miner - -	Pulmonary consumption, 3 years. Certified.
„ 17	76	Miner - -	Bronchitis, 1 week. Certified.
„ 15	70	Tin streamer -	Old age. Certified.
„ 11	11	Son of tin miner	Killed by falling into an open mine shaft while in search of birds' nests. Inquest.
„ 20	58	Farm labourer	Disease of stomach. No medical attendant.
May 1	38	Clay labourer	Epileptic fits. No medical attendant.
„ 4	14	Son of carpenter	Congestion of liver. Apoplexy. Certified.
„ 6	38	Miner - -	Disease of stomach. Certified.
„ 2	19	Waggoner -	Accident: killed by the wheels of a waggon passing over him. Inquest.
„ 23	10	Son of clay labourer.	Phthisis. Certified.
„ 27	57	Rag gatherer -	Paralysis, 1 year. Softening of brain. Certified.
June 4	54	Labourer -	Phthisis. Certified.
„ 19	12	Son of blacksmith.	Pneumonia. Not certified.
„ 24	62	Miner - -	Accident: killed by a rock falling on him. Inquest.
„ 30	57	Miner - -	Seizure. Not certified.
July 7	32	Clay labourer	Diseased lungs. Not certified.
„ 8	76	Miner - -	Old age. No medical attendant.
„ 12	69	Miner - -	Diseased kidneys. Certified.
„ 19	27	Tin miner -	Fracture of spine, 15 weeks. Paralysis. Certified.
„ 23	77	Street pavior	Seizure. Not certified.
„ 27	70	Miner - -	Consumption. Certified.
„ 30	76	Clay labourer	Not known. No medical attendant
„ 30	68	Farmer - -	Dropsy. Not certified.
„ 31	24	Hair dresser -	Epilepsy. Certified.
Aug. 1	16	Son of farmer	Cephalitis. Not certified.
„ 2	21	Tin miner -	Phthisis. Certified.
„ 7	82	Woolcomber -	Old age. Certified.
„ 10	73	Husbandman	Decay of nature. Not certified.
„ 17	82	Miner - -	Decay of nature. No medical attendant.
„ 19	80	Shoemaker -	Paralysis. Certified.
„ 24	10	Son of labourer	Phthisis. Certified.
„ 26	43	Schoolmaster	Consumption. Certified.
„ 25	63	Mine blacksmith	Diseased heart, 1 year. Certified
Sept. 1	13	Son of farmer	Abscess. Certified.
Aug. 31	88	Parish clerk -	Senile decay. Certified.
Sept. 8	13	Son of miner	Scrofula. Certified.
„ 9	70	Carpenter -	Natural causes. Inquest.
„ 22	75	Farmer - -	Decay of nature. Not certified.
„ 28	27	Miner - -	Diseased lungs. Not certified.
„ 29	65	Labourer -	Cancer of the stomach. Certified.
„ 28	60	Labourer -	Diseased heart, 2 years. Asthma.
Oct. 1	27	Tin miner -	Fever. Certified.
„ 1	26	Carpenter -	Nephria. Coma, 2 days. Certified.
„ 14	19	Quarryman -	Consumption. No medical attendant.
„ 23	25	Labourer -	Diseased larynx. Certified.
„ 24	50	Tin streamer -	Chronic bronchitis. Dropsy. Certified.
„ 28	66	Annuitant -	Chronic gout, — years. Certified
Nov. 2	26	Clay labourer	Consumption. Not certified.
„ 5	75	Mine blacksmith	Bronchitis. Certified.
„ 4	54	Miner - -	Consumption. Not certified.
„ 8	89	Miller - -	Bronchitis, 3 weeks. Certified.
„ 7	50	Clay agent -	Typhoid fever, 1 week. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1859			
Nov. 8	62	Accountant -	Dropsy. Certified.
„ 13	28	Lead smelter -	Diphtheria. Certified.
„ 17	78	Confectioner -	Old age. No medical attendant.
„ 15	21	Copper miner	Consumption, 1 year. Certified.
„ 19	54	Miner - -	Bronchitis, 1 year. Certified.
„ 23	23	Clay labourer	Lumbar abscess, — years. Certified.
Dec. 2	76	Engineer -	Natural causes. Inquest.
„ 6	10	Son of quarryman.	Fever. Pneumonia. Not certified.
„ 6	74	Farmer - -	Phlegmon, 1 week. Certified.
„ 13	38	Miner - -	Phthisis. Certified.
„ 13	22	Clay labourer	Consumption. No medical attendant.
„ 17	13	Tin streamer -	Scarlatina. Not certified.
„ 18	17	Mine labourer	Scarlatina, 5 weeks. Renal epilepsy, 3 weeks. Certified.
„ 27	37	Clay labourer	Diseased heart, 3 years. Bronchitis. Certified.
1860			
Jan. 3	59	Baker - -	Epilepsy. Apoplexy. Certified.
„ 7	54	Farmer -	Pneumonia. Not certified.
„ 18	24	Clay labourer	Diphtheria, 10 days. Phthisis, 11 months. Certified.
„ 21	29	Shopkeeper -	Abscess. Not certified.
„ 21	64	Miner - -	Apoplexy, 8 hours. Certified.
„ 30	83	Shoemaker -	Old age. Not certified.
Feb. 4	15	Not stated -	Diseases of spine, 15 years. Certified.
„ 10	80	Tin streamer -	Old age. No medical attendant.
„ 16	53	Farmer -	Consumption. Certified.
„ 14	77	Mason - -	Senile decay. Certified.
„ 19	74	Tallow chandler	Diseased heart. Bronchitis. Certified.
„ 23	74	Malster -	Strangulated hernia. Certified.
„ 23	56	Farmer -	Bronchitis, 14 days. Certified.
„ 28	77	Farmer -	Hydrothorax. Certified.
Mar. 8	50	Miner - -	Gangrene of lungs. Certified.
„ 8	76	Tin streamer -	Seizure. Not certified.
„ 10	46	Engine worker	Pneumonia, 14 days. Certified.
„ 15	89	Farmer -	Old age. No medical attendant.
„ 17	11	Son of miner	Diarrhœa and fever. Certified.
„ 18	42	Land surveyor	Suppression of urine. Dropsy. Certified.
„ 22	74	Farm labourer	Senile decay. Certified.
Apr. 5	55	Tin miner -	Diseased heart and lungs. Certified.
Mar. 16	70	Agent of clay works.	Natural causes. Inquest.
Apr. 10	50	Miner - -	Miners' consumption. Not certified.
„ 8	53	Wheelwright -	Tuberculosis. Certified.
„ 18	43	Dealer in marine stores.	Abscess on brain, 14 days. Certified.
„ 21	45	Labourer -	Diseased kidneys. Certified.
May 19	40	Sawyer -	Pulmonary consumption, 1 year. Certified.
„ 19	82	Labourer -	Senile decay. Certified.
„ 30	26	Miner - -	Consumption. Certified.
June 8	52	Miner - -	Miners' consumption. Gangrene of lungs. Certified.
„ 4	18	Mariner -	Congestion of lungs. Inquest.
„ 13	70	Miner - -	Bronchitis. Certified.
„ 25	55	Miner - -	Hepatitis, 6 years. Certified.
July 4	78	Labourer -	Old age. Certified.
„ 8	34	Farmer -	Fever. Not certified.
„ 9	28	Tin miner -	Softening of brain. Certified.
„ 13	61	Miner - -	Consumption, 2 years. Certified.
„ 16	14	Tin smelter -	Fever. Certified.
„ 13	79	Miller - -	Old age. Not certified.
„ 16	28	Blacksmith -	Accident. Falling from the bob flat in North Codra Mine. Inquest.
Aug. 3	27	Tin miner -	Fever. Certified.
„ 4	15	Mine labourer	Fever. Certified.
„ 14	44	Engine worker	Consumption. No medical attendant.
Sept. 13	53	Mine labourer	Diseased heart. Dropsy. Certified.
„ 22	37	Veterinary surgeon.	Obstruction of bowels, 24 hours. Enteritis. Certified.
„ 26	41	Marine pensioner.	Consumption. Not certified.
„ 27	66	Farm labourer	Senile decay. Certified.
Oct. 22	22	Miner - -	Accident. Falling over a cliff. Inquest.
Nov. 7	46	Clergyman -	Phrenitis, 3 days. Serous effusion. Certified.
„ 19	71	Ship carpenter	Old age. Not certified.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Nov. 21	54	Clay labourer	Pneumonia, 6 months. Dropsy. Certified.
Dec. 4	13	Son of tin miner.	Diseased kidneys. Not certified.
Nov. 23	61	Miner - -	Accident. Killed in St. Crinnis mine. Inquest.
„ 27	40	Miner - -	Accident. Falling down a shaft in Cuddra mine. Inquest.
Dec. 11	42	Master mariner	Heart disease, 1 year, Certified.
„ 22	43	Carpenter -	Abscess, 10 years. Dropsy. Certified.
„ 24	49	Farm labourer	Phthisis, 8 years. Certified.
„ 26	70	Tin streamer -	Old age. Not certified.
„ 26	63	Miner - -	Asthma, Miner's consumption. Certified.
„ 29	56	Imbecile -	Softening of brain. Certified.
„ 30	82	Shoemaker -	Bronchitis. Certified.
„ 20	27	Miner - -	Accident. Falling down a mine shaft. Inquest.
„ 27	66	Tailor - -	Found dead. Inquest.
1861			
Jan. 1	75	Labourer -	Stricture of œsophagus. Certified.
„ 4	60	General labourer	Chronic bronchitis, 3 years. Certified.
„ 5	88	Mine labourer	Old age. Not certified.
„ 7	49	Cooper - -	Accident. Shot himself. Inquest.
„ 10	53	Miner - -	Miners' consumption. No medical attendant.
„ 10	47	Miner - -	Tumour on the back. Not certified.
„ 18	93	Farm labourer	Senile decay. Certified.
„ 24	65	Blacksmith -	Carbuncle. Certified.
„ 24	83	Farmer -	Old age. Not certified.
„ 24	43	Mason - -	Consumption, 2 years. Certified.
Feb. 1	69	Mine carpenter	Epilepsy. Apoplexy. Certified.
Jan. 22	40	Miner - -	Accident. Fall down a shaft in Charlestown United Mines. Inquest.
Feb. 5	79	Farmer - -	General dropsy. Certified.
„ 14	58	Tin miner -	Consumption, — years. Certified.
„ 11	66	Iron founder -	Bronchitis. Debility. Certified.
Jan. 13	73	Labourer -	Natural causes. Inquest.
Mar. 6	71	Farmer - -	Old age. Not certified.
„ 12	32	Seaman, merchant service.	Consumption. Certified.
„ 19	71	Labourer -	Old age. Not certified.
„ 21	49	Miner - -	Fever. Disease of liver. Certified.
„ 23	106	Carpenter -	Senile decay. Certified.
„ 26	47	Agric. labourer	Pulmonary congestion. Inquest.
„ 28	23	Clay labourer	Fever. Certified.
„ 28	28	Miner - -	Pulmonary consumption, 1 year. Certified.
Mar. 30	39	Vagrant -	Phthisis. Certified.
„ 31	47	Horsekeeper -	Bronchitis. Certified.
April 5	16	Tin streamer -	Accident. Killed on the Par and Newquay railway. Inquest.
„ 5	31	Moulder -	Consumption, 12 months. Certified.
„ 9	66	Tallow chandler	Over exertion. Congestion of liver, 1 day. Certified.
„ 11	54	Tin streamer	Seizure. Not certified.
„ 12	72	Carpenter -	Diseased heart, 2 years. Dropsy, 3 month. Certified.
„ 17	80	General labourer	Senile decay. Certified.
„ 18	28	Tin miner -	Consumption, 2 years. No medical attendant.
„ 18	18	Tin streamer	Consumption. No medical attendant.
„ 21	15	Son of clay labourer.	Consumption. Not certified.
„ 17	45	Labourer -	Natural causes. Inquest.
„ 30	55	Miner - -	Miners' consumption. Not certified.
„ 27	57	Clay labourer	Fever, 14 days. Gangrene of lungs. Certified.
May 7	68	Blacksmith -	Bronchitis. Certified.
„ 9	52	Tin miner -	Diseased spinal cord. Certified.
1860.			
Dec. 4	13	Son of tin miner	Diseased kidneys. Not certified.
1861.			
May 14	10	Son of mine proprietor.	Typhus fever. Not certified.
„ 25	71	Shoemaker -	Consumption. Certified.
„ 25	76	Farm labourer	Senile decay. Certified.
June 1	42	Engine worker	Enteritis. Not certified.
May 27	68	Carpenter -	Seizure. Not certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1861			
June 8	20	General labourer	Consumption. Not certified.
„ 12	57	Tin miner -	Consumption. No medical attendant.
„ 15	14	Farm labourer	Scrofula. Diseased hip joint, 3 months. Certified.
„ 18	20	Currier -	Consumption. No medical attendant.
„ 22	67	Woolstapler -	Jaundice, 10 days. Congestion of kidneys. Certified.
„ 25	17	Clay labourer	Consumption. Not certified.
„ 25	52	Shoemaker -	Chronic abscess. Phthisis. Certified.
July 1	66	Builder -	Diabetes, 18 months. Hæmorrhage from stomach and bowels, 12 hours. Certified.
„ 5	10	Son of copper miner.	Confluent small pox. Certified.
„ 17	71	Farm labourer	Senile decay. Certified.
„ 23	53	Miner -	Miners' consumption. Not certified.
„ 30	48	Clay labourer	Cancer. Not certified.
„ 31	27	Clay labourer	Typhoid fever, 10 days. Peritonitis, 3 days. Certified.
Aug. 1	68	Miner -	Consumption, 2 years. Certified.
„ 30	21	Miner -	Accident. Falling down a shaft in Gunbarrow Mine. Inquest.
Sept. 7	10	Son of tin miner	Phthisis, 3 months. Certified.
„ 12	65	Miner -	Paralysis, 2 years. Certified.
„ 12	15	Tin streamer	Typhus, 15 days. Certified.
„ 12	64	Farmer -	Natural causes. Inquest.
„ 26	64	Copper miner	Typhus, 3 weeks. Certified.
„ 27	18	Tin miner -	Fever. Congestion of brain. Certified.
„ 25	84	Farmer -	Old age. Certified.
Oct. 1	78	Tin streamer	Diarrhœa. Certified.
„ 3	26	Tin miner -	Diarrhœa. Bloody flux. Not certified.
„ 6	33	Miner -	Miners' consumption. Not certified.
„ 8	59	Farmer -	Enlargement of heart. Certified.
„ 18	67	Farmer -	Age. Not certified.
„ 16	21	Farm labourer	Diseased heart. Inquest.
Nov. 14	25	Mason -	Cephalitis. Not certified
„ 18	65	Tin streamer	Senile decay. Certified.
„ 19	51	Miner -	Bronchitis. Certified.
„ 20	59	Carpenter -	Decline. Not certified.
„ 23	19	Clay labourer	Typhus. Not certified.
„ 26	55	Miner -	Consumption, 15 months. Certified
„ 25	59	Schoolmaster	Pneumonia, 1 day. Suffocation, 2 hours. Certified.
„ 28	70	Wheelwright	Typhus, 14 days. Certified.
„ 30	22	Farm labourer	Tuberculosis. Peritonitis, 14 days, Certified.
Dec. 1	90	Gardener -	Old age. Not certified.
„ 8	61	Clay labourer	Dropsy. Not certified.
„ 10	39	Schoolmaster	Pneumonia. Not certified.
„ 11	85	Iron manufacturer.	Gangrene of feet. Certified.
„ 20	20	Shoemaker -	Diseased heart. Dropsy, 3 weeks. Certified.
„ 20	26	Miner -	Accident by rubble falling on him in Gunbarrow Mine. Inquest.
30	52	Tin streamer	Cancer of stomach, 2 years. Certified.

Sub-district - 3. Mevagissey.

1859.			
Jan. 28	85	Land owner -	Old age. Certified.
Mar 22	45	Farm labourer	Consumption. Not certified.
„ 24	21	Farm labourer	Phthisis. Certified.
April 1	73	Farm labourer	Natural decay. Certified.
„ 24	69	Farmer -	Phthisis. Certified.
May 12	40	Gardener -	Extensial ulcer. Certified.
„ 17	75	Farmer -	Dropsy. Certified.
„ 15	38	Shipwright -	Phthisis, Certified.
July 10	82	Farmer -	Natural decay. No medical attendant.
„ 16	30	Tin miner -	Thigh crushed between the cog wheels of a steam stamping engine. Inquest.
Aug. 3	72	Mason - -	Retention of urine, 9 days. Cystitis, 3 days. Certified.
Sept. 11	27	Blacksmith -	Drowned by the upsetting of a boat through drunkenness. Inquest.
1859			
Sept. 11	20	Tailor -	Drowned by the upsetting of a boat through drunkenness. Inquest.
„ 11	18	Copper miner	Drowned by the upsetting of a boat through drunkenness. Inquest.
„ 11	21	Carrier -	Drowned by the upsetting of a boat through drunkenness. Inquest.
„ 18	73	Agric. labour.	Sudden. Inquest.
Nov. 11	22	Tin miner -	Slow typhus. Certified.
„ 25	59	Victualler -	Cancer. Certified.
1860.			
Jan. 1	82	Farm labourer	Natural decay. No medical attendant.
„ 7	29	Tin miner -	Pneumonia. Certified.
„ 31	19	Son of farm labourer -	Phrenitis. Certified.
„ 28	65	Tin miner -	Hepatitis. Certified.
Feb. 17	68	Farm labourer	Phthisis. Certified.
„ 18	26	Farmer -	Consumption. No medical attendant.
„ 22	79	Farm labourer	Natural decay. Certified.
Mar. 9	19	Farm labourer	Abscess on the brain. Certified.
April 3	13	Son of fisherman	Injury. Accidental cut. Tetanus. Inquest.
„ 5	62	Farm labourer	Decline. No medical attendant.
„ 29	25	Farmer -	Phthisis. Certified.
„ 28	70	Ropemaker -	Bronchitis. Certified.
May 22	27	Farm labourer	Phthisis. Certified.
June 8	80	Sawyer- -	Palsy. Certified.
July 8	70	Cooper - -	Natural decay. No medical attendant.
„ 22	24	Blacksmith -	Abscess in the side. Certified.
Oct. 2	76	Farmer -	Dropsy. No medical attendant.
„ 6	75	Yeoman -	Hydrothorax. Certified.
„ 10	79	Fisherman -	Ascites. Certified.
Nov. 6	81	Fisherman -	Ascites. Certified.
„ 11	86	Fisherman -	Natural decay. No medical attendant.
„ 15	33	Farmer -	Gastralgia. Certified.
„ 27	59	Tin miner -	Decline. Asthma. Not certified.
1861.			
Jan. 6	85	Carpenter -	Natural decay. Certified.
Mar. 1	21	Carpenter -	Scrofula. Certified.
„ 21	47	Tin miner -	Apoplexy. Certified.
„ 30	16	Son of Coast Guard.	Phthisis. Certified.
Apr. 9	76	Farm labourer	Hydrothorax. Certified.
„ 15	12	Son of farmer	Ileus. Certified.
„ 17	25	Carpenter -	Consumption. Certified
May 14	73	Farmer -	Paralysis. Certified.
„ 26	18	Son of fisherman.	Epilepsy. Certified.
June 19	72	Ship carpenter	Diseased heart. Inquest.
July 1	74	Farm labourer	Natural decay. Not certified.
„ 19	61	Woodman -	Hepatitis. Certified.
„ 28	60	Master, merchant seaman.	Cancer of stomach. Certified.
Aug. 4	36	Fish carrier -	Phthisis. Certified.
„ 12	72	Farm labourer	Pressure on brain. Not certified.
„ 27	27	Farm labourer	Congestion of brain. Certified.
Oct. 7	79	Farm labourer	Rupture of bloodvesssel. Certified.
„ 10	54	Farm labourer	Natural decay. No medical attendant.
Nov. 13	20	Tin miner -	Lumbar abscess. Certified.
„ 27	34	Fisherman -	Phthisis. Certified.

Sub-district - 4. Grampound.

1859.			
Jan. 14	77	Agric. labourer	Old age. No medical attendant.
Feb. 8	64	Farmer -	Organic disease of stomach. Certified.
„ 7	29	Tin miner -	Injuries while at work under ground in St. Austell's Consols Mine by a rock falling on him. Inquest.
„ 23	41	Shoemaker, master.	Asthma, and diseased heart. Certified.
„ 28	78	Master mason	Old age. Fracture of thigh bone. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1859			
Feb. 28	43	Tin miner -	Convulsions. Not certified.
Apr. 1	25	Tin miner -	Decline. Not certified.
„ 7	74	Tin miner -	Decline. No medical attendant.
„ 25	77	Carpenter, master.	Old age. No medical attendant.
„ 27	75	Tin miner -	Consumption. Not certified.
July 13	75	Farmer -	Old age. Not certified.
„ 17	33	Master miller	Diseased kidneys, 1 year. Certified.
Aug. 22	66	Agric. labourer	Decline. Not certified.
„ 30	79	Farmer -	Decline. Not certified.
Sept. 4	57	Agric. labourer	Suffocation. Disease of windpipe. Inquest.
„ 25	63	Agric. labourer	Internal cancer, 10 months. Certified.
„ 30	76	Grocer - -	Diseased kidneys. Certified.
Oct. 29	40	Clay labourer -	Injuries in a clay pit by some ground falling on him. Inquest.
Nov. 19	39	Stone quarry labourer.	Consumption. Not certified.
„ 21	11	Son of cattle dealer.	Concussion of brain: thrown from a horse. Inquest.
Dec. 1	77	Farmer -	Old age. Not certified.
1860.			
Jan. 3	78	Farmer -	Old age. No medical attendant.
„ 11	43	Grocer -	Decline. Not certified.
„ 13	90	Agric. labourer	Asthma. Old age. Certified.
„ 30	83	Woolcomber -	Old age. No medical attendant.
Feb. 8	90	Innkeeper -	Old age. No medical attendant.
„ 8	36	Tin miner -	Decline. Not certified.
„ 14	88	Agric. labourer	Old age. Certified.
Mar. 3	65	Agric. labourer	Decline. Not certified.
„ 14	66	Carpenter, master.	Bronchitis. Certified.
Apr. 3	61	Blacksmith -	Diseased liver. Not certified.
„ 6	66	Innkeeper -	Cephalitis. Certified.
„ 15	63	Tin miner -	Diseased kidneys. Certified.
„ 26	62	Mining clerk -	Diseased heart. Inquest.
May 8	67	Farmer -	Decline. Not certified.
„ 28	76	Farmer -	Congestion of lungs. Certified.
June 9	10	Son of miner -	Pneumonia. Congestion. Certified.
„ 30	37	China clay labourer.	Fever. Not certified.
Aug. 23	75	Farmer -	Old age. Not certified.
„ 26	27	China clay labourer.	Typhus. Not certified.
Sept. 6	73	Farmer -	Dropsy. Not certified.
„ 16	68	Seaman -	Old age. Not certified.
„ 30	38	Tin miner -	Diseased heart. Not certified.
Oct. 7	96	Agric. labourer	Old age. Not certified.
„ 24	34	Tin miner -	Decline. Not certified.
„ 29	28	Tin miner -	Diseased kidneys and consumption. Certified.
Nov. 28	75	Carpenter, master.	Old age. Not certified.
Dec. 4	56	Agric. labourer	Paralysis. Certified.
„ 21	59	Tin miner -	Decline. Not certified.
1861.			
Jan. 6	71	Farmer -	Old age. Not certified.
„ 29	74	Agric. labourer	Dropsy. Certified.
Feb. 14	74	Quarryman -	Pneumonia. Not certified.
Mar. 1	76	Carpenter,	Old age. Not certified.
„ 20	87	Woolstapler -	Old age. Not certified.
Apr. 7	64	Farmer -	Injuries: thrown out of a carriage. Inquest.
„ 20	15	Son of farmer	Typhus fever. Not certified.
„ 29	60	Agric. labourer	Pneumonia. Not certified.
May 8	52	Shoemaker, master.	Cancer. Not certified.
„ 14	45	Clay labourer	Smallpox. Certified.
„ 31	37	Agric. labourer	Smallpox. Not certified
„ 31	77	Clay labourer	Old age. No medical attendant.
June 11	28	Farmer -	Strumous disease of brain. Certified.
„ 18	48	Quarryman -	Smallpox. Not certified
„ 20	28	Clay labourer	Inflammation. Certified.
Aug. 6	59	Clay labourer	Diseased heart. Not certified.
„ 13	55	Farmer -	Decline. Not certified.
Oct. 9	67	Butcher -	Endocarditis. Certified.
„ 13	81	Agric. labourer	Decline. Not certified.
Nov. 5	73	Agric. labourer	Diarrhœa. Certified.
„ 17	50	Farmer -	Dropsy. Not certified.
Dec. 5	11	Son of miller -	Pressure of the brain. Not certified.

Superintendent Registrar's District.	Registrar's Sub-District.
TRURO.	1. Probus. 2. St. Just. 3. St. Agnes. 4. St. Clement. 5. Kenwyn. 6. Kea.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859–61.

Sub-District - 1. Probus.

When Died.	Age.	Occupation.	Cause of Death.
1859			
Jan. 4	56	Farmer -	Debility after fever. Certified.
Feb. 9	22	Seaman, merchant service.	Bilious fever. Not certified.
May 7	77	Agric. labourer	Paralysis. No medical attendant.
June 6	62	Farmer -	Atrophy. Certified.
Sept. 5	25	Blacksmith, journeyman.	Consumption. Certified.
„ 11	24	Farmer -	Scarlet fever. Certified.
„ 24	86	Tailor, master	Age. Not certified.
Oct. 4	77	Agric. labourer	Typhus, 2 weeks. Certified.
„ 10	78	Agric. labourer	Old age. Certified.
„ 31	77	Agric. labourer	Old age. No medical attendant.
Nov. 12	13	Son of agricultural labourer.	Typhus. Certified.
1860			
Feb. 15	71	Agric. labourer	Paralysis. Certified.
„ 15	53	Agric. labourer	Asthma. Certified.
„ 20	66	Basket maker	Bronchitis. Certified.
Mar. 7	11	Son of agricultural labourer	Scarlatina. Dropsy. Certified.
„ 28	35	Policeman -	Consumption. Not certified.
Apr. 23	82	Gardener -	Age. No medical attendant.
June 20	15	Agric. labourer	Abscess in groin. No medical attendant.
July 30	31	Mason, journeyman.	Typhus. Certified.
Oct. 17	78	Watchmaker, master.	Paralysis. Not certified.
Nov. 11	75	Farmer -	Bronchitis. Certified.
„ 18	73	Dealer in marine stores.	Found dead. Inquest.
Dec. 12	18	Agric. labourer	Abscess on brain. Not certified.
1861			
Jan. 2	70	Agric. labourer	Dropsy. Certified.
„ 15	61	Agric. labourer	Typhus fever. Certified.
„ 11	87	Farmer -	Age. No medical attendant.
Mar. 22	79	Agric. labourer	Age. No medical attendant.
Apr. 2	27	Farmer -	Pneumonia. Certified.
„ 30	79	Agric. labourer	Age. Certified.
May 2	39	Agric. labourer	Typhus. Certified.
„ 9	48	Shoemaker -	Fever. Certified.
June 4	68	Farmer -	Fever. Certified.
„ 5	62	Agric. labourer	Asthma. Certified.
„ 9	10	Son of shoemaker.	Phthisis, many months. Certified.
July 5	67	Agric. labourer	Fever. Certified.
„ 20	78	Farmer -	Diseased, prostate. Certified.
„ 20	18	Carpenter -	Brain fever. Certified.
Aug. 23	59	Mason, master	Injury to spine. Certified.
Nov. 21	88	Clergyman -	Age. Certified.
Dec. 4	23	Agric. labourer	Typhus. Certified.
„ 6	62	Agric. labourer	Pneumonia. Not certified.
„ 20	86	Farmer -	Age. No medical attendant.

Sub-District - 2. St. Just.

1859			
Jan. 23	58	Farm labourer	Congestion of brain. Certified.
„ 21	51	Gamekeeper -	Accident. Drowned by falling into a mill pond. Inquest.
Feb. 3	75	Farm labourer	Malignant ulceration. Certified.
„ 12	88	Farm labourer	Old age. Not certified.
Apr. 9	66	Ship carpenter	Scirrhus: stomach. Certified.
„ 26	20	Son of farm labourer.	Small pox. Certified.

COUNTY OF CORNWALL.

When Died.	Age	Occupation.	Cause of Death.
1859			
May 6	56	Greenwich pensioner.	Hydrothorax. Certified.
„ 12	79	Farm labourer	Old age. Not certified.
„ 22	75	Boatman -	Small pox. Certified.
„ 21	19	Son of boat builder.	Small pox. Certified.
„ 9	58	Fisherman -	Disease of stomach. Certified.
„ 22	82	Landed proprietor.	Infirmities of age. Certified.
June 9	17	Son of innkeeper.	Typhus fever. Certified.
July 7	80	Innkeeper -	Paralysis. Certified.
„ 7	84	Boatbuilder -	Old age. Certified.
„ 14	78	Farmer -	Old age. Certified.
Aug. 14	47	Farm labourer	Peritonitis. Certified.
„ 16	78	Farm labourer	Old age. Certified.
„ 25	78	Farmer -	Dropsy. Certified.
Dec. 29	86	Farm labourer	Age. Certified.
„ 31	11	Son of farm labourer.	Hydrocephalus. Certified.
1860			
Jan. 18	41	Farmer -	Consumption, 2 months. Certified.
„ 27	12	Son of shoemaker	Concussion of brain. Effusion. Certified.
Feb. 17	62	Farmer -	Gastritis. Certified.
„ 26	83	Miller - -	Age. Certified.
Mar. 15	23	Son of farmer	Phthisis. Certified.
„ 22	36	Farmer -	Phthisis. Not certified.
„ 22	60	Farmer -	General decay. Certified.
„ 23	88	Farmer -	Old age. Certified.
Apr. 4	83	Cordwainer -	Retention of urine. Certified.
„ 7	76	Farmer -	Age. No medical attendant.
„ 23	77	Mason - -	Age. Certified.
May 29	21	Mariner -	Concussion of brain. Certified.
June 5	77	Road labourer	Erysipelas. Certified.
„ 8	69	Farmer -	Apoplexy. Certified.
„ 15	20	Farm labourer	Rheumatism. Certified.
„ 15	31	Farm labourer	Phthisis. Certified.
„ 16	14	Son of fisherman	Phthisis. Certified.
„ 2	64	Mason, master	Decay of nature. Certified.
July 16	67	Butcher -	Gastralgia. Certified.
June 30	23	Seaman, merchant service	Phthisis, 5 months. Certified.
Aug. 2	47	Farmer -	Scirrhus of pylorus. Certified.
„ 19	83	Farmer and butcher.	Old age. Not certified.
„ 26	25	Policeman -	Diseased heart. Certified.
Sept. 2	82	Farmer -	Age. Certified.
„ 10	41	Farm labourer	Mesenteric disease. Certified.
„ 30	72	Farmer -	Paralysis. Certified.
Oct. 10	13	Son of fisherman	Consumption. Not certified.
Sept. 29	31	Shoemaker, journeyman.	Fever. Certified.
Nov. 27	68	Not stated -	Paralysis. Certified.
Dec. 5	77	Blacksmith -	Natural causes. Certified.
„ 9	84	Farm labourer	Paralysis. Not certified.
„ 9	83	Tailor, master	Age. Certified.
„ 4	76	Master, R.N.	Bronchitis. Certified.
1861			
Jan. 14	25	Farm labourer	Phthisis. Certified.
„ 25	18	Son of naval officer.	Affection of lungs. Certified.
Feb. 3	40	Farm labourer	Bronchitis. Pneumonia. Certified.
„ 3	61	Farmer -	Sphacelus. Certified.
„ 5	77	Farmer -	Natural causes. Certified.
„ 23	89	Tin-plate worker	Old age. Certified.
„ 27	87	Pilot - -	Old age. Certified.
Mar. 19	34	Mariner -	Constipation. Certified.
Apr. 3	45	Greenwich pensioner.	Diseased heart. Dropsy. Certified.
„ 18	27	Mariner -	Diseased heart. Certified.
„ 20	70	Farmer -	Paralysis. Certified.
May 23	54	Road labourer	Scirrhus stomach. Certified.
„ 31	86	Farmer -	Old age. Certified.
June 9	20	Gardener -	Consumption. Certified.
July 1	16	Agric. labourer	Fall from a waggon. Inquest.
„ 20	50	Mariner -	Found drowned. Inquest.
„ 25	75	Farm labourer	Palsy. Certified.
„ 22	20	Sailor - -	Accident. Drowned. Inquest.
„ 29	79	Boatman -	Age. Not certified.
Sept. 2	72	Miller and farmer.	Age. Not certified.
Oct. 11	67	Maltster -	Tumour. Certified.
„ 22	72	Sexton -	Suicide by hanging. Inquest.
Nov. 12	78	Superannuated, Coast Guard.	Natural causes. Certified.
„ 9	65	Fisherman -	Diseased heart. Certified.
1861			
Nov. 23	78	Boatman -	Diarrhœa. Certified.
„ 28	13	Son of mariner	Internal abscess. Certified.
Dec. 14	64	Farmer -	Bronchitis. Phthisis. Certified.
„ 14	34	Farmer -	Gastric fever. Certified.
„ 17	70	Master mason	Age. Not certified.
„ 3	80	Pilot - -	Bronchitis. Certified.
„ 12	79	Shoemaker -	Age. certified.

Sub-District - 3. St. Agnes.

1858			
Dec. 55	25	Copper miner -	Apoplexy. Inquest.
1859			
Jan. 8	74	Copper miner -	Natural decay. No medical attendant.
„ 9	70	Tin miner -	Decay of nature. Certified.
„ 11	58	Blacksmith -	Consumption, 5 years. No medical attendant.
Feb. 20	79	Agric. labourer	Cerebral paralysis, 8 weeks. Certified.
„ 26	54	Agric. labourer	Suffocated by hanging. Suicide. Inquest.
Mar. 9	55	Coal carrier -	Pneumonia, 7 days. Certified.
„ 19	21	Tin miner -	Miners' consumption. Certified.
„ 25	22	Agric. labourer	Inflammation of the bowels, 12 hours. Not certified.
Apr. 20	21	Blacksmith, master.	Rupture of a blood vessel, 12 months. Not certified.
May 12	84	Chelsea pensioner -	Paralysis, 6 years. No medical attendant.
„ 21	11	Son of yeoman	Fever. Cephatitis. Certified.
„ 24	51	Tailor, master	Paralysis, 6 months. Not certified.
„ 31	65	Agric. labourer	Natural decay. No medical attendant.
June 15	80	Road labourer	Erysipelas. Certified.
„ 22	60	Chelsea pensioner -	Diseased heart and kidneys. Certified.
July 9	56	Tin miner -	Consumption. Certified.
„ 11	42	Copper miner -	Injury of the kidneys, 2 years. No medical attendant.
„ 23	66	Agric. labourer	Natural decay. No medical attendant.
„ 24	36	Spirit merchant	Bronchitis. Congestion of lungs, 2 years. Certified.
Aug. 2	52	Blacksmith -	Pneumonia, 3 weeks. Certified.
„ 26	45	Copper miner	Miners' consumption, 2 years. No medical attendant.
Sept. 1	56	Tin miner -	Bronchitis. Effusion on brain. Certified.
„ 16	64	Copper miner	Dropsy, 1 year. Not certified.
„ 18	64	Copper miner	Consumption. No medical attendant.
„ 29	57	Copper miner	Consumption, 4 months. Not certified.
„ 28	72	Lead miner -	Ileus. Certified.
Oct. 9	30	Copper miner	Enteritis, 5 weeks. Certified.
„ 19	80	Tin miner -	Natural decay. No medical attendant.
„ 21	70	Tin miner -	Diseased bladder. No medical attendant.
„ 31	16	Copper miner	Diseased liver, 7 months. Certified.
Nov. 1	17	Tin miner -	Injury to abdomen. Peritonitis, 3 days. Certified.
„ 1	25	Engine driver	Nephria, 2 years. Certified.
„ 3	28	Blacksmith -	Smallpox, 9 days. Certified.
„ 3	69	Yeoman -	Natural decay. No medical attendant.
„ 10	62	Copper miner	Consumption, 8 weeks. No medical attendant.
„ 14	55	Copper miner	Consumption, 2 years. No medical attendant.
„ 16	59	Copper miner	Consumption, 1 year. No medical attendant.
„ 18	35	Copper miner	Consumption, 1 year. Not certified.
„ 22	75	Innkeeper -	Paralysis. Retention of wind. Certified.
„ 20	63	Tin miner -	Consumption, 2 years. No medical attendant.
„ 28	14	Tin dresser -	Fever. Effusion on brain. Certified.
Dec. 10	21	Copper miner	Bronchitis, 14 days. Not certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Dec. 4	15	Copper miner	Epileptic convulsions. Certified.
„ 15	42	Carpenter, master.	Consumption. Certified.
„ 15	80	Tin miner -	Natural decay. No medical attendant.
„ 20	40	Lead miner -	Consumption. Not certified.
„ 29	22	Agric. labourer	Asthma. Phthisis. No medical attendant.
„ 31	57	Copper miner	Consumption, 2 years. Not certified.
1860			
Jan. 5	63	Tin miner -	Consumption, 3 years. No medical attendant.
„ 9	55	Copper miner	Consumption. Certified.
„ 21	68	Mine agent -	Bronchitis, 5 months. Certified.
„ 23	42	Farmer -	Burns. Inquest.
Feb. 10	63	Copper miner	Consumption, 3 months. Not certified.
„ 16	77	Coal porter -	Bronchitis. Certified.
„ 17	60	Tin miner -	Consumption, 2 years. No medical attendant.
„ 15	61	Tin miner -	Diseased heart, 3 months. Not certified.
„ 19	51	Tin miner -	Consumption. Certified.
„ 17	59	Tin miner -	Diseased liver. Certified.
„ 18	51	Copper miner	Consumption, 2 years. Not certified.
„ 26	24	Copper miner	Fever, 3 weeks. Meningitis, 14 days. Certified.
Mar. 13	75	Mine labourer	Paralysis, 3 months. No medical attendant.
„ 17	19	Copper miner	Typhoid fever, 17 days. Certified.
„ 19	65	Tin miner -	Consumption. Not certified.
„ 31	15	Copper miner	Typhus, 4 weeks. Not certified.
Apr. 5	86	Tin miner -	Natural decay. No medical attendant.
„ 7	67	Tin miner -	Bronchitis. Certified.
„ 16	70	Mine agent -	Laryngitis, 10 days. Certified.
„ 17	59	Tin miner -	Consumption, 3 months. No medical attendant.
„ 21	17	Copper miner	Typhus, 4 weeks. Certified.
„ 27	83	Copper miner	Natural decay. No medical attendant.
May 2	25	Tin miner -	Consumption. Certified.
„ 6	56	Tin miner -	Phthisis, 8 months. Certified.
„ 5	78	Tin miner -	Paralysis, 1 week. Not certified.
„ 14	55	Copper miner	Congestion of lungs and brain. Certified.
„ 13	36	Carpenter -	Fistula, 3 years. Not certified.
„ 17	42	Lead miner -	Bursting of a blood vessel. Inquest.
„ 29	60	Tin miner -	Congestion of lungs, 4 weeks. Certified.
June 6	71	Agric. labourer	Bronchitis. Certified.
—	Male	- -	Found washed ashore. Inquest.
„ 26	15	Copper miner	Bronchitis. Certified.
„ 27	42	Engine driver	Diseased heart. Dropsy. No medical attendant.
July 10	69	Lead miner -	Natural decay. No medical attendant.
„ 10	30	Copper miner	Rupture of bloodvessel. No medical attendant.
„ 11	72	Tin miner -	Natural decay. No medical attendant.
„ 11	66	Tin miner -	Consumption, 6 months. No medical attendant.
Aug. 2	20	Copper miner	Falling out of a kibble in returning up from underground. Inquest.
Sep. 13	58	Blacksmith -	Diseased heart, Dropsy. Certified.
„ 17	20	Tin miner -	Consumption. Hæmoptysis. Not certified.
„ 20	47	Tin miner -	Consumption. Not certified.
Oct. 3	88	Tin miner -	Decay of nature. No medical attendant.
„ 9	18	Tin miner -	Consumption. Not certified.
„ 11	53	Tin miner -	Bronchitis. Certified.
„ 16	78	Carpenter -	Age. No medical attendant.
„ 18	73	Husbandman -	Age. Certified.
„ 20	21	Tin miner -	Diseased heart. Phthisis, 13 months. Not certified.
Nov. 6	74	Tin miner -	Natural decay. No medical attendant.
„ 16	63	Copper miner	Consumption. Certified.
„ 21	68	Yeoman -	Jaundice. Certified.
Dec. 3	74	Copper miner	Old age. Certified.
16	62	Tin miner -	Myelitis, 5 months. Certified.

When Died.	Age.	Occupation.	Cause of Death.
1860			
Dec. 21	26	Sawyer -	Phthisis, 7 months. Certified.
„ 19	12	Son of a tailor	Killed by a steam-crushing machine. Inquest.
1861.			
Jan. 3	19	Copper miner	Injuries by the blasting of a hole in Penhals Mine. Inquest.
„ 9	82	Yeomen -	Paralysis, 8 months. Certified.
„ 10	72	Yeoman -	Natural decay. No medical attendant.
„ 13	24	Yeoman -	Peritonitis, 9 days. Certified.
„ 20	71	Tin miner -	Natural decay. No medical attendant.
„ 22	27	Yeoman -	Rheumatic fever. Jaundice, 1 week. Not certified.
„ 25	55	Tin miner -	Consumption, 1 year. No medical attendant.
„ 31	70	Agric. labourer	Age. No medical attendant.
Feb. 10	68	Copper miner	Consumption, 1 year. Not certified.
„ 11	37	Tin miner -	Consumption, 1 year. No medical attendant.
„ 19	66	Gamekeeper -	Pleuro-pneumonia. Certified.
„ 19	66	Tin Dresser -	Natural decay. Not certified.
„ 22	20	Tin miner -	Consumption, 1 year. Not certified.
„ 23	69	Copper miner	Congestion of lungs. Certified
„ 27	56	Copper miner	Consumption, 4 months. Not certified.
Mar. 1	78	Tin miner -	Natural decay. No medical attendant.
„ 5	64	Copper miner	Consumption. No medical attendant.
„ 8	62	Tin miner -	Consumption, 3 years. No medical attendant.
„ 10	65	Tin miner -	Consumption, 3 months. No medical attendant.
„ 18	31	Innkeeper -	Hypertrophy of heart. Certified.
„ 29	11	Son of a mason	Scarlatina, 7 days. Certified.
Apr. 15	54	Yeoman -	Hepatitis, 11 weeks. Not certified.
„ 26	64	Tin miner -	Consumption, 7 months. No medical attendant.
„ 28	63	Mine labourer	Diseased stomach. Certified.
„ 28	27	Mariner -	Diseased heart. Certified.
May 2	46	Agric. labourer	Abscess. Ulceration of intestines. Certified.
„ 6	43	Tin miner -	Consumption, 15 months. No medical attendant.
„ 9	80	Agric. labourer	Natural decay. No medical attendant.
„ 10	20	Copper miner	Phthisis. Certified.
June 21	67	Yeoman -	Consumption, 1 year. No medical attendant.
„ 19	23	Carpenter -	Consumption. No medical attendant.
July 1	16	Agric. labourer	Fall from a waggon. Inquest.
„ 8	77	Copper miner	Visitation of God. Inquest.
„ 19	15	Tin dresser -	Diseased joints. Certified.
„ 26	66	Engine driver	Pneumonia. Not certified.
Aug. 5	77	Mason, master	Gangrene. Certified.
„ 5	25	Copper miner	Consumption, 9 months. Not certified.
„ 13	32	Agric. labourer	Small pox, 14 days. No medical attendant.
„ 22	24	Wesleyan minister	Phthisis, 4 months. Not certified.
„ 23	27	Copper miner	Palsy, 9 months. No medical attendant.
„ 25	70	Cordwainer -	Diseased heart. Certified.
„ 26	61	Tin miner -	Consumption. Certified.
Sept. 2	21	Tin miner -	Typhus, 5 weeks. Certified.
„ 17	11	Son of a mine agent	General debility. No medical attendant.
„ 25	53	Mine labourer	Dropsy, 6 months. Not certified.
„ 27	79	Agric. labourer	Natural decay. No medical attendant.
Oct. 6	35	Mine manager	Phthisis, 3 years. No medical attendant.
„ 14	16	Copper miner	Phthisis, 11 months. Certified.
Nov. 8	31	Yeoman -	Abscess on hip joint. Certified.
„ 9	40	Servant -	Diseased heart. Certified.
„ 20	71	Yeoman -	Palsy, 1 year. Certified.
„ 25	83	Yeoman -	Natural decay. No medical attendant.
Dec. 5	84	Solicitor -	Dropsy. Certified.
„ 16	48	Lead miner -	Smallpox, 14 days. No medical attendant.
„ 15	13	Copper dresser	Scarlatina. Dropsy. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1861			
Dec. 22	21	Yeoman -	Bronchitis, 1 year. Not certified.
„ 28	66	Copper miner	Natural decay. No medical attendant.
„ 31	77	Tin miner -	Incontinence of urine. Certified.

Sub-District - 4. St. Clement.

1859.			
Jan. 7	49	Carrier - -	Visitation of God. Disease of heart. Inquest.
„ 30	20	Labourer -	Tuberculosis. Certified.
Feb. 10	76	Farmer -	Natural decay. Not certified.
„ 24	57	Butcher, master	Disease of heart, 2 years. Hydropericardium. Certified.
„ 27	18	An idiot -	Epilepsy. Congenital. Certified.
Mar. 12	66	Superannuated supervisor of excise.	Diseased kidneys. Hydrothorax. Certified.
„ 12	35	Farmer and carrier.	Diseased brain. Certified.
„ 17	45	Painter, journeyman.	Pneumonia. Suppuration of lungs, 2 weeks. Certified.
„ 21	47	Shoemaker -	Diseased liver, stomach, and kidneys, — years. Certified.
Apr. 7	65	Shoemaker, journeyman.	Bronchitis, 2 weeks. Certified.
„ 13	49	Serjeant, militia	Phthisis. Certified.
„ 17	62	Banker - -	Phthisis pulmonalis. Certified.
May 4	66	Banker's clerk	Pneumonia, left lung, 14 days. Certified.
„ 2	25	Servant -	Knocked off the mail coach in passing under a temporary arch, wheels passing over him. Inquest.
„ 1	27	Lead miner -	Decline. Not certified.
„ 3	43	General labourer	Diphtheria, 1 week. Not certified.
„ 15	80	Miner - -	Natural decay. Certified.
„ 25	35	Tanner and currier.	Morbus cerebri, — months. Certified.
„ 27	76	Labourer -	Hæmoptysis, 14 days. Certified.
June 1	32	Turner and carver.	Phthisis. Certified.
„ 5	31	Farmer - -	Malignant sore throat, 7 days. Not certified.
„ 9	67	Farm labourer	Diseased heart. Dropsy. Certified.
May 27	20	Carpenter, journeyman.	Phthisis. Certified.
June 8	69	Dairyman -	Diseased heart. Dropsy. Not certified.
„ 13	60	Farmer's hind	Diseased heart. Anasarca, 3 months. Certified.
21	42	Commercial traveller.	Chronic rheumatism. Pericarditis, 2 days. Certified.
„ 27	81	Bookbinder -	Old age. No medical attendant.
„ 27	63	Mason, master	Abdominal tumour. Certified.
July 13	73	Sailor - -	Diseased heart. Certified.
„ 13	49	Shoemaker, master.	Apoplexy. Certified.
„ 15	13	Son of horse-keeper.	Decline. No medical attendant.
„ 14	57	Surgeon -	Diseased heart. Dropsy. Certified.
„ 27	61	Farm labourer	Apoplexy. Certified.
„ 26	50	Master mariner	Diseased heart. Certified.
Aug 15	57	Shoemaker, master.	Pneumonia, 10 days. Certified.
„ 21	18	Cabinet maker, apprentice.	Drowned, bathing. Inquest.
„ 25	25	Labourer -	Consumption, 1 year. Certified.
Sept. 3	76	Bargeman -	Consumption, 2 years. Certified.
„ 23	62	Pensioner, R.N.	Diseased heart. Anasarca, 3 months. Certified.
Oct. 2	10	Son of coachman	Tabes mesenterica, 1 year. Certified.
„ 5	81	Lime burner -	Age. Certified.
„ 8	73	Farm labourer	Age. Certified.
„ 9	56	Hotel keeper -	Dysthetica. Certified.
„ 11	31	Grocer - -	Diseased heart. No medical attendant.
„ 14	72	Shoemaker, master.	Dementia. Certified.
„ 16	65	Chelsea pensioner.	Œdema of lungs, 13 weeks. Certified.
„ 28	55	Schoolmaster	Bronchitis, 6 months. Certified.
1859.			
Nov. 26	52	Labourer -	Malignant ulcer, 12 months. Certified.
„ 24	73	Brush maker, journeyman.	Diseased kidneys. Serous effusion on brain. Certified.
„ 30	77	Miner - -	Natural decay. No medical attendant.
Dec. 4	70	Printer and bookseller.	Bronchitis, 18 days. Certified.
„ 15	60	Mason, master	Apoplexy. Palsy, 7 weeks. Certified.
„ 19	52	Farmer - -	Phthisis, 5 years. Certified.
„ 31	76	Tailor, master	Apoplexy, 3 days. Certified.
1860.			
Jan. 6	50	Gardener -	Visitation of God. Inquest.
„ 14	56	Farm labourer	Phthisis. No medical attendant.
„ 30	64	Farm labourer	Unknown. No medical attendant.
„ 30	73	Farm labourer	Diseased heart. Anasarca, 3 weeks. Certified.
Feb. 7	33	Soldier - -	Pneumonia, 10 weeks. Certified.
„ 13	93	Butcher, master	Paralysis. Pneumonia. Certified.
„ 21	77	Farmer - -	Natural decay. Not certified.
„ 18	72	Tinman -	Consumption, 6 months. Certified.
„ 22	48	Hatter, journeyman.	Decline. Not certified.
Mar. 3	72	House proprietor.	Diseased liver. Dropsy. Certified.
„ 2	39	Farmer - -	Phthisis. Certified.
„ 5	74	Chelsea pensioner.	Diseased heart. Anasarca, 2 months. Certified.
„ 6	84	Mine agent -	Natural decay. No medical attendant.
„ 7	11	Son of statuary	Phthisis. Certified.
„ 17	67	Gardener -	Dropsy, 11 months. Certified.
„ 21	73	Master mariner	Hepatic abscess. Certified.
„ 31	12	Son of farm labourer.	Phthisis. Certified.
Apr. 6	53	Sawyer - -	Psoas abscess. Certified.
„ 5	42	Accountant -	Epilepsy. Certified.
„ 13	20	Lead miner -	Phthisis, 18 months. Certified.
„ 18	76	Shoemaker, master.	Bronchitis. Certified.
„ 23	16	Blacksmith's apprentice.	Injury to spine. Tetanus, 3 days. Certified.
„ 26	21	Plumber, journeyman.	Phthisis, 8 months. Certified.
May 11	57	Gardener -	Phthisis. Certified.
„ 15	15	Shoemaker, apprentice.	Diseased kidneys. Not certified.
„ 14	70	Carrier - -	Paralysis, 3 years. Not certified.
„ 24	29	Painter, journeyman.	Pneumonia, 2 years. Consumption. Certified.
„ 25	67	Arsenic smelter	Bronchitis. Certified.
June 17	71	Carrier - -	Morbus cordis. Certified.
„ 19	25	Bookbinder -	Phthisis, 6 months. Certified.
July 2	65	Shoemaker -	Diseased kidneys, 3 years. Dropsy. Certified.
„ 3	54	Eating-house keeper.	Diseased liver. Certified.
„ 18	12	Son of farm labourer.	Meningitis. Certified.
„ 26	10	Son of lead miner.	Peritonitis, 7 days. Certified.
„ 26	22	Tailor, journeyman.	Peritonitis, 5 days. Certified.
Aug. 1	44	Brewer - -	Pneumonia. Abscess on lungs, 6 weeks. Certified.
„ 3	78	Miner - -	Natural decay. Certified.
„ 12	86	Pensioner -	Paralysis, — months. Certified.
„ 31	35	Shoemaker, journeyman	Abscess. Certified.
„ 29	33	Tailor - -	Diseased heart. Inquest.
„ 29	54	Wharfinger -	Abscess of rectum, 12 months. Certified.
Sept. 9	34	Innkeeper -	Diseased heart. Inquest.
„ 18	42	Innkeeper -	Diseased brain. Certified.
„ 26	75	Gardener -	Dropsy. Asthma. Certified.
Oct. 1	74	Potter, master	Paralysis, 4 months. Certified.
Sept. 28	65	Shoemaker journeyman	Natural decay. Certified.
Oct. 18	74	Shoemaker, master.	Bronchitis, 8 months. Dropsy. Certified.
„ 24	60	Builder -	Diseased liver. Dropsy. Certified.
Nov. 6	22	Farm labourer	Epilepsy, 1 hour. Certified.
„ 4	52	Upholsterer -	Decline. No medical attendant.
„ 8	47	Greengrocer -	Phthisis, — years. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Nov. 20	60	Postman -	Diseased liver. Dropsy. Certified.
„ 30	56	Farm labourer	Natural decay. Certified.
Dec. 4	21	Wheelwright	Phthisis. Certified.
„ 7	74	Rate collector	Apoplexy, 2 hours. Certified.
„ 10	53	Tidewaiter -	Apoplexy, 3 days. Certified.
1861.			
Jan. 4	85	Roadman -	Morbus cordis. Certified.
„ 2	83	Drainer -	Dropsy. No medical attendant.
„ 20	87	Fisherman -	Palsy. Certified.
„ 26	67	Farm labourer	Dropsy. Not certified.
„ 17	40	Groom - -	Aneurism. Inquest.
Feb. 11	39	Painter -	Found drowned. Inquest.
„ 22	75	Miner - -	Enteritis. Diarrhœa, Certified.
„ 24	83	Miner - -	Enteritis. Diarrhœa. 2 months. Certified.
„ 26	27	Sailor - -	Accident. Drowned. Inquest.
Mar. 1	65	Glover, master	Natural decay. No medical attendant.
„ 11	32	Carpenter, journeyman.	Phthisis. Certified.
„ 19	75	Miner -	Phthisis. Certified.
„ 20	73	Boarding-house keeper.	Natural decay. No medical attendant.
„ 23	66	Labourer -	Apoplexy, 20 hours. Not certified.
„ 30	22	Baker - -	Phthisis. Certified.
„ 21	76	Wheelwright	Hæmoptysis, 4 days. Certified.
April 8	36	Tailor - -	Softening of brain, 3 years. Certified.
„ 3	74	Superannuated postman.	Hydropericardium. Certified.
„ 17	49	Dyer, master	Morbus cordis. Certified.
„ 20	67	Mason - -	Visitation of God. Inquest.
„ 26	66	Mineralogist -	Paralysis, 2 years. No medical attendant.
„ 29	56	Gamekeeper -	Decline. No medical attendant.
May 2	55	Carpenter -	Anthrax, 3 weeks. Certified.
„ 15	67	Bargeman -	Pleuro-pneumonia. Certified.
„ 22	100	Pedlar - -	Natural decay. Certified.
„ 21	36	Pavior -	Fever, 6 days. Certified.
„ 30	55	Mining carpenter.	Phthisis, — months. Certified.
June 1	79	Cooper - -	Natural decay. Certified.
„ 7	15	Son of smith -	Convulsions, 4 years. No medical attendant.
„ 13	82	Waggoner -	Bronchitis. Certified.
„ 15	25	Labourer -	Small pox, 14 days. Certified.
„ 18	70	Cutler - -	Renal disease. Certified.
„ 23	81	Town sergeant	Paralysis, 11 months. Certified.
July 5	48	Labourer -	Phthisis. Certified.
„ 10	41	An idiot -	Epilepsy. Certified.
„ 19	23	Shoemaker -	Small pox, 12 days. Certified.
„ 22	50	Farm labourer	Phthisis. Diarrhœa. Certified.
Aug. 2	84	Chelsea pensioner.	Natural decay. No medial attendant.
„ 3	76	Admiral, R.N.	Nephria. Diseased heart. Certified.
„ 6	65	Chelsea pensioner.	Hepatitis, 9 months. Certified.
„ 11	40	Draper - -	Delirium tremens. Certified.
„ 12	10	Son of groom	Small pox. No medical attendant.
„ 9	87	Foreman in factory.	Age. Certified.
„ 16	19	Cooper, journeyman.	Peritonitis. Certified.
Sept. 6	79	Shipwright -	Diseased bladder. Certified.
„ 7	74	Farm labourer	Natural decay. Certified.
„ 12	69	Farm labourer	Dropsy. No medical attendant.
„ 26	20	Brushmaker, journeyman.	Typhus, 5 weeks. Certified.
„ 27	10	Son of shoemaker, journeyman.	Meningitis. Certified.
„ 23		Bootmaker, journeyman.	Typhoid, 4 weeks. Peritonitis. Certified.
„ 27		Son of farmer	Nephritis, 9 days. Certified.
Oct. 10		Waggoner -	Typhus. Certified.
" 19		Grocer - -	Phthisis, 9 months. Certified.
„ 23		Farm labourer	Diarrhœa 9 days. Certified.
„ 20		Labourer -	Decline. Not certified.
Nov. 4		Carpenter -	Diarrhœa, 17 days. Certified.
„ 4		Mason, journeyman.	Phthisis. Certified.
„ 22		Farm labourer	Asthma. Pneumonia, 10 days. Certified.
„ 15	12	Son of miner	Typhoid fever, 6 weeks. Certified.
1861.			
Nov. 22	13	Son of mine worker.	Ascites. Certified.
„ 24	74	Farm labourer	Diseased kidneys, 2 years. Certified.
„ 26	36	Mining engineer	Phthisis. Certified.
„ 29	59	Ostler - -	Paralysis. Certified.
Dec. 3	23	Soldier - -	Suicide, by shooting himself. Inquest.
„ 4	68	Innkeeper -	Diseased heart. Inquest.
„ 17	44	Shoemaker, journeyman.	Aneurism. Certified.
Dec. 19	22	Draper's assistant.	Pleurisy. Certified.
„ 21	39	Machinist -	Injury to finger, 17 days. Tetanus, 8 days. Certified.
„ 19	37	Captain 36th regiment.	Apoplexy. Certified.
„ 23	74	Farm labourer	Phthisis. Certified.

Sub-district - 5. Kenwyn.

When Died.	Age.	Occupation.	Cause of Death.
1858			
Dec. 25	55	Farmer -	Ruptured blood vessel of brain. Inquest.
1859			
Jan. 7	70	Proprietor of iron mines.	Unknown. No medical attendant.
„ 9	87	Proprietor of money.	Old age. Not certified.
„ 15	83	Copper miner	Old age. Not certified.
1858			
Dec. 30	62	Copper miner	Bronchitis, 4 months. Certified.
1859			
Jan. 17	33	Copper miner	Injuries at Great Wheal Busy Mine by falling into a winze. Inquest.
Feb. 7	29	Butcher, master	Epilepsy. Certified.
„ 8	49	Copper miner	Consumption, 6 months. Not certified.
Jan. 30	61	Copper miner	Bronchitis, 6 months. Certified.
„ 17	34	Copper miner	Consumption, many weeks. Not certified.
„ 28	64	Copper miner	Inflammation of lungs. Not certified.
Feb. 22	46	Draper -	Disease of liver. Dropsy. Certified.
„ 23	49	House painter	Disease of heart. Inquest.
Mar. 6	11	Son of agric. labourer.	Inflammation of lungs, 14 days. Certified.
Feb. 21	28	Copper miner	Consumption, 10 months. Certified.
Mar. 1	75	Copper miner	Old age. Not certified.
Feb. 10	37	Copper miner	Consumption. Not certified.
„ 18	26	Carpenter, journeyman.	Diseased heart, 5 years. Certified.
Mar. 17	74	Copper miner	Old age. Not certified.
Apr. 17	48	Copper miner	Bronchitis. Diarrhœa, — months. Certified.
„ 3	57	Mine agent -	Pneumonia, left lung, partly consolidated. Certified.
„ 16	59	Druggist -	Induration of liver, — years. Certified.
„ 27	81	Greenwich pensioner.	Morbus cordis. Certified.
May 4	66	Tinman, journeyman.	Diarrhœa. Exhaustion. Certified.
„ 6	59	Solicitor -	Unknown. No medical attendant.
„ 12	17	Lead miner -	Skull fractured, falling from the 50 to the 70-fathom level through the whim shaft. Inquest.
„ 13	64	Butcher, master	Œdema of lungs, 5 months. Certified.
„ 13	85	Agric. labourer	Natural decay. Certified.
„ 1	23	Servant -	Scrofula, — years. Bronchitis. Certified.
„ 23	81	Agric. labourer	Old age. Certified.
„ 27	28	Railway labourer.	Broncho-pneumonia. Certified.
„ 23	47	Railway contractor.	Pneumonia, — weeks. Certified.
June 4	45	Mason -	Injuries received by a fall from a ladder, knocked from under him by a passing cart.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
June 8	65	Mason -	Apoplexy. Paralysis, 12 months. Certified.
„ 10	78	Copper miner	Old age. Not certified.
July 17	63	Auctioneer -	Diseased bladder, &c. Certified.
Aug. 1	21	Copper miner	Killed under ground, by a rock falling on him from the back of his pitch. Inquest.
„ 23	46	Malster, journeyman.	Pleurisy. Phthisis, 3½ months. Certified.
„ 28	20	Copper miner	Consumption, 9 months. Not certified.
„ 24	35	Agric. labourer	Diseased kidneys. Dropsy, — months. Certified.
„ 31	26	Policeman -	Hepatitis. Dropsy. Certified.
Sept. 1	46	Lead miner -	Accident. Falling down the engine shaft. Inquest.
Aug 31	18	Lead miner -	Accident. Falling down the engine shaft. Inquest.
Sept. 6	30	Shoemaker, journeyman.	Cancer in abdomen, 6 months. Certified.
„ 4	37	Carpenter, journeyman.	Consumption. Certified.
„ 1	29	Copper miner	Consumption, some years. Not certified.
Oct. 7	59	Copper miner	Consumption, 9 months. Not certified.
„ 16	34	Mason, master	Retention of urine, laceration of bladder, 3 days. Certified.
„ 30	64	Grocer, master.	Consumption, — months. Not certified.
Nov. 12	19	Agric. labourer	Diseased knee joint, 3 years. Certified.
„ 6	75	Master mariner	Apoplexy, 24 hours. Certified.
„ 18	52	Shoemaker, master.	Diseased heart, 1 year. Certified.
„ 8	71	Copper miner	Old age. Not certified.
Dec. 7	74	Seaman, merchantservice	Old age. Certified.
„ 18	35	Copper miner	Bronchitis, 1 year. Dropsy. Certified.
„ 31	64	Greenwich pensioner -	Diseased heart, 3 years. Certified.
1860			
Jan. 17	15	Son of seaman, merchant service	Not stated. No medical attendant.
„ 19	78	Chelsea pensioner.	Bronchitis. Certified.
„ 25	88	Blacksmith -	Old age. Not certified.
„ 25	88	Blacksmith -	Old age and infirmity. Not certified.
Feb. 5	25	Sawyer, journeyman.	Phthisis. Certified.
„ 13	77	Chelsea pensioner.	Bronchitis. Certified.
„ 11	17	Tin miner -	Suffocation and scalds, from the bursting of a boiler. Inquest.
„ 21	60	Farmer -	Purpura, 1 week. Certified.
„ 7	55	Farmer -	Dispepsia, 6 months. Diseased lungs. Certified.
„ 25	13	Son of copper miner.	Typhus. Certified.
„ 15	40	Copper miner	Consumption. Not certified.
Mar. 3	84	Agric. labourer	Old age. Certified.
Feb 21	62	Shoemaker, journeyman.	Gangrene senilis, 4 weeks. Certified.
„ 21	25	Copper miner	Typhus fever. Certified.
Mar. 5	24	Copper miner	Injury in Wheal Unity Wood Mine, a slide of earth falling. Inquest.
„ 10	82	Agric. labourer	Diseased bladder. Certified.
„ 12	28	Copper miner	Scarlatina. Certified.
Feb. 23	51	Blacksmith, journeyman.	Bronchitis. Certified.
Mar. 18	59	Sawyer -	Diseased heart. Dropsy. Certified.
„ 27	50	Copper miner	Paralysis. Certified.
Apr. 4	61	Solicitor -	Morbus Brightii, 18 months. Certified.
„ 7	20	Seaman, merchantservice	Phthisis, 2 years. Certified.
Mar. 31	48	Copper miner	Pneumonia. Dropsy. Certified.
„ 28	36	Copper miner	Typhus, 6 weeks. Cystitis. Certified.
Apr. 11	53	Solicitor -	Diseased heart· Dropsy. Certified.
May 4	49	Proprietor of money.	Bronchitis. Certified.
1860.			
May 1	28	Blacksmith, journeyman.	Pneumonia, 2 years. Hæmoptysis. Certified.
„ 17	69	Barber -	Diseased heart. Inquest.
„ 26	68	Shoemaker, master	Bronchitis. Pneumonia. Certified.
„ 10	12	Son of copper miner.	Meningitis. Certified.
June 5	51	Copper miner	Bronchitis. Certified.
„ 2	42	Son of copper miner.	Bronchitis. Scrofula. Certified.
„ 19	78	Shoemaker -	Visitation of God. Inquest.
July 30	40	Soldier -	Cancer of intestines. Post mortem. Certified.
„ 14	70	Carpenter, journeyman	Diseased liver and pleura, 5 months. Certified.
„ 15	83	House proprietor	Morbus cordis. Certified.
„ 2	22	Son of copper miner.	Injury of hip. Dropsy Certified.
Aug. 22	82	Solicitor -	Old age. Certified.
„ 9	51	Mine engineer	Diseased liver and kidneys. Certified.
„ 29	67	Agric. labourer	Paralysis, 18 months. Certified.
„ 6	59	Copper miner	Bronchitis. Certified.
Sept. 9	60	Copper miner	Tumour. Dropsy. Certified.
Oct. 3	68	Tallow chandler	Diarrhœa. Epistaxis. Certified.
Sept. 27	51	Maltster -	Accident. Thrown out of a gig Inquest.
Oct. 5	62	Copper miner	Consumption, 3 years. Certified.
„ 7	74	Pensioner -	Pneumonia. Certified.
„ 12	32	Mason, journeyman.	Diseased heart, 4 years. Certified.
„ 20	74	Blacksmith, master.	General decay. Not certified.
„ 27	91	Miller, master	Asthma. Certified.
„ 26	70	Carpenter -	Asphyxia. Inquest.
„ 31	27	Labourer -	Visitation of God. Inquest.
Nov. 15	84	Servant -	Age. Certified
„ 23	46	Agric. labourer	Phthisis, 12 months. Certified.
„ 10	71	Copper miner	Old age. Not certified.
„ 9	68	Shoemaker, journeyman.	Fracture. Diseased heart, — years. Certified.
„ 19	40	Copper miner	Injuries from fall of a barrel of water. Inquest.
Dec. 15	83	Butcher, master	Diseased prostate gland. Certified.
„ 26	71	Servant	Asthma, — years. Not certified.
„ 23	38	Engine man -	Bursting of a steam engine boiler. Inquest.
„ 22	64	Copper miner	Consumption, 9 months. Not certified.
„ 27	75	Agric. labourer	Bronchitis. Certified.
„ 28	69	Pensioner, Chelsea.	Broncho-pneumonia. Certified.
„ 28	38	Copper miner	Bronchitis. Diseased heart. Inquest.
1861			
Jan. 7	62	Copper miner	Consumption, 2 years. Not certified.
„ 10	12	Son of copper miner.	Rheumatism. Pericarditis. Certified.
„ 12	58	Carpenter, master.	Bronchitis, 6 weeks. Certified.
„ 17	16	Son of copper miner.	Ascites. Certified.
„ 18	54	Labourer -	Carcinoma. Certified.
1860.			
Dec. 18	75	Farmer -	Old age. Not certified.
1861.			
Jan. 23	71	Coach smith -	Bronchitis, 14 days. Certified.
Feb. 18	64	Shoemaker -	Phthisis. Certified.
„ 25	16	Carpenter, apprentice.	Scrofulous disease of knee, 15 months. Certified.
Mar. 5	83	Malster -	Dropsy, 2 months. Certified.
„ 11	58	Mason - -	Paralysis. Certified.
„ 8	28	Copper miner	Consumption, 6 months. Not certified.
„ 12	38	Iron moulder -	Tumour. Certified.
„ 18	33	Victualler -	Anasarca. Certified.
„ 26	68	Mine broker -	Apoplexy, 2 days. Certified.
Apr. 2	12	Son of van proprietor.	Scrofula, 3 years. Certified.
„ 18	76	Carpenter -	Paralysis. Certified.
„ 19	74	Copper miner	Old age. Not certified.
„ 23	69	Copper miner	Pleuro-pneumonia. Certified.
„ 24	43	Copper miner	Dysentery. Certified.
„ 23	77	Agric. labourer	Bronchitis. Certified.
May 15	26	Copper miner	Tubercular peritonitis, 3 months. Certified.
June 6	18	Son of carrier	Smallpox, 13 days. Vaccinated. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
June 14	61	Shoemaker, journeyman.	Paralysis, 9 weeks. Certified.
„ 17	24	Blacksmith -	Smallpox. Vaccinated. Certified.
„ 28	40	Copper miner	Consumption, 14 weeks. Not certified.
July 7	40	Copper miner	Diseased ankle joint, 6 months. Certified.
„ 7	62	Clerk - -	Diseased liver. Certified.
„ 15	30	Copper miner	Killed by the breaking of capstan ropes. Inquest.
Aug. 2	84	Agric. labourer	Old age. Not certified.
„ 2	41	Ship broker -	Consumption, 6 months. Not certified.
„ 9	86	Waggoner -	Bronchitis. Certified.
„ 5	66	Road labourer	Cancer in face. Certified.
„ 18	22	Porter - -	Typhus, 15 days. Certified.
July 15	78	Copper miner	Bronchitis. Certified.
Aug. 25	19	Son of copper miner.	Phthisis. Certified.
„ 11	12	Son of mine agent.	Peritonitis, 7 days. Certified.
July 18	46	Copper miner	Bronchitis, 2 years. Certified.
Aug. 18	25	Postboy -	Diabetes, 7 months. Certified.
„ 30	55	Agric. labourer	Phthisis, 3 years. Certified.
„ 31	68	Watchmaker, master.	Apoplexy, 3 days. Certified.
Sept. 2	13	Son of tinman, master.	Scrofula, 3 years. Certified.
„ 5	10	Son of copper miner.	Unknown. No medical attendant
Oct. 2	30	Copper miner	Confluent smallpox. Certified.
„ 5	26	Malster - -	Hepatitis. Certified.
Sept. 29	15	Tin miner -	Injury by fall from a ladder in going underground in Cregbraws Mine. Inquest.
„ 9	64	Copper miner	Natural decay. Not certified.
Oct. 9	10	Son of copper miner.	Small pox. Certified.
„ 20	42	Copper miner	Consumption. Certified.
„ 25	61	Linen draper -	Diseased brain, — years. Certified.
Nov. 5	24	Tailor, journeyman.	Typhoid fever, 9 weeks. Certified.
„ 14	46	Agric. labourer	Phthisis, — months. Certified.
Dec. 16	13	Son of hostler	Run over by omnibus. Inquest.
Nov. 22	20	Blacksmith -	Phthisis, 11 months. Certified.
„ 13	26	Copper miner	Phthisis. Certified.
„ 26	69	House proprietor	Ileus, 3 weeks. Certified.
Feb. 7	13	Son of chair maker.	Typhoid, 15 days. Certified.
„ 7	60	Tinman, journeyman.	Bronchitis, 4 years. Certified.
„ 12	70	House agent -	Bronchitis. Certified.
„ 22	10	Son of agricultural labourer	Fever, 9 days. Certified.
„ 21	14	Son of carpenter	Fever, 2 weeks. Melæna, 4 days. Certified.

Sub-district - 6. Kea.

When Died.	Age.	Occupation.	Cause of Death.
1858.			
Dec. 29	29	Waterman -	Psoas abscess, 2 years. Certified.
„ 27	13	Son of copper miner.	Unknown. Not certified.
„ 29	64	Copper miner	Abscess on thigh. Not certified.
„ 23	39	Copper miner	Unknown. Not certified.
1859.			
Feb. 10	15	Copper miner	Visitation of God. Inquest.
„ 22	89	Agric. labourer	Debility. No medical attendant.
Apr. 9	40	Shipwright -	Diseased heart. Dropsy. Certified.
„ 27	76	Agric. labourer	Unknown. Not certified.
May 24	19	Statuary -	Drowned by falling out of a boat, supposed in a fit. Inquest.
June 5	64	Farmer -	Diseased heart. Asthma. Not certified.
„ 7	18	Mason -	Accidental discharge of a loaded gun. Inquest.
„ 16	11	Son of waterman.	Decline. Not certified.
July 28	69	Engineer -	Diseased heart. Not certified.
„ 29	19	Carver and gilder.	Phthisis. Certified.
1859.			
Sep. 26	33	Miller - -	Dropsy. Not certified.
July 12	56	Copper miner	Consumption. Certified.
Oct. 4	17	Copper miner	Cephalitis. Certified.
Nov. 9	43	Copper miner	Consumption. Not certified.
Oct. 13	51	Copper miner	Consumption. Not certified.
„ 16	65	Farmer -	Sciatica. Not certified.
Nov. 22	88	Woodman -	Debility. Not certified.
1860.			
Jan. 3	50	Carpenter -	Diseased heart. Not certified.
„ 7	80	Servant -	Debility. No medical attendant.
„ 14	84	Agric. labourer	Debility. No medical attendant.
„ 29	51	Woodman -	Apoplexy. Not certified.
Feb. 4	45	Master mariner	Diseased heart. Not certified.
„ 23	23	Carpenter -	Consumption. Not certified.
Mar. 10	76	Grocer - -	Dropsy. No medical attendant.
Feb. 2	15	Son of tailor -	Typhus fever. Not certified.
„ 11	14	Son of cattle dealer.	Typhus fever. Not certified.
Apr. 4	82	Labourer -	Debility. No medical attendant.
„ 5	76	Mariner -	Debility. Not certified.
„ 18	58	Copper miner	Consumption. Not certified.
„ 23	14	Son of shipwright.	Diphtheria. Not certified.
„ 4	54	Copper miner	Fever. Not certified.
May 24	12	Son of copper miner.	Fracture from falling from the engine bob-flat. Inquest.
„ 29	33	Tin miner -	Killed underground, a rock falling on him from the back of a stull. Inquest.
Apr. 15	85	Gentleman -	Debility. Not certified.
July 30	21	Shipwright -	Phthisis. Certified.
Aug. 4	51	Agric. labourer	Malignant disease of testicle. Certified.
Sep. 23	57	Lead smelter -	Dropsy. Not certified.
—	64	Cooper - -	Found drowned. Inquest.
Aug 30	96	Farmer -	Debility. No medical attendant
Sep. 27	51	Innkeeper -	Thrown from a gig. Inquest.
„ 6	87	Lead smelter -	Diseased heart. Certified.
„ 5	64	Copper miner	Paralysis. Certified.
Dec. 8	32	Schoolmaster	Consumption. Not certified.
„ 23	43	Agric. labourer	Found dead. Pneumonia. Inquest.
1861.			
Jan. 13	14	Son of mine agent.	Rheumatism. Diseased heart. Certified.
1860.			
Dec. 27	82	Mariner -	Debility. No medical attendant.
„ 17	55	Copper miner	Consumption. Not certified.
„ 25	73	Copper miner	Debility. No medical attendant.
1861.			
Jan. 16	23	Copper miner	Consmption. Not certified.
„ 23	78	Sexton - -	Pneumonia. Not certified.
Mar. 3	86	Farmer -	Debility. No medical attendant.
„ 4	82	Agric. labourer	Debility. No medical attendant.
„ 7	82	Blacksmith -	Water on chest. Not certified.
„ 31	26	Mariner -	Phthisis, 12 months. Certified.
Feb. 25	46	Copper miner	Pneumonia. Not certified.
June 1	64	Copper miner	Consumption. No medical attendant.
May	73	Labourer -	Dropsy. Not certified.
June 19	68	Copper miner	Phthisis. Certified.
July 29	69	Agric. labourer	Diseased heart. Inquest.
„ 21	24	Carpenter -	Bursting blood vessel. Not certified.
Sep. 9	35	Sawyer -	Consumption. Not certified.
„ 22	25	Copper miner	Smallpox. Not certified.
„ 23	66	Mason - -	Dropsy. Certified.
„ 19	54	Copper miner	Consumption. Not certified.
Nov. 10	18	Cordwainer's apprentice.	Consumption. Not certified.
„ 28	53	Copper miner	Broncho-pneumonia. Certified.
„ 29	40	Farmer -	Consumption. No medical attendant.
„ 29	73	Copper miner	Debility. No medical attendant.
Dec. 17	57	Farmer -	Consumption. No medical attendant.
„ 20	17	Son of lead smelter.	Typhus. Not certified.
„ 14	53	Waterman -	Delirium tremens. Certified.
„ 1	52	Copper miner	Pneumonia. Not certified.

COUNTY OF CORNWALL.

Superintendent Registrar's District.

FALMOUTH.

Registrar's Sub-district.

1. Mylor.
2. Falmouth.
3. Penryn.
4. Constantine.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859–61.

Sub-district - 1. Mylor.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Feb. 15	18	Son of farmer-	Dropsy and general debility. Certified.
„ 25	20	Foundry smith	Small pox. Vaccinated. Not certified.
Mar. 10	77	Mason - -	Contraction of œsophagus, 6 months. Certified.
„ 3	22	Engine man (mine).	Scalds: bursting of a steam engine boiler at the United Mines, Gwennap. Inquest.
Apr. 5	26	Boiler smith -	Consumption, 8 weeks. Not certified.
May 2	45	Waterman -	Dropsy. Certified.
„ 19	32	Farmer -	Peritonitis, 7 days. Certified.
Aug. 3	19	Son of farm labourer.	Consumption, 6 months. Not certified.
July 10	56	Master mariner	Suicide by drowning. Inquest.
Sept. 23	17	Son of Greenwich pensioner.	Peritonitis, 11 days. Certified.
„ 27	61	Gentleman -	Diabetes, 10 years. Certified.
„ 13	40	Fisherman -	Drowned by falling out of a boat. Inquest.
Oct. 14	33	Sawyer -	Apoplexy, 6 days. Certified.
Dec. 9	53	Copper miner-	Consumption, 12 months. Not certified.
„ 17	64	Agric. labourer	Diseased heart. Inquest.
„ 27	66	Chelsea pensioner.	Diseased liver. Certified.
1860.			
Jan. 27	51	Farm labourer	Consumption, 3 months. Not certified.
Feb. 2	44	Sailor, merchant service.	Concussion of brain. Certified.
„ 4	81	Farmer -	Old age. No medical attendant.
„ 9	54	Foundry smith	Asthma. Not certified.
Mar. 1	68	Ferry master -	Erysipelas. Not certified.
May 31	57	Labourer -	Asthma. Dropsy. Certified.
July 3	79	Agent - -	Old age. Not Certified.
„ 20	46	Copper miner	Rheumatic fever. Not certified.
Aug 17	69	Labourer -	Cystitis. Certified.
Sept. 12	78	Farmer -	Diseased heart. Bronchitis. Certified.
„ 14	60	Gentleman -	Diseased heart, 10 years. Certified.
„ 15	70	Innkeeper -	Unknown. No medical attendant.
June 29	66	Superannuated Excise officer.	Paralysis. Not certified.
Dec. 4	24	Wheelwright	Diseased heart, 1 year. Certified.
„ 9	31	Farm servant	Peritonitis, 2 weeks. Certified.
1861.			
Jan. 5	64	Labourer -	Palsy, 2 weeks. Certified.
„ 13	43	Carpenter -	Consumption. Not certified.
„ 14	51	Tin miner -	Asthma. No medical attendant.
„ 16	65	Farmer -	Asthma. No medical attendant.
Feb. 20	59	Engine driver	Consumption. Not certified.
April 2	86	Shipwright -	Diseased prostate glands. Certified.
„ 26	97	Labourer - -	Old age. Not certified.
May 4	62	Shipowner -	Apoplexy. Certified.
„ 7	68	Farmer -	Consumption. Not certified.
„ 19	22	Carter -	Consumption. Not certified.
„ 25	60	Cooper -	Scrofula. Not certified.
July 9	21	Son of labourer	Consumption. Not certified.
Aug 28	58	Carrier -	Dropsy. Certified.
„ 29	88	Master, merchant seaman	Old age. No medical attendant.
Sep. 7	27	Copper miner	Rheumatic fever, 17 days. Certified.
Oct. 9	78	Baker -	Senectus Certified.
Nov. 5	18	Copper miner	Typhus. Ulcerated intestines. Certified.
„ 11	71	Grocer -	Fever, 4 weeks. Bronchitis. Certified.
Nov. 25	87	Tailor - -	Old age. Not certified.
„ 28	68	Chelsea pensioner -	Diseased heart. Not certified.
„ 30	51	Copper miner	Consumption. Not certified.
Dec. 17	22	Labourer -	Rheumatic fever, 12 weeks. Certified.
„ 25	24	Copper miner	Typhus. Certified.
„ 30	42	Greenwich pensioner -	Pulmonia. Certified.

Falmouth - 2. Falmouth.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 4	16	Merchant seaman's apprentice -	Skull fractured by falling from the mast head of the bark Fairy. Inquest.
„ 14	20	Sailor, merchant service	Abscesses on thigh. Certified.
„ 20	20	Sailor -	Sea scurvy. Low fever. Abscesses. Certified.
„ 23	77	Ship builder -	Diseased heart. Dropsy, 3 years. Certified.
Feb. 1	57	Music master	Apoplexy. Certified.
„ 8	50	Sailor merchant service	Bronchitis. Certified.
„ 3	43	Master mariner	Visitation of God. Inquest.
„ 14	16	Seaman -	Accidental death. Inquest.
„ 27	36	Seaman -	Rupture of blood vessel of lungs. Inquest.
Mar. 1	14	Son of porter	Variola. Certified.
„ 8	51	Shipwright -	Phthisis. Certified.
„ 20	20	Merchant's clerk -	Consumption, 2 months. Certified.
„ 27	74	Captain, R.N.	Gravel. Intermittent fever. Certified.
April 1	63	Cordwainer -	Atrophy. Certified.
„ 2	61	Mariner -	Apoplexy. Disease heart. Certified.
„ 5	88	Sexton -	Paralysis. Certified.
Mar. 31	70	Cordwainer -	Paralysis, 3 months. Certified.
April 6	80	Superanuated Excise officer	Apoplexy, half an hour. Certified.
„ 11	74	Ironmonger -	Diseased heart. Certified.
„ 11	24	Tin miner -	Skull fractured in Swanpool Mine by a stone falling down the shaft. Inquest.
„ 27	78	Stonemason -	Bronchitis. Certified.
„ 29	72	Porter -	Dysentery. Certified.
May 1	52	Mariner, master	Phthisis, 10 months. Certified.
„ 11	34	Director of the Kew Observatory -	Phthisis, 9 months. Certified.
„ 10	49	Carpenter -	Compression of brain. Extravasation of blood, the result of a fall.
„ 20	62	Labourer -	Paralysis, 4 days. Certified.
„ 22	75	Mason -	Infirmities of age. Certified.
June 2	87	Officer, H.M.'s Customs -	Bronchitis. Certified.
„ 6	25	Roper -	Consumption, 12 months. Certified.
„ 3	73	Mason -	Bronchial affection. Congestion of brain. Paralysis. Certified.
„ 25	52	Van driver -	Hæmoptysis. Certified.
„ 26	16	Son of pilot -	Phthisis pulmonalis. Certified.
July 2	52	Pensioner -	Bronchitis. Certified.
„ 8	38	Carpenter -	Pericarditis, 4 weeks. Certified.
June 23	72	Master, R.N.	Stabs in thigh, wilful murder. Inquest.
July 10	76	Paper maker	Natural decay. Certified.
„ 15	34	Miner -	Fatty liver, 9 months. Certified.
„ 22	36	Pensioner -	Aneurism. Certified.
„ 22	11	Son of master mariner.	Enteritis, 4 days. Certified.
Aug 10	24	Boatman -	Phthisis. Certified.
„ 13	41	Mate, merchant seaman.	Diseased kidneys. Anasarca. Certified.
„ 15	49	Fisherman -	Gastritis. Certified.
„ 22	43	Collector of rates	Diarrhœa. Certified.
Sept. 2	55	Miner -	Phthisis, 3 years. Certified.
„ 7	84	Solicitor -	Diseased heart, 2 years. Certified.
„ 24	92	Fisherman -	Apoplexy. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Oct. 1	74	Mariner -	Hepatitis, 2 months. Certified.
„ 5	84	Merchant -	Asthenic senilis. Certified.
„ 7	68	Superannuated Custom House officer.	Diseased stomach. Gout. Certified.
„ 11	26	Sailor -	Dysentery, 2 years. Phthisis, 1 year. Certified.
„ 12	23	Accountant -	Febris, 14 days. Certified.
„ 14	84	Mason -	Gangrene senilis, 3 months. Certified.
„ 15	75	Chelsea pensioner.	Bronchitis. Certified.
„ 22	40	Master seaman	Wound in the throat inflicted wilfully by Chas. Arons. Inquest.
„ 26	75	Labourer -	Natural causes. Inquest.
„ 30	54	Master mariner	Diseased heart. Certified.
Nov. 3	25	Miner -	Phthisis, 2 years. Certified.
„ 5	38	Cordwainer -	Phthisis, 2 years. Certified.
„ 7	65	Surveyor of shipping -	Atrophy. Certified.
„ 17	27	Sailor -	Phthisis, 4 years. Certified.
„ 17	64	Labourer -	Ascites. Certified.
„ 24	95	Baker -	Age. Certified.
„ 27	23	Sailor -	Phthisis, 10 months. Certified.
„ 28	71	Farmer -	Pneumonia, 9 days. Certified.
„ 30	38	Sailor -	Dysentery, — months. Certified.
„ 30	72	Labourer -	Diarrhœa. Certified.
Dec. 3	31	LieutenantR.N.	Delirium with tremor. Certified.
„ 10	33	Sailor -	Fracture. Suppurative phlebitis. Certified.
„ 18	85	Bootmaker -	Old age. Certified.
„ 27	86	Labourer -	Old age. Certified.
„ 28	33	Sailor -	Sea scurvy. Certified.
1860.			
Jan. 3	81	Labourer -	Diarrhœa. Not certified.
„ 4	42	Labourer -	Spasm of the heart. Certified.
„ 5	47	Druggist -	Rheumatic fever. Certified.
„ 8	42	Gardener -	Pulmonary consumption. Certified.
„ 16	19	Son of smith -	Phthisis, 2 years. Certified.
„ 25	96	Labourer -	Old age. Certified.
Feb. 14	47	Jeweller -	Phthisis, 10 months. Certified.
„ 19	73	Cordwainer -	Bronchitis. Certified.
„ 21	71	Labourer -	Age. Certified.
„ 19	27	Farm labourer	Consumption. Certified.
„ 23	70	Labourer -	Diarrhœa. Certified.
„ 22	78	Coalporter -	Gangrene of foot. Certified.
„ 26	32	Ship cook -	Consumption. No medical attendance.
„ 27	73	Blacksmith -	Old age. Certified.
„ 28	23	Sailor -	Dysentery Certified.
Mar. 1	81	Gardener -	Old age. Certified.
Apr. 2	27	Sailor -	Diseased heart. Dropsy. Certified.
„ 4	50	Solicitor -	Ischuria, 40 hours. Certified.
„ 17	71	Tinman -	Old age. Certified.
„ 16	60	Labourer -	Hydrothorax, 5 years. Certified.
„ 16	10	Son of farmer	Necrosis, 4 months. Hydrops, 2 months. Certified.
„ 16	34	Labourer -	Stone of granite falling on him. Inquest.
„ 30	50	Horsekeeper -	Bronchitis, Certified.
„ 30	70	Carpenter -	Asthma, 10 years. Certified.
May 1	84	Gardener -	Influenza, 1 week. Certified.
„ 8	23	Labourer -	Fever, 3 weeks. Certified.
„ 14	12	Son of mariner	Dropsy. Certified.
„ 23	19	Son of labourer	Diseased heart. Not certified.
„ 23	71	Merchant -	Softening of brain. Certified.
„ 21	33	Innkeeper -	Phthisis, 4 months. Certified.
June18	54	Porter -	Asthma. Certified.
„ 18	63	Waterman -	Phthisis, 8 months. Certified.
„ 29	68	Superannuated Excise officer.	Paralysis. Not certified.
July 1	46	Tailor -	Hepatitis, 5 weeks. Certified.
„ 3	31	Gentleman -	Phthisis. Certified.
„ 11	53	Sailor -	Stricture of œsophagus, 7 months. Certified.
„ 20	65	Pensioner -	Pneumonia, 4 weeks. Certified.
„ 22	74	Shipwright -	Old age. Certified.
„ 26	66	Farmer -	Paralysis, 3 weeks. Certified.
„ 30	22	Soldier -	Psoas abscess, 11 months. Certified.
Aug. 4	59	Porter -	Bronchitis, 4 months. Certified.
„ 4	60	Boatman -	Phthisis, 6 months. Certified.
„ 3	64	Cabinetmaker	General debility. Certified.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Aug. 4	21	Sailor -	Typhus. Pneumonia Certified.
„ 10	30	Surgeon -	Fever, 9 weeks. Certified.
„ 14	90	Cordwainer -	Age. Certified.
„ 17	66	Mariner -	Severe cold. Certified.
„ 19	82	Waterman -	Age. Certified.
„ 21	82	Schoolmaster-	Natural decay. Certified.
„ 28	36	Mariner -	Sea scurvy. Certified.
„ 31	19	Mariner -	Scurvy. Bronchitis. Certified.
Sep. 19	36	Solicitor -	Diseased brain. Apoplexy. Certified.
„ 26	19	Son of labourer	Morbus cordis. Certified.
Oct. 13	31	Coachman -	Phthisis, 1 year. Certified.
„ 28	28	Sailmaker -	Apoplexy, 10 days. Certified.
„ 26	35	Farmer -	Injuries: thrown from a horse. Inquest.
„ 29	76	Sailor -	Age. Certified.
„ 28	27	Solicitor -	Apoplexy, 7 days. Certified.
Nov. 2	26	Sailor -	Dysentery. Certified.
„ 4	43	Master mariner	Phthisis, 22 months. Certified.
„ 8	58	Cordwainer -	Paralysis. Certified.
„ 20	43	Master mariner	Sudden death. Inquest.
„ 22	72	Mine engineer	Paralysis. Certified.
„ 27	21	Sailor -	Fever. Phthisis. Certified.
Dec. 9	18	Sailor -	Exæma. Anemia. Certified.
„ 7	79	Commander, R.N.	Hydrothorax, 12 months. Certified.
„ 9	45	Farmer -	Phthisis, 1 year. Certified.
„ 14	38	Sailor -	Scurvy. Certified.
„ 18	55	Lieutenant, R.N.	Jaundice, 3 days. Melæna, 2 days. Certified.
„ 28	76	Chelsea pensioner	Bronchitis, 2 weeks. Certified.
„ 27	27	Mariner -	Diseased heart, 4 years. Certified.
„ 31	63	Gentleman -	Diseased stomach. Certified.
1861.			
Jan. 1	81	Agric. labourer	Visitation of God. Inquest.
„ 12	93	Sexton -	Old age. No medical attendant.
„ 16	22	Labourer -	Apoplexy, 6 days. Certified.
„ 18	70	Boatman -	Pneumonia, 4 days. Certified.
„ 23	46	Engineer, R.N.	Epilepsy. Apoplexy. Certified.
„ 27	63	Grocer - -	Dropsy. Certified.
„ 31	85	Ropemaker -	Old age. No medical attendant.
„ 28	24	Sailor - -	From eating water hemlock. Inquest.
„ 28	27	Sailor - -	From eating water hemlock. Inquest.
Feb. 6	32	Locker, H.M.'s Customs.	Enlarged liver, 3 months. Certified.
„ 6	21	Tailor - -	Phthisis, 6 months. Certified.
„ 8	69	Mariner -	Diseased heart, 7 months. Certified.
„ 11	42	Surgeon -	Diseased liver, 12 months. Certified.
„ 20	83	Solicitor -	Age. Certified.
„ 21	52	Carrier - -	Diseased liver. Ascites. Certified.
„ 21	42	Cellarman -	Dropsy. Not certified.
„ 25	62	Carpenter -	Accident. Inquest.
„ 27	65	Surveyor -	Visitation of God. Inquest.
Mar. 1	61	Spirit merchant	Found drowned. Inquest.
„ 14	28	Mariner -	Dysentery. Not certified.
„ 15	23	Mariner -	Dysentery. Not certified.
„ 18	75	Gentleman -	Apoplexy, 30 hours. Certified.
„ 23	88	Labourer -	Old age. Certified.
„ 24	58	Labourer -	Diseased liver. Jaundice, 4 days. Certified.
„ 23	18	Sailor - -	Fall from maintopsail. Inquest.
„ 27	74	Ironmonger -	Diseased heart. Certified.
„ 25	20	Sailor - -	Accident: drowned. Inquest.
Apr. 12	71	Shoemaker -	Age. Certified.
„ 17	77	Waterman -	Paralysis. Certified.
„ 24	17	Son of gardener	Scrofula, 10 years. Certified.
„ 26	28	Sailor - -	Apoplexy. Certified.
May 1	17	Sailor - -	Consumption. Certified.
„ 3	90	Shoemaker -	Old age. Certified.
„ 18	42	Sailor - -	Rheumatism. Certified.
„ 18	77	Cooper - -	Diseased prostrate gland. Certified.
„ 16	19	Seaman, R.N.	Phthisis. Certified.
„ 26	72	Labourer -	Age. Certified.
„ 30	30	Carpenter -	Dropsy. No medical attendant.
June13	30	Sailor - -	Fever, 2 months. Certified.
„ 4	15	Seaman's apprentice.	Fall from the mast head. Inquest.
„ 17	54	Sailor - -	Pneumonia. Phthisis. Certified.
„ 21	38	Steward, R.N.	Ileus. Certified.
„ 22	16	Son of innkeeper	Diseased ankles. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
July 6	43	Sailor - -	Diseased liver. Ascites. Certified.
„ 9	85	Engineer -	Diseased liver. Certified.
„ 17	79	Butcher -	Old age. Certified.
„ 22	39	Gentleman -	Delirium tremens. Certified.
Aug. 3	19	Sailor - -	Synochus, 10 days. Meningitis, 2 days. Certified.
„ 7	41	Gunner, R.A.	Gangrene of lungs. Certified.
„ 15	28	Groom - -	Typhoid fever, 10 days. Certified.
„ 17	22	Master mariner	Phthisis. Certified.
„ 25	52	Engine driver	Accident. Drowned. Inquest.
Sept. 2	64	Labourer -	Consumption, 10 months. Certified.
„ 10	74	Pilot - -	Cancer. Certified.
„ 10	70	Chelsea pensioner.	Suicide by hanging. Inquest.
„ 13	72	Mariner -	Dysentery, 14 days. Certified.
„ 13	15	Son of shipwright.	Scrofula, 12 years. Certified.
„ 20	77	Labourer - -	Old age. Certified.
„ 22	63	Mariner -	Old age. Certified.
„ 23	69	Mariner -	Anasarca, 2 months. Certified.
Oct. 4	24	Mariner -	Paralysis. Certified.
„ 8	20	Shipwright -	Phthisis, 1½ years. Certified.
„ 10	32	Ship carpenter	Nephritis, 1 year. Hydrops, 2 months. Certified.
„ 8	15	Shipwright -	Fever. Internal hæmorrhage. Certified.
„ 10	43	Mason - -	Fever. Certified.
„ 13	84	Cordwainer -	Age. Certified.
„ 25	72	Coast Guard -	Paralysis. Certified.
Nov. 7	23	Sailor - -	Scorbutus. Dysenteria. Certified.
„ 10	19	Seaman -	Accident: fall from aloft. Inquest.
„ 17	60	General agent	Insanity, 2 years. Certified.
„ 16	74	Builder - -	Diseased heart. Certified.
„ 22	42	Greenwich pensioner.	Icterus, 14 days. Certified.
„ 20	79	Solicitor -	Paralysis, 1 month. Certified.
„ 23	42	Labourer -	Phthisis, 5 years. Certified.
„ 24	83	Labourer -	Old age. Certified.
„ 25	63	Gentleman -	Asthma, 6 years. Certified.
Dec. 1	25	Sailor - -	Pneumonia, 24 hours. Certified.
„ 5	31	Sailor - -	Diseased heart. Certified.
„ 5	64	Gentleman -	Apoplexy, 16 hours. Certified.
„ 7	33	Sailor - -	Fractured thigh, 12 days. Certified.
„ 9	15	Son of labourer	Hepatitis. Bronchitis. Certified.
„ 11	37	Cabinet maker	Hydrothorax, 18 months. Certified.
„ 18	64	Pensioner -	Apoplexy, 12 hours. Certified.
„ 23	81	Mariner -	Old age. Certified.
„ 25	69	Surgeon -	Phthisis. Certified.
„ 26	34	Ironmonger -	Phthisis. Certified.

Sub-District - 3. Penryn.

1859.			
Jan. 2	50	Vagrant -	Diseased heart, 5 months. Certified.
„ 6	12	Son of porter -	Typhus, 3 weeks. Certified.
„ 30	20	Son of miner -	Typhus. Pneumonia, 3 weeks. Certified.
Apr. 9	80	Superannuated Excise officer	Palsy, 4 years. Certified.
„ 26	42	Cordwainer, journeyman.	Consumption, 6 months. Certified.
May 23	54	Joiner - -	Paralysis, 10 days. Certified.
July 15	43	Master butcher	Concussion of the brain, 9 days. Certified.
Sept. 8	19	Son of porter	Consumption, 1 year. Not certified.
„ 11	25	Cordwainer -	Consumption, 2 years. Certified.
Oct. 3	56	Husbandman -	Paralysis, 2 weeks. Certified.
„ 12	15	Son of porter -	Diseased heart, 1 year. Not certified.
„ 21	21	Son of joiner -	Epilepsy, 9 years. Certified.
Nov. 2	84	Farmer - -	Age. No medical attendant.
„ 14	37	Stonemason -	Phthisis pulmonalis, 1 year. Certified.
„ 20	30	Husbandman	Diseased heart, 14 months. Certified.
1860.			
Jan. 6	32	Seaman, merchant service	Ulcer, 13 years. Certified.
„ 23	66	Tinker - -	Paralysis, 3 days. Certified.
Feb. 16	47	Sawyer - -	Phthsis, 2 years. Certified.
„ 23	21	Mariner, merchant service	Ague, 2 weeks. Certified.
„ 22	45	Master mariner	Dysentery, 8 months. Certified.
Mar. 11	73	Tallowchandler	Apoplexy, 1 week. Certified.
„ 15	17	Son of schoolmaster.	Peritonitis, 6 weeks. Certified.
„ 17	80	Millwright -	Old age, 2 weeks. No medical attendant.
„ 18	64	Millwright -	Diseased heart, 3 months. Certified.
„ 28	65	Gardener -	Diseased heart, 3 months. Certified.
Apr. 1	60	Whitesmith -	Suicide by hanging. Inquest.
„ 5	63	Joiner, journeyman.	Scirrhus of stomach, 5 months. Certified.
„ 9	82	Stonemason -	Paralysis, 3 weeks. Certified.
„ 11	41	Mason, journeyman.	Diseased heart. Certified.
„ 16	13	Son of agricultural labourer	Scrofula, 4 years. Certified.
„ 30	67	Master mariner	Paralysis, 2 years. Certified.
May 17	59	Agric. labourer	Consumption, 2 weeks. Certified.
„ 24	75	Porter - -	Old age, 12 weeks. Certified.
June 13	79	Brazier - -	Bronchitis, 1 month. Certified.
July 2	53	Saddler, master	Dropsy, 7 months. Certified.
„ 11	77	Farmer - -	Decay of nature. No medical attendant.
„ 31	75	Farmer - -	Decay of nature. Certified.
Aug. 15	74	Baker - -	Hydrothorax, 5 months. Certified.
Sept. 13	66	Farmer -	Palsy, 1 week. Certified.
Nov. 2	60	Porter - -	Cancer of stomach, 6 months. Certified.
„ 4	46	Husbandman -	Palsy, 3 weeks. Certified.
„ 8	33	Copper miner	Fall of killas in the United Mines. Inquest.
Dec. 24	21	Tailor, apprentice.	Phthisis, 14 months. Certified.
„ 27	29	Seamen, R.N.	Ileus, 9 days. Certified.
„ 27	27	Printer, journeyman.	Consumption, 18 months. Certified.
1861.			
Jan. 10	48	Husbandman -	Hæmorrhage, 3 days. Certified.
Mar. 24	39	Farmer -	Diseased heart, 4 weeks. Certified.
Apr. 6	11	Son of farm labourer.	Consumption, 15 months. Certified.
„ 17	84	Millwright -	Old age. Certified.
„ 14	59	Mason - -	Fall from a ladder. Inquest.
„ 30	41	Cordwainer, journeyman.	Phthisis, 1 year. Certified.
May 16	62	Cordwainer -	Diseased brain, 2 years. Certified.
June 17	66	Tailor - -	Cancer, 1 year. Certified.
July 1	76	Landed proprietor.	Gangrene, 2 months. Certified.
„ 8	66	Copper miner	Cousumption, 3 years. No medical attendant.
„ 12	10	Son of joiner -	Peritonitis, 5 days. Certified.
Aug. 13	64	Labourer -	Paralysis, 3 days. Certified.
Oct. 2	48	Draper - -	Consumption, 6 months. Certified.
„ 5	87	Agric. labourer	Age. No medical attendant.
„ 8	15	Son of agricultural labourer	Typhus, 11 days. Certified.
„ 13	23	Millwright -	Typhus, 3 weeks. Certified.
Dec. 21	56	Saddler, journeyman.	Diseased kidneys, 1 year. Certified.

Sub-District - 4. Constantine.

1859			
Jan. 10	35	Copper miner	Phthisis pulmonalis, 3 years. Certified.
Feb. 1	53	Farmer -	Diseased heart, 9 months. Not certified.
Mar. 16	76	Miller -	Hæmaturia, 3 months. Certified.
„ 19	78	Carrier -	Stoppage and inflammation of bowels. Not certified.
„ 21	65	Agric. labourer	Pneumonia, 6 days. Certified.
Apr. 8	54	Farmer -	Diseased stomach. Certified.
„ 25	57	Labourer -	Killed while at work in a stone quarry, by a fall of overburden. Inquest.
June 6	77	Farmer -	Melæna, 14 days. Certified.
July 31	19	Son of wheelwright.	Intussusception, 3 days. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Aug. 6	17	Son of labourer.	Phthisis, 6 months. Certified.
Sept. 4	77	Parish clerk -	Scirrhus of stomach, 1 year. Certified.
Dec. 20	72	Innkeeper -	Unknown. No medical attendant.
1860			
Jan. 6	74	Agric. labourer	Paralysis. No medical attendant.
,, 13	53	Agric. labourer	Diseased heart. Certified.
,, 27	79	Blacksmith -	Paralysis. No medical attendant.
,, 26	90	Fishmonger -	Injuries. Fall down stairs. Inquest.
Feb. 8	22	Stone cutter -	Dropsy. Certified.
May 15	26	Agric. labourer	Abscess in leg. Not certified.
,, 31	81	Agric. labourer	Apoplexy. No medical attendant.
June 11	22	Farmer -	Phthisis. Certified.
,, 18	22	Seaman, merchant service	Phthisis, 2 years. Certified.
July 30	37	Solicitor -	Diseased brain. Certified.
Aug. 8	72	Agric. labourer	Apoplexy. Inquest.
,, 29	51	Plumber -	Drowned. Fall into a well. Inquest.
Sept 29	52	Farrier -	Hæmorrhage from lungs. Not certified.
,, 28	62	Waggon driver	Found drowned. Inquest.
Oct. 22	40	Sexton -	Phthisis, 15 months. Certified.
Nov. 18	57	Blacksmith -	Phthisis, 1 year. Certified.
,, 24	79	Yeoman -	Unknown. No medical attendant.
Dec. 9	72	Agric. labourer	Diseased stomach. No medical attendant.
,, 25	70	Agric. labourer	Unknown. No medical attendant
1861			
Jan. 15	67	Agric. labourer	Rheumatism. Certified.
Feb. 11	46	Tin miner -	Hæmoptysis. Certified.
Mar. 7	19	Son of farmer	Phthisis, 8 months. Certified.
Apr. 1	62	Farmer -	Gastric fever, 5 weeks. Certified.
,, 8	66	Agric. labourer	Ulcered legs, 2 months. Gangrene. Certified.
,, 23	69	Tin miner -	Cancer, 1 year. Not certified.
May 12	19	Son of labourer -	Caries of spine. Certified.
Aug 10	66	Farmer -	Diseased liver. Certified.
,, 22	48	Farmer -	Ulcered intestine. Certified.
Nov. 8	65	Agric. labourer	Ascites, 6 months. Certified.
Oct. 15	19	Son of farmer	Phthisis, 12 months. Not certified.
Nov. 14	45	Shoemaker -	Phthisis. Certified.
Dec. 24	47	Farmer -	Sarcoma of stomach. Certified.
,, 25	28	Carpenter -	Phthisis pulmonalis, 6 months. Certified.

Superintendent Registrar's District.	Registrar's Sub-District.
HELSTON.	1. Wendron. 2. Helston. 3. St. Keverne. 4. Breage. 5. Crowan.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859–61.

Sub-District - 1. Wendron.

1859.			
Jan	22	Fisherman -	Consumption, 12 months. Not certified.
,, 3	28	Tin miner -	Consumption, 18 months. Not certified.
,, 13	70	Farm labourer	Erysipelas, 7 years. Abscess in seat, 4 weeks. Not certified.
,, 12	66	Farmer -	Consumption, 12 months. Not certified.
,, 26	11	Son of blacksmith.	Typhus, 7 days. Not certified.
,, 29	48	Tin miner -	Enteritis, 5 days. Not certified.
,, 31	64	Tin miner -	Hæmaturia, 1 year. Certified.
Feb. 17	62	Farm labourer	Dyspepsia, 4 months. Not certified.
Feb. 21	85	Tin miner -	Consumption, 7 years. Not certified.
Mar. 6	50	Tin miner -	Consumption, 12 months. No medical attendant.
,, 12	38	Agric. labourer	Consumption, 4 years. Not certified.
,, 16	21	Copper miner	Consumption, 12 months. Not certified.
,, 17	22	Tin miner -	Consumption, 18 months. Not certified.
,, 23	55	Tin miner -	Asthma, 12 months. Pneumonia, 7 days. Not certified.
Apr. 2	18	Shipwright, apprentice.	Consumption, 8 months. Not certified.
,, 18	10	Son of tailor -	Abscess on lungs, 10 days. Not certified.
,, 22	66	Farmer -	Dropsy, 6 months. Not certified.
May 20	61	Tin miner -	Consumption, 18 months. Not certified.
,, 21	78	Stone mason -	Old age. No medical attendant.
June 9	52	Tin miner -	Consumption, 8 months. Not certified.
,, 21	48	Copper miner	Consumption, 3 years. Not certified.
July 3	76	Fisherman -	Dyspepsia, 3 months. Not certified.
,, 7	25	Mariner .	Consumption, 6 months. Not certified.
,, 13	21	Miner - -	Natural death. Inquest.
Aug. 5	49	Tin miner -	Consumption. Not certified.
,, 3	51	Tin miner -	Apoplexy, 9 days. Not certified.
,, 17	58	Miller - -	Consumption, 6 years. Not certified.
Sept. 30	63	Farmer - -	Ulcered leg, 30 years. Dropsy, 6 weeks. Not certified.
Oct. 4	76	Tin miner -	Old age. Not certified.
,, 5	61	Farm labourer	Pneumonia, 3 weeks. No certified.
,, 6	53	Tin miner -	Consumption, 10 months. Not certified.
,, 16	54	Farm labourer	Ulcered leg, 2 years. Certified.
,, 30	57	Tin miner -	Mania, 2 years. Not certified.
Nov. 1	40	Mariner -	Shipwreck. Accidentally drowned. Inquest.
,, 13	66	Farm labourer	Pneumonia, 4 days. Not certified.
,, 16	49	Copper miner	Consumption, 8 months. Not certified.
Dec. 4	44	Copper miner	Consumption, 6 months. Not certified.
,, 24	44	Tin miner -	Diseased liver, 5 months. Not certified.
1860.			
Jan. 16	69	Cordwainer -	Paralysis, 2 years. Not certified.
,, 26	30	Farmer -	Pneumonia. Phthisis, 2 weeks. Not certified.
,, 26	44	Tin miner -	Fits, 20 years. Not certified.
,, 31	73	Farm labourer	Paralysis, 3 years. Not certified.
,, 30	86	Farmer -	Old age. Not certified.
Feb. 4	19	Tin miner -	Typhus, 3 weeks. Not certified.
,, 8	60	Tin miner -	Concussion of brain. Certified.
,, 20	56	Farmer -	Diseased heart. Asthma, 2 years. Not certified.
Mar. 4	61	Tin miner -	Consumption, 18 months. Not certified.
,, 8	62	Tin miner -	Consumption, 12 months. Not certified.
,, 15	72	Miller - -	Natural debility. No medical attendant.
,, 18	53	Gentleman -	Apoplexy, 2 days. Certified.
,, 18	74	Tin miner -	Consumption. Asthma, 2 years. No medical attendant.
Apr. 1	33	Gardener -	Consumption, 2 years. Certified.
,, 11	79	Copper miner	Old age. No medical attendant.
,, 10	77	Fisherman -	Old age. Not certified.
,, 17	78	Farmer - -	Hydrocephalus, 5 weeks. Not certified.
,, 30	19	Son of mason	Fits, 6 years. Not certified.
May 8	19	Tin miner -	Dropsy. Diseased kidneys, 2 weeks. Not certified.
,, 22	80	Farmer - -	Old age. No medical attendant.
,, 29	74	Farmer - -	Natural debility. Not certified.
June 15	69	Copper miner	Asthma, 2 years. Not certified.
,, 16	69	Farm labourer	Consumption. No medical attendant.
,, 18	12	Son of engine smith.	Diarrhœa, 3 weeks. Fistula. Certified.
July 2	13	Tin miner -	Typhus, 7 weeks. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
July 2	60	Tin miner -	Consumption, 2 years. Not certified.
,, 7	10	Son of tin miner.	Pneumonia. 8 days. Certified.
Aug. 6	59	Fisherman -	Consumption, 2 years. Certified.
,, 10	63	Tin miner -	Consumption, 2 years. Not certified.
,, 13	41	Tin miner -	Consumption, 2 years. Not certified.
,, 14	49	Tin miner -	Consumption, 2 years. Not certified.
,, 27	75	Farmer - -	Consumption, 12 months. No medical attendant.
Sept. 16	53	Cordwainer -	Stone, 2 years. Not certified.
,, 30	16	Son of farm labourer.	Consumption, 2 years. Not certified.
Oct. 3	14	Son of miner	Fall into a shaft. Inquest.
,, 20	66	Road labourer	Consumption, 12 months. Not certified.
,, 26	43	Farm labourer	Spasms of stomach, 6 days. Not certified.
Nov. 5	73	Farmer - -	Paralysis, 4 days. No medical attendant.
,, 5	11	Son of miner	Fall into a shaft. Inquest.
,, 14	13	Son of road labourer.	Typhus, 4 weeks. Not certified.
,, 16	62	Farmer - -	Ulcered intestines, 5 weeks. Not certified.
1861.			
Jan. 21	43	Tin miner -	Consumption, 10 months. Not certified.
,, 23	85	Farmer -	Old age. No medical attendant.
,, 28	51	Tin and copper miner.	Consumption, 12 months. Not certified.
,, 29	26	Blacksmith -	Consumption, 2 years. Not certified.
,, 29	68	Farmer -	Paralysis, 9 days. Not certified.
Feb. 4	80	Tin miner -	Old age. No medical attendant.
,, 9	56	Farmer -	Natural death. Inquest.
,, 18	63	Tin miner -	Consumption, 12 months. Not certified.
,, 25	70	Tin miner -	Debility. No medical attendant.
Mar. 18	76	Tin miner -	Debility. No medical attendant.
Apr. 5	69	Farm labourer	Rupture of blood vessel, 10 days. Not certified.
,, 22	81	Accountant -	Diseased heart. Certified.
,, 30	59	Tin miner -	Consumption, 3 months. Not certified.
May 5	20	Engine smith-	Consumption, 6 months. Not certified.
,, 10	75	Mason - -	Natural debility. No medical attendant,
,, 19			
,, 23	10	Son of tin dresser.	Bronchitis, 2 weeks. Not certified.
,, 27	33	Miner - -	Internal injuries. Inquest.
,, 28	19	Blacksmith, apprentice.	Ulcered intestines, 14 weeks. Certified.
June 3	14	Son of copper miner.	Dropsy, 3 months. Not certified.
,, 5	79	Tin miner -	Old age. No medical attendant.
,, 16	60	Tin miner -	Pneumonia, 6 weeks. Certified.
,, 18	24	Tin miner -	Consumption, 10 months. Not certified.
,, 21	14	Son of tin miner.	Injured spine, 2 months. Not Certified.
,, 26	13	Son of tin miner.	Consumption, 12 months. Not certified.
July 10	77	Labourer -	Injuries by a cart. Inquest.
,, 23	64	Farmer -	Diseased liver. Certified.
Aug. 1	34	Tin miner -	Injuries received under ground, 5 weeks. Not certified.
,, 20	69	Farm labourer	Carbuncle, 10 days. Certified.
,, 22	51	Tin miner -	Consumption, 12 months. Not certified.
Sept. 6	46	Tin miner -	Ulcers, 11 months. Not certified.
,, 21	36	Mine agent -	Abscess on lungs, 6 weeks. Certified.
,, 28	20	Fisherman -	Enteritis, 7 days. Certified.
Oct. 2	54	Mine labourer	Enteritis, 4 days. Certified.
,, 4	50	Copper miner-	Consumption, 9 months. Certified.
,, 6	33	Miner - -	Found dead in a shaft. Inquest.
Nov. 3	49	Stone mason -	Natural death. Inquest.
,, 6	62	Tin miner -	Consumption, 2 years. Not certified.
,, 7	87	Farmer -	Old age. No medical attendant.
,, 27	46	Copper miner-	Consumption, 12 months. Not certified.
Dec. 1	65	Tin miner -	Consumption, 12 months. Not certified.
1861.			
Dec. 5	38	Cordwainer -	Dropsy, 4 months. Not certified.
,, 12	86	Stone mason -	Old age. No medical attendant.
,, 20	76	Tin miner -	Old age. No medical attendant.
,, 25	49	Tin miner -	Pneumonia, 9 days. Not certified.

Sub-district - 2. Helston.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 9	71	Butcher -	Old age. Certified.
Feb. 7	90	Chelsea pensioner.	Concussion of brain: falling off a scaffold. Certified.
,, 10	70	Carpenter -	Disease of heart. Dropsy. Certified.
,, 24	40	Labourer -	Lock-jaw. Inquest.
Mar. 19	77	Labourer -	Natural decay. No medical attendant.
,, 22	28	Tin miner -	Phthisis. Certified.
Apr. 12	49	Cordwainer, journeyman.	Carbuncle. Paralysis, 12 months. Certified.
,, 30	36	Innkeeper -	Phthisis, 2 years. Certified.
May 7	90	Tin miner -	Old age. Not certified.
,, 27	78	Labourer -	Natural decay. No medical attendant.
June 18	83	Farmer -	Old age. No medical attendant.
,, 24	74	Labourer -	Old age. Not certified.
,, 26	70	Miner - -	Hanged himself: suicide. Inquest.
July 12	37	Carpenter, journeyman.	Consumption. No medical attendant.
,, 14	25	Draper's assistant.	Phthisis, 2 years. Certified.
,, 24	90	Farmer -	Decay of nature. Not certified.
,, 28	39	Tin miner -	Abscess of the lungs. Certified.
Aug. 1	80	Not stated -	Decay of nature. Not certified.
,, 19	77	Malster -	Natural decay. Not certified.
Sept. 8	76	Labourer -	Natural causes. Inquest.
,, 17	21	Tailor, journeyman.	Nephria. Certified.
,, 19	61	Farm labourer	General debility. Certified.
,, 25	84	Farm labourer	General debility. Not certified.
Oct. 5	78	Farm labourer	Natural decay. No medical attendant.
,, 8	67	Cordwainer -	Hepatitis, 3 months. Certified.
Nov. 3	63	Farmer -	Bronchitis. Certified.
,, 7	25	Mariner -	Shipwreck. Accident: drowned. Inquest.
,, 7	25	Mariner -	Shipwreck. Accident: drowned. Inquest.
,, 7	25	Mariner -	Shipwreck. Accident: drowned. Inquest.
,, 14	48	Wheelwright, master.	Diseased liver, 10 years. Certified.
,, 18	32	Farm labourer	Diseased heart. Certified.
,, 22	66	Farm labourer	Diseased heart. Certified.
Dec. 4	54	Farm labourer	Softening of brain, 6 weeks. Certified.
,, 6	49	Greenwich pensioner.	Consumption. Certified.
,, 17	66	Music master -	Retention of urine. Certified.
,, 26	84	Farm labourer	Old age. No medical attendant.
1860.			
Jan. 19	43	Tin miner -	Consumption, 4 years. Certified.
,, 21	45	Draper -	Gout. Certified.
,, 31	25	Farm labourer	Intussusception. Mortification. Certified.
,, 30	56	Auctioneer -	Epilepsy. Certified.
,, 31	32	Coachman -	Diseased kidneys. Certified.
Feb. 8	86	Mason - -	Old age. Not certified.
,, 17	68	Cordwainer -	Paralysis. Certified.
,, 21	81	Tin miner -	Age. Not certified.
,, 27	33	Tailor, master	Consumption, 3 months. Certified.
Mar. 12	81	Seaman, merchant seaman.	Age. Not certified.
,, 21	76	Farm labourer	Age. Not certified.
,, 25	80	Farmer -	Bronchitis. Certified.
Apr. 3	74	Tin miner -	Bronchitis. Certified.
,, 28	49	Millwright -	Consumption. Not certified.
May 3	61	Tinman -	Cancer. Certified.
,, 13	78	Currier, master	Bronchitis. Certified.
,, 24	61	Farm labourer	Influenza, 3 weeks. Certified.
,, 26	63	Gardener -	Pneumonia. Certified.
,, 29	58	Mason, master	Fracture of leg. Mortification. Not certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
May 29	84	Mason, master	Old age. No medical attendant.
June 11	18	Son of tailor	Consumption. No medical attendant.
„ 20	77	Wesleyan minister.	Paralysis. Not certified.
July 20	10	Son of farm labourer.	Diseased brain. Not certified.
Aug. 6	63	Tin miner -	Dropsy. Certified.
„ 19	70	Carpenter, master.	Sciatica. Certified.
„ 19	78	Chelsea pensioner.	Natural decay. No medical attendant.
„ 27	75	Carpenter, journeyman.	Natural decay. Not certified.
Sept 25	78	Labourer -	Found dead. Inquest.
Oct. 9	76	Cordwainer -	Old age. Certified.
„ 16	79	Seaman, merchant service.	Natural decay. No medical attendant.
„ 15	48	Son of captain, R.N.	Epilepsy, almost from birth. Certified.
Nov. 9	80	Coiner - -	Gangrene senilis. Not certified
Dec. 7	80	Labourer -	Old age. Certified.
„ 16	31	Butcher, master	Ulceration of windpipe. Certified.
„ 22	71	Farm labourer	Old age. Certified.
„ 31	30	Mason, journeyman.	Phthisis. Certified.
1861.			
Jan. 14	81	Farmer -	Natural decay. No medical attention.
„ 14	64	Chelsea pensioner.	Diseased heart. No medical attendant.
„ 26	84	Farmer -	Natural decay. No medical attendant.
„ 28	69	Labourer -	Natural decay. Not certified.
„ 27	56	Innkeeper -	Diseased liver. Certified
„ 27	62	Farm labourer	Consumption. Not certified.
„ 2	19	Groom - -	Accident: fall from a horse. Inquest.
Mar. 1	54	Tin miner -	Phthisis. Certified.
„ 3	73	Labourer -	Cancer. Certified.
„ 31	20	Chaise driver	Consumption. No medical attendant.
Apr. 19	80	Cordwainer -	Old age. No medical attendant.
„ 23	74	Gardener -	Hydrothorax, 4 months. Certified.
May 1	28	Omnibus driver	Enteritis. Certified.
Apr. 30	20	Son of farmer	Diseased stomach. Certified.
May 16	14	Son of mason	Scrofula, 6 months. Certified.
„ 28	21	Farm labourer	Consumption. No medical attendant.
„ 31	70	Farm labourer	Bronchitis. Certified.
June 13	62	Tailor - -	Suppression of urine. Not certified.
„ 29	58	Miner - -	Apoplexy. Not certified.
July 3	16	Son of tailor	Phthisis, 12 months. Certified.
June 29	58	Miner - -	Apoplexy. Not certified.
July 4	8	Son of farmer	Diseased lungs. Certified.
„ 15	60	Farm labourer	Natural decay. Not certified.
„ 25	71	Cordwainer -	Diseased kidneys. Certified.
Aug. 5	45	Farm labourer	Diabetes, 1 month. certified.
„ 5	45	Commission agent.	Paralysis. Certified.
„ 19	20	Printer -	Phthisis, 2 years. Certified.
Sept 19	72	Carpenter -	Anemia. Certified.
„ 26	52	Greenwich pensioner.	Diseased brain. Not certified.
Nov. 6	65	Farm labourer	Dropsy. Not certified.
„ 7	36	Tailor, journeyman.	Apoplexy. Certified.
„ 7	32	Mason, journeyman.	Phthisis. Certified.
Dec. 21	72	Farmer -	Old age. Not certified.
„ 27	71	Farmer -	Pneumonia. Not certified.
„ 16	41	Colt breaker -	Bursting a blood vessel. Inquest.

Sub-district - 3. St. Keverne.

1859.			
Jan. 5	25	Son of farmer	Phthisis. Certified.
„ 20	80	Carpenter -	Disease of stomach. Not certified.
„ 22	17	Son of farmer	Phthisis. Not certified.
„ 27	31	Agric. labourer	Hæmoptysis. Certified.
„ 30	24	Agric. labourer	Ulceration of shoulder. Not certified.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 26	62	Retired military officer.	Natural death. Inquest.
„ 25	45	Miller - -	Cut his throat: suicide. Inquest.
„ 22	35	Master mariner	Drowned. Shipwreck. Inquest.
Feb. 21	48	Miller - -	Phthisis.
Mar. 21	26	Son of farmer	Disease of liver. Not certified.
„ 23	76	Agric. labourer	Unknown. No medical attendant.
Apr. 2	85	Farmer - -	Old age. Not certified.
„ 2	36	Engine grinder	Diseased lungs and bowels. Certified.
„ 5	27	Wheelwright	Nephria and diseased lungs. Certified.
„ 21	32	Agric. labourer	Phthisis. Certified.
May 1	83	Farmer -	Paralysis, 14 days. Certified.
„ 4	54	Superannuated, Coast Guard.	Diseased stomach. Not certified.
„ 12	71	Superannuated, Coast Guard.	Consumption. Not certified.
„ 29	82	Farmer -	Old age. Not certified.
June 18	47	Fisherman -	Diseased stomach. Not certified.
July 4	25	Stone mason -	Consumption. Not certified.
Aug. 19	82	Master mariner	Bronchitis. Certified.
„ 17	33	Blacksmith -	Accident: gun shot wound. Inquest.
„ 22	53	Agric. labourer	Pleuro-pneumonia. Certified.
„ 25	74	Farmer -	Old age. Not certified.
„ 29	26	Greenwich pensioner.	Diseased hip joint. Not certified.
Sept. 10	40	Farmer -	Concussion of brain: fall from horse. Inquest.
„ 15	16	Son of farmer	Consumption. Not certified.
„ 28	70	Farmer -	Diseased stomach. Not certified.
Oct. 4	74	Farmer -	Anasarca. Certified.
Sept. 29	37	Mariner -	Drowned: washed out of a boat. Inquest.
Oct. 17	16	Son of blacksmith.	Consumption. Not certified.
„ 26	79	Agric. labourer	Paralysis. Not certified.
Nov. 8	70	Farmer -	Found dead in bed. Inquest.
1860.			
Jan. 6	84	Stone mason -	Old age. Not certified.
„ 8	37	Agric. labourer	Consumption, 12 months. Not certified.
„ 13	72	Farmer -	Dropsy, 6 months. Not certified.
Feb. 5	14	Son of thatcher	Phthisis. Certified.
Jan. 23	80	Parish clerk -	Wet and exposure to the weather. Inquest.
Feb. 8	21	Agric. labourer	Consumption, 19 months. Certified.
„ 22	80	Farmer -	Dropsy, 1 year. Certified.
Mar. 9	76	Farmer -	Bronchitis. Certified.
„ 17	76	Agric. labourer	Consumption, 10 years. Not certified.
„ 8	35	Stone mason -	Consumption, 9 months. Not certified.
„ 24	64	Cordwainer -	Stomach complaint. Certified.
„ 28	44	Agric. labourer	Consumption, 6 weeks. Not certified.
May 7	83	Stone mason -	Old age. Not certified.
June 2	91	Agric. labourer	Old age. Not certified.
„ 4	67	Farmer -	Bronchitis, 5 weeks. Not certified.
„ 10	23	Farmer -	Consumption. Not certified.
„ 16	56	Farmer -	Diseased lungs. Certified.
„ 30	35	Poulterer -	Drowned. Inquest.
Aug. 1	76	Agric. labourer	Ascites. Certified.
„ 5	30	Seamen, merchant service	Diseased lungs and liver. Certified.
„ 29	75	Stonemason -	Diseased stomach. Not certified.
Oct. 3	13	Son of agricultural labourer	Rheumatic fever. Certified.
„ 9	85	Stone mason -	Old age. Not certified.
„ 9	31	Farmer -	Phthisis. Certified.
„ 14	19	Son of butcher	Fistula in urethra. Phthisis. Certified.
„ 20	44	Shoemaker, journeyman.	Diseased liver. Ascites. Certified.
„ 27	19	Son of farmer	Consumption, 16 months. Not certified.
Nov. 9	24	Agric. labourer	Diseased heart. Certified.
„ 19	87	Miller - -	Old age. Not certified.
„ 29	30	Seaman -	Drowned. Inquest.
Dec. 20	21	Agric. labourer	Consumption, 3 months. Not certified.
„ 22	58	Farmer -	Diseased stomach. Certified.
„ 26	24	Seaman, R.N.	Phthisis. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
Jan. 12	74	Seaman, R.N.	Old age. Not certified.
„ 28	88	Farmer -	Diseased stomach. Not certified.
Feb. 18	77	Agric. labourer	Old age. Not certified.
Mar. 3	46	Agric. labourer	Dropsy, 3 months. Not certified.
„ 4	56	Farmer -	Debility. Not certified.
„ 4	64	Agric. labourer	Bronchitis, 8 days. Certified.
„ 19	35	Farmer -	Consumption, 12 months. Not certified.
„ 21	78	Agric. labourer	Consumption, 12 months. Not certified.
Apr. 2	75	Agric. labourer	Old age. Not certified.
May 4	25	Seamen, R.N.	Consumption. Not certified.
„ 20	45	Farmer -	Diseased stomach. Not certified.
„ 25	70	Carpenter -	Ileus, 3 days. Certified.
June 1	21	Cabinet maker, apprentice.	Remittent fever. Certified.
„ 8	16	Son of farmer	Bronchitis, 6 weeks. Certified.
July 20	90	Farmer -	Old age. Not certified.
Aug. 18	36	Miller - -	Phthisis. Certified.
„ 25	60	Surveyor -	Consumption. Not certified.
„ 27	83	Farmer -	Disease of foot. Not certified.
Sept. 4	61	Farmer -	Apoplexy. Certified.
„ 6	68	Farmer -	Paralysis, 5 days. Not certified.
Oct. 4	79	Agric. labourer	Bronchitis. Certified
„ 12	70	Farmer -	Apoplexy. Certified.
Nov. 1	45	Postman -	Consumption, 2 years. Not certified.
„ 6	90	Farmer -	Age. Not certified.
„ 19	74	Agric. labourer	Age. Not certified.
„ 24	65	Blacksmith, master.	Softening of brain. Not certified.
Dec. 19	79	Farmer	Dropsy. Not certified.
„ 20	13	Son of pilot -	Typhus fever, 2 weeks. Not certified.
„ 19	58	Labourer -	Natural causes. Inquest.

Sub-district - 4. Breage.

1859.			
Jan 13	44	Miner - -	Phthisis, 4 years. No medical attendant.
Feb. 14	39	Tin miner -	Phthisis, 11 weeks. Not certified.
„ 28	68	Farmer - -	Cystitis, 6 days. Not certified.
„ 26	41	Tin miner -	Phthisis, 6 months. Not certified.
Mar. 1	28	Tin miner -	Phthisis, 3 years. Certified.
„ 19	57	Tin miner -	Phthisis, 6 months. Not certified.
Apr. 2	53	Tin miner -	Apoplexy, 48 hours. Certified.
„ 5	54	Tin miner -	Paralysis, 6 weeks. Certified.
„ 19	20	Tin miner -	Phthisis, 3 months. Not certified.
May 7	38	Farmer - -	Phthisis, 12 months. Not certified.
„ 25	82	Tin dresser -	Apoplexy, 3 hours. Certified.
June 22	36	Tin miner -	Diseased lungs, 5 months. Certified.
July 8	58	Mine labourer	Inguinal hernia, 10 days. Certified.
„ 8	30	Tin miner -	Phthisis, 3 years. Certified.
„ 12	26	Miner - -	Injuries, falling into a shaft. Inquest.
„ 17	18	Waggon driver	Drowned: bathing. Inquest.
„ 25	58	Tin miner -	Phthisis, 4 months. Hæmoptysis, 24 hours. Certified.
„ 31	42	Tin miner -	Phthisis, 2 years. No medical attendant.
Aug 13	58	Tin miner -	Phthisis, 12 months. No medical attendant.
„ 22	26	Lead miner -	Phthisis, 6 months. Not certified.
„ 21	18	Tin miner -	Scrofula, 12 months. Dropsy, 3 weeks. Certified.
„ 28	66	Tin miner -	Phthisis, 8 months. No medical attendant.
Sept. 5	20	Tin miner -	Diseased heart, 16 months. Certified.
„ 7	55	Tin miner -	Phthisis, 12 months. Certified.
Oct. 1	43	Mine agent -	Suffocated: buried under a mass of rubbish. Inquest.
„ 1	33	Tin miner -	Suffocated: buried under a mass of rubbish. Inquest.
„ 14	68	Mine blacksmith	Anasarca, 6 months. Certified.
„ 26	50	Mine blacksmith	Phthisis, 6 months. No medical attendant.
Nov. 9	55	Tin miner -	Phthisis, 2 years. No medical attendant.
„ 3	42	Miner - -	Diseased heart. Inquest.
„ 21	23	Blacksmith, master.	Phthisis, 9 months. Not certified.
1859.			
Nov. 30	45	Shoemaker, master.	Diseased kidneys, 5 months. Not certified.
Dec. 11	33	Tin miner -	Phthisis, 3 months. Certified.
„ 16	86	Farmer -	Old age. No medical attendant.
„ 22	30	Tin miner -	Phthisis, 2 years. Certified.
1860.			
Jan. 7	82	Sawyer - -	Old age. No medical attendant.
„ 8	23	Miner - -	Found dead. Inquest.
„ 21	72	Tin dresser -	Amputation of finger. General pain and debility, 3 months Not certified
„ 23	61	Yeoman -	Natural death. Inquest.
„ 30	59	Miner - -	Phthisis, 7 months. Not certified.
Feb. 8	72	Farm labourer	Natural death. Inquest.
„ 28	49	Tin miner -	Phthisis, 3 years. Not certified.
Mar. 9	80	Miner - -	Old age. No medical attendant.
„ 16	58	Dissenting minister.	Natural death. Inquest.
„ 29	62	Miner - -	Phthisis, 3 years. Not certified.
Apr. 6	69	Farmer - -	Pneumonia, 2 weeks. Certified.
Mar. 29	62	Miner - -	Phthisis, 3 years. Certified.
Apr. 6	69	Farmer - -	Pneumonia, 2 weeks. Certified.
„ 9	40	Miner - -	Phthisis, 18 months. Certified.
„ 17	22	Tin miner -	Phthisis, 2 years. Certified.
„ 21	53	Miner - -	Phthisis, 12 months. Certified.
„ 28	37	Miner - -	Phthisis, 4 years. Not certified.
May 10	66	Agric. labourer	Influenza, 3 weeks. Not certified.
„ 31	40	Tin miner -	Phthisis, 6 months. Certified.
June 7	89	Agric. labourer	Old age. No medical attendant.
„ 12	35	Tin miner -	Dropsy, 12 months. Not certified.
July 4	34	Miner - -	Phthisis. Certified.
„ 6	30	Miner - -	Natural death. Inquest.
„ 19	79	Miner - -	Old age. No medical attendant.
„ 18	75	Miner - -	Old age. No medical attendant.
„ 18	68	Miner - -	Apoplexy, 5 days. Certified.
„ 24	43	Miner - -	Phthisis, 10 months. Not certified.
„ 25	65	Mine blacksmith	Hydrothorax, 3 weeks. Not certified.
Aug 17	75	Lime burner -	Old age. No medical attendant.
Oct. 4	64	Tin dresser -	Polypus in nostril, 30 years. Not certified.
„ 14	62	Tin miner -	Diseased liver, 3 months. Not certified.
Nov. 16	71	Farmer - -	Dyspepsia, 2 months. Not certified.
Dec. 1	unk.	Seaman - -	Found drowned. Inquest.
„ 4	55	Tin miner -	Gastri enteric, 9 weeks. Certified.
„ 4	24	Tin dresser -	Fever, 7 weeks. Not certified.
„ 24	55	Tin dresser -	Epilepsy, 10 years. Certified.
„ 28	54	Tin miner -	Asthma, 4 years. Not certified.
„ 31	17	Son of tin miner	Peritonitis, 7 days. Certified.
1861.			
Feb. 9	69	Engine worker in mine.	Fracture: fall against an engine cistern. Inquest.
„ 14	81	Agric. labourer	Old age. Certified.
Mar. 14	68	Tin miner -	Diseased lungs. Certified.
„ 28	70	Tin miner -	Old age. Not certified.
Apr. 24	40	Tin miner -	Phthisis, 5 months. Certified.
May 17	86	Greenwich pensioner.	Old age. No medical attendant.
„ 20	71	Labourer in a mine.	Old age. Not certified.
„ 30	54	Tin miner -	Phthisis, 8 months. Not certified.
June 7	54	Inspector of mines.	Splenitis, 2 months. Certified.
July 1	15	Son of tin miner	Phthisis, 6 months. Not certified.
„ 2	11	Son of tin miner	Fall from a horse. Inquest.
„ 20	46	Miner - -	Fractured skull. Inquest.
„ 26	12	Son of tin miner	Phthisis, 8 months. Certified.
Aug. 1	81	Agric. labourer	Old age. No medical attendant.
„ 3	35	Labourer - -	Found dead. Inquest.
„ 4	17	Joiner - -	Drowned: bathing. Inquest.
„ 31	47	Farmer - -	English cholera, 6 days. Certified.
Sept. 19	22	Tin miner -	Phthisis, 17 months. Not certified.
Oct. 11	56	Blacksmith, master.	Apoplexy, 3 days. Certified
„ 16	75	Farmer - -	Old age. Not certified.
Nov. 10	54	Tin miner -	Diseased heart. Pneumonia. Certified.
„ 10	61	Farmer - -	Pneumonia, 6 days. Not certified
Dec. 3	44	Seaman -	Found drowned. Inquest.
„ 10	19	Son of blacksmith.	Phthisis, 7 weeks. Not certified
„ 28	47	Tin miner -	Phthisis, 6 months. Not certified.

COUNTY OF CORNWALL.

Sub-district - 5. Crowan.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 14	58	Tin miner -	Diseased liver, several years. Not certified.
„ 23	20	Tin miner -	Cold. Phthisis, 5 months. Certified.
„ 26	60	Tin miner -	Consumption, 12 months. Not certified.
Mar. 8	40	Tea dealer -	Consumption, 10 months. Not certified.
Apr. 18	19	Tin miner -	Consumption, 7 months. Not certified.
„ 26	36	Tin miner -	Fever, 6 weeks. Meningitis, 1 week. Certified.
May 21	37	Blacksmith -	Paralysis, — years. Not certified.
„ 22	14	Son of farmer	Bathing feet in cold water, 6 days. Phrenitis. Certified.
June 1	14	Son of tin miner -	Typhus, 13 days. Congestion of brain, 3 days. Certified.
„ 14	78	Road labourer	Decay of nature. No medical attendance.
„ 18	13	Son of tin miner	Consumption, 2 years. Not certified.
Aug. 17	51	Farmer -	General debility. Certified.
„ 8	30	Labourer -	Injuries from being crushed. Inquest.
Sept. 15	60	Blacksmith -	Dropsy, 4 weeks. Not certified.
Oct. 9	49	Farmer -	Consumption, 12 months. Not certified.
„ 23	88	Farmer -	Age. No medical attendant.
Nov. 3	11	Son of tin miner	Lumbar abscess, 2 years. Certified.
„ 14	11	Son of copper miner.	Phrenitis, 8 days. Certified.
Dec. 2	53	Engine worker in a copper mine.	Consumption, 6 months. Not certified.
„ 9	26	Copper miner	Enteritis, 7 days. Certified.
„ 10	16	Son of copper miner.	Typhus, 4 weeks. Certified.
„ 17	68	Copper miner	Phthisis, 6 months. Certified.
1860.			
Jan. 5	62	Tin miner -	Paralysis. Certified.
„ 6	15	Son of copper miner.	Typhus, 24 days. Certified.
Feb. 27	40	Copper miner	Pneumonia. Bronchitis. Certified.
Mar. 8	64	Fisherman -	Pneumonia. Certified.
„ 17	77	Tin miner -	Cancer in neck, 6 months. No medical attendant.
„ 16	10	Son of miner	Fall into a shaft at New Wheal Vor Mine. Inquest.
Apr. 6	87	Farmer -	Apoplexy, 43 hours. Certified.
May 31	29	Sawyer -	Lumbar abscess, 6 months. Certified.
July 8	60	Grocer and draper.	Cancer, 12 months. Certified.
Sept. 23	53	Tin miner -	Phthisis, 4 months. Certified.
„ 30	64	Farmer -	Hydrothorax, 3 weeks. Certified.
Oct. 15	24	Miner - -	Injuries by falling into a shaft. Inquest.
„ 17	56	Farmer -	Pleuro - pneumonia. Effusion. Certified.
Nov. 12	66	Tin miner -	Asthma, 3 years. Not certified.
„ 28	32	Copper miner	Fever. Pneumonia, 12 days. Certified.
Dec. 4	76	Tin miner -	Diseased lungs, 10 months. Diarrhœa. Certified.
„ 5	54	Copper miner	Diseased liver. Certified.
„ 9	72	Copper miner	Hemiplegia, 2 days. Certified.
„ 27	10	Son of tin miner	Scarlatina. Certified.
1861.			
Jan. 17	59	Tin miner -	Consumption, 2 years. Not certified.
„ 19	65	Blacksmith -	Gastric disease, 8 months. Certified.
„ 30	65	Farmer -	Bronchitis, 4 months. Certified.
Feb. 19	83	Copper miner	Decay of nature. No medical attendant.
„ 27	19	Son of copper miner.	Scarlatina, 4 days, Certified.
„ 28	17	Son of copper miner.	Scarlatina. Certified.
Mar. 9	79	Yeoman -	Natural cause. Inquest.
„ 23	47	Copper miner	Phthisis, 12 months. Certified.
Apr. 19	59	Copper miner	Phthisis, 3 months. Not certified.
„ 27	49	Tin miner -	Phthisis, 11 months. Certified.
1861.			
Aug. 17	45	Tin and copper miner.	Diseased brain. Certified.
Sept. 4	25	Tin miner -	Consumption, 4 months. Not certified.
„ 10	32	Sawyer - -	Pneumonia, 4 months. Certified.
„ 21	70	Copper miner	Age. Not certified.
„ 23	30	Miner - -	Fall into a shaft. Inquest.
Oct. 16	70	Copper miner	Hydrothorax, 3 months. Certified.
Nov. 2	64	Copper miner	Asthma. Dropsy. Certified.
„ 7	64	Farmer -	Dropsy, 3 months. No medical attendant.
„ 10	76	Farmer -	Decay of nature. No medical attendant.
„ 15	54	Copper miner	Consumption, 9 months. Not certified.
„ 17	24	Copper miner	Consumption, 12 months. Certified.
„ 18	62	Miner - -	Injury to his head. Inquest.
„ 24	66	Copper miner	Asthma. Not certified.
Dec. 9	55	Copper miner	Injuries received to his head, 13 months. Certified.
„ 12	72	Cordwainer -	Paralysis, 1 week. Certified.
„ 20	60	Thatcher -	Dropsy. Certified.

Superintendent Registrar's District.	Registrar's Sub-District.
REDRUTH.	1. Gwennap. 2. Redruth. 3. Illogan. 4. Camborne. 5. Phillack.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859–61.

Sub-district - 1. Gwennap.

1859.			
Jan. 5	49	Copper miner	Contusion of leg. Certified.
„ 15	70	Mine engineman	Old age. Not certified.
„ 17	71	Copper miner	Old age, Not certified.
„ 17	45	Mine engineman	Phthisis, 6 months. Certified.
„ 21	55	Copper miner	Gastro-intestinal derangement, 1 week. Certified,
Feb. 3	62	Copper miner	Phthisis, 18 months. Certified.
„ 4	55	Farmer -	Diseased heart. Inquest.
„ 10	48	Tin miner -	Injuries in Pednandret Mine: rock falling on him. Inquest.
„ 16	20	Cordwainer -	Diseased hip joint, 12 months. Certified.
„ 22	80	Copper ore dresser.	Senile gangrene, 3 months. Certified.
„ 22	75	Copper miner	Old age. Not certified.
Mar. 3	50	Copper miner	Fractured skull, 8 days. Certified.
„ 20	56	Copper miner	Phthisis. Not certified.
„ 22	48	Copper miner	Phthisis. Not certified.
„ 30	28	Copper miner	Phthisis. Not certified.
„ 30	44	Copper miner	Phthisis. Not certified.
Apr. 14	76	Butcher -	Debility. Certified.
„ 18	53	Copper miner	Bronchitis. Certified.
„ 28	33	Farmer -	Phthisis. Not certified.
May 1	64	Copper miner	Seizure. Not certified.
„ 1	71	Farm labourer	Old age. Not certified.
„ 3	13	Son of copper miner.	Throat fever. Not certified.
„ 9	64	Mine engineer	Phthisis. Not certified.
„ 19	36	Copper miner	Killed by a fall of ground on him from the back of his pitch. Inquest.
„ 6	33	Copper miner	Fall from 160 fathom level to the 190. Inquest.
„ 14	30	Copper miner	Phthisis, 4 months. Certified.
„ 19	59	Copper miner	Stricture of œsophagus. Asthma. Certified.
„ 18	54	Copper miner	Consumption. Certified.
„ 26	49	Copper miner	Phthisis. Not certified.
June 27	23	Son of farmer	Phthitis. Not certified.
July 3	60	Stone mason -	Pneumonia, 10 days. Certified.
„ 7	45	Copper miner	Diseased liver. Not certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
July 19	68	Saddler -	Phthisis. Not certified.
„ 20	46	Coal carrier -	Concussion of brain; fall from a cart. Inquest.
Aug. 7	56	Copper miner	Phthisis. Not certified.
„ 14	69	Copper miner	Phthisis. Certified.
„ 22	62	Copper miner	Phthisis. Not certified.
Sept. 4	57	Mine engineer	Bronchitis. Not certified.
„ 6	60	Copper miner	Phthisis. Not certified.
„ 21	42	Copper miner	Phthisis. Not certified.
Oct. 7	78	Forester -	Phthisis. Not certified.
„ 14	43	Copper miner	Killed underground by being buried underneath a fall of stuff. Inquest.
„ 22	27	Powder maker	Congestion of liver. Ischuria. Certified.
„ 27	38	Copper miner	Phthisis. Not certified.
„ 29	56	Copper miner	Diseased stomach. Not certified.
Nov. 3	35	Yeoman -	Hydrocephalus. Not certified.
„ 5	67	Copper miner	Phthisis. Not certified.
„ 13	79	Copper ore dresser.	Old age. Not certified.
„ 18	54	Copper miner	Diseased stomach. Certified.
„ 8	28	Gunpowder maker.	Explosion of gunpowder in the breaking-house at Kennal Vale mills. Inquest.
„ 17	33	Copper miner	Killed underground by a stull falling on him. Inquest.
„ 29	31	Stone mason -	Phthisis. Not certified.
Dec. 7	67	Farm labourer	Phthisis. Not certified.
„ 15	38	Copper miner	Phthisis. Not certified.
„ 16	19	Copper miner	Smallpox. Not certified.
„ 22	68	Copper miner	Phthisis. Not certified.
„ 12	60	Gunpowder maker.	Explosion of gunpowder in the mixing-house at Kennal Vale mills. Inquest.
„ 24	74	Mine engine man	Old age. Not certified.
1860.			
Jan. 7	40	Copper miner	Phthisis. Not certified.
„ 11	14	Son of copper miner.	Hydrocephalus, 2 weeks. Certified.
„ 16	11	Son of servant	Diphtheria. Not certified.
„ 15	13	Copper miner	Scalds: bursting of a boiler. Inquest.
„ 27	66	Farm labourer	Peritonitis. Certified.
„ 25	82	Cordwainer -	Old age. Not certified.
Feb. 5	53	Copper miner	Phthisis. Not certified.
„ 27	34	Copper miner	Fall down a shaft. Inquest.
„ 16	11	Son of yeoman	Bronchitis. Fever. Certified.
„ 19	68	Copper miner	Old age. Not certified.
„ 24	23	Copper miner	Typhoid fever, 3 weeks. Certified.
„ 26	84	Grocer -	Old age. Not certified.
Mar. 7	81	Farm labourer	Old age. Not certified.
„ 6	18	Copper miner	Killed underground by fall of rock. Inquest.
„ 11	48	Copper miner	Phthisis. Not certified.
„ 9	37	Copper miner	Killed by a fall from the 70 fathom level to the 150 fathom level. Inquest.
„ 19	18	Copper miner	Phthisis. Not certified.
„ 21	53	Copper miner	Seizure. Not certified.
Feb. 14	67	Copper agent	Pneumonia. Not certified.
April 6	38	Tea dealer -	Consumption. Certified.
„ 21	50	Copper miner	Fever. Certified.
„ 25	70	Farmer -	Old age. Not cerrified.
„ 23	89	Farmer -	Old age. Not certified.
„ 25	59	Mathematical instrument maker -	Diseased stomach. Not certified.
„ 26	16	Copper miner-	Killed by falling from the 194 to the 208-fathom level. Inquest.
„ 28	62	Copper miner-	Phthisis. Not certified.
May 5	37	Copper miner-	Suffocated: a waste heap falling on him. Inquest.
„ 16	12	Son of copper miner.	Fever, 3 weeks. Effusion on brain, 6 days. Certified.
„ 21	74	Chelsea pensioner.	Phthisis. Not certified.
„ 22	87	Farmer -	Phthisis. Not certified.
„ 21	55	Copper miner-	Phthisis. Not certified.
„ 29	68	Shopman -	Phthisis. Not certified.
June 16	48	Copper miner-	Consumption. Not certified.
„ 30	47	Copper miner-	Phthisis. Not certified.
July 12	78	Coal weigher-	Phthisis. Not certified.
„ 15	60	Copper miner-	Phthisis. Not certified.
„ 17	50	Farmer -	Bronchitis. Not certified.
„ 19	24	Copper miner-	Fever, 4 weeks. Certified.
„ 23	77	Mine engine man.	Old age. Not certified.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Aug 22	66	Copper miner-	Phthisis. Not certified.
Sep. 4	13	Son of copper miner.	Fall from the shaft of a cart and run over. Inquest.
„ 5	37	Copper miner-	Phthisis. Not certified.
„ 17	27	Copper miner-	Phthisis. Not certified.
„ 17	41	Copper miner-	Phthisis. Not certified.
„ 22	21	Carpenter -	Phthisis, 1 year. Not certified.
„ 17	11	Son of grocer	Gastro-enteritis. Certified.
„ 30	79	Copper miner-	Old age. No medical attendant.
„ 29	48	Copper miner-	Phthisis. Not certified.
Oct. 18	54	Copper miner-	Phthisis, 18 months. Not certified.
„ 28	28	Copper miner-	Phthisis. Not certified.
Nov. 5	72	Farmer -	Decay of nature. Certified.
„ 24	91	Chandler -	Diseased heart. Not certified.
Dec. 4	36	Farmer -	Phthisis. Not certified.
„ 8	58	Agent - -	Asthma. Pleurisy. Not certified.
„ 9	43	Mine engine man.	Phthisis. Not certified.
„ 12	38	Farmer -	Asthma. Not certified.
„ 19	52	Copper miner-	Consumption. Not certified.
„ 22	16	Hatter - -	Phthisis, 2 years. Not certified.
1861.			
Jan. 11	82	Malster -	Old age. Not certified.
„ 19	54	Copper miner	Phthisis. Not certified.
„ 19	55	Copper mine agent.	Catarrh. Fever, 9 days. Certified.
„ 27	60	Farmer -	Cancer. Certified.
„ 23	66	Gentleman -	Diseased heart, 6 months. Certified.
Feb. 5	70	Mine labourer	Apoplexy, 6 days. Certified.
„ 8	88	Cooper - -	Old age. Not certified.
„ 5	13	Son of cooper	Pneumonia. Congestion of lungs. Certified.
„ 13	50	Copper miner-	Consumption, 15 months. Not certified.
Mar. 13	66	Mine engine man.	Fever. Not certified.
„ 13	50	Copper miner-	Phthisis. Not certified.
„ 17	71	Copper miner-	Old age. Not certified.
„ 19	16	Labourer -	Quinsey, 12 days. Certified.
„ 20	66	Engine man -	Scalds by a jet of steam. Inquest.
„ 22	18	Copper miner-	Injuries by a fall from 170 to 190 fathom level in whin shaft. Inquest.
„ 26	25	Stone mason -	Paralysis. Not certified.
Apr. 1	52	Farmer -	Dropsy. Not certified.
„ 7	54	Mine agent -	Phthisis. Not certified.
„ 8	64	Copper miner-	Bronchitis, 18 months. Certified.
„ 10	50	Mine agent -	Phthisis. Not certified.
„ 12	18	Clerk - -	Phthisis. Not certified.
„ 19	23	Farm labourer	Phthisis, 22 months. Not certified.
„ 22	45	Copper miner-	Fractured spine, 9 months. Certified.
Mar. 16	10	Son of yeoman	Hydrocephalus. Not certified.
May 5	20	Farm labourer	Phthisis, 4 months. Certified.
„ 14	40	Copper miner-	Phthisis. Certified.
„ 14	51	Copper miner-	Decline, 9 years. Certified.
„ 19	38	Copper miner-	Decline, 9 months. Not certified.
„ 19	56	Innkeeper -	Pneumonia, 3 weeks. Not certified.
„ 19	56	Mine agent -	Bronchitis. Not certified.
June 4	23	Blacksmith -	Bronchitis. Not certified.
„ 6	22	Copper miner-	Diseased heart. Not certified.
„ 10	58	Blacksmith -	Phthisis. Not certified.
„ 11	57	Copper miner-	Decline. Not certified.
„ 21	13	Son of copper miner.	Fall from the 80 to 110 fathom level. Inquest.
July 3	72	Mine agent -	Dropsy. Certified.
„ 3	63	Copper miner-	Consumption. Not certified.
„ 9	64	Copper miner-	Phthisis. Not certified.
„ 16	64	Copper miner-	Consumption. Not certified.
Aug 19	24	Copper miner-	Consumption. Not certified.
„ 17	22	Miner - -	Accident. Drowned: bathing. Inquest.
„ 21	22	Miner - -	Accident by the bursting of a hole in St. Day United Mine. Inquest.
Sep. 19	57	Copper miner-	Consumption. Not certified.
„ 21	60	Copper miner-	Apoplexy, 2 hours. Certified.
„ 26	59	Copper miner-	Decline. Not certified.
Oct. 3	24	Draper - -	Decline, 2 years. Not certified.
„ 2	57	Miller - -	Decline. Asthma. Not certified.
„ 11	58	Copper miner-	Fever. Not certified.
„ 12	71	Copper miner-	Old age. Not certified.
„ 21	21	Copper miner-	Fever. Not certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
Oct. 29	17	Copper miner	Fever, 8 days. Certified.
Nov. 4	59	Copper miner	Consumption. Not certified.
„ 8	78	Copper miner	Old age. Not certified.
„ 10	25	Copper miner	Typhus. Not certified.
„ 10	77	Mine agent	Decay of nature. Not certified.
„ 17	47	Copper miner	Consumption. Not certified.
„ 17	21	Merchant's clerk.	Ileus. Not certified.
„ 21	10	Son of farmer	Decline. Not certified.
„ 20	18	Copper miner	Killed by falling into a winze. Inquest.
„ 26	24	Copper miner	Abscess on lungs. Certified.
Dec. 8	26	Copper miner	Typhus. Not certified.
„ 9	20	Copper miner	Typhus. Not certified.
„ 11	43	Copper miner	Phthisis, 2 years. Not certified.
„ 15	58	Copper miner	Cardiac disease. Certified.
„ 15	14	Son of copper miner.	Fever. Not certified.
„ 27	11	Son of copper miner.	Variola, 5 days. Certified.

Sub-district - 2. Redruth.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 8	38	Mason	Epilepsy. Certified.
„ 27	73	Gardener, master.	Ossification of heart. Hydropericardium. Not certified.
Feb. 2	13	Son of copper miner.	Phthisis, 6 weeks. Certified.
„ 3	62	Copper miner	Bronchitis, 4 years. Certified.
„ 11	51	Copper miner	Phthisis, 2 years. Not certified.
„ 19	75	Engine worker at a mine.	Debility. Certified.
„ 21	36	Innkeeper	Bronchitis. Certified.
25	22	Copper miner	Dropsy. Not certified.
Mar. 2	55	Copper miner	Phthisis, 3 years. Not certified.
„ 9	16	Blacksmith	Fever. Bronchitis, 3 months. Certified.
„ 6	65	Copper miner	Febris intermittent, — years. Certified.
„ 15	42	Copper miner	Phthisis, 2¾ years. Certified.
„ 21	58	Copper miner	Phthisis. Certified.
„ 27	71	Farmer	Disease of heart. Anasarca, Certified.
Apr. 14	71	Innkeeper	Hemiplegia, 4 months. Bronchitis, 1 week. Certified.
„ 22	65	Chemist	Bronchitis, 4 weeks. Certified.
May 1	39	Copper miner	Phthisis, 4 months. Not certified.
Apr. 27	20	Tin miner	Killed underground, a rock falling on him from the back of level. Inquest.
May 5	14	Son of currier	Phthisis, 4 months. Certified.
„ 14	60	Copper miner	Chronic bronchitis, 2 years. Certified.
„ 17	62	Dresser of copper ores.	Pulmonary consumption. Certified.
„ 20	49	Copper miner	Bronchitis, 12 months. Certified.
„ 26	46	Copper miner	Phthisis. Certified.
June 8	40	Copper miner	Phthisis. Certified.
„ 22	59	Mine labourer	Debility. Certified.
„ 26	69	Confectioner	Paralysis, 5 years. Apoplexy, 7 days. Certified.
„ 29	53	Ostler	Pleurisy. Certified.
July 9	20	Copper miner	Phthisis, 12 months. Not certified.
„ 9	73	Mine labourer	Diseased liver, many years. Certified.
„ 13	44	Copper miner	Phthisis, 4 years. Certified.
„ 15	60	Copper miner	Phthisis, 2 years. Not certified.
„ 16	24	Clerk	Phthisis, 18 months. Certified.
„ 19	52	Copper miner	Diseased lungs, 18 months. Certified.
„ 20	34	Copper miner	Phthisis, 12 months. Certified.
„ 22	23	Hawker	Fever, 7 days. Certified.
Aug. 4	59	Carrier	Carditis. Dropsy Certified.
„ 4	48	Copper miner	Abscess of lungs, 5 months Certified.
„ 18	65	Farmer	Pneumonia. Certified.
„ 16	60	Copper miner	Phthisis. Certified.
„ 18	15	Copper miner	Fall from a kibble in returning to surface. Inquest.
„ 24	24	Copper miner	Smallpox. Certified.
Sept. 1	50	Copper miner	Diseased liver, 6 months. Certified.
„ 8	57	Copper miner	Phthisis, 5 months. Certified.
„ 7	63	Cordwainer	Carditis. Certified.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Sept. 4	14	Son of copper miner.	Fall from a footway ladder in going underground at Copperhill Mine. Inquest.
„ 15	54	Copper miner	Diseased stomach. Perforation. Certified.
„ 28	38	Copper miner	Paralysis, 7 years. Not certified.
Oct. 6	57	Greengrocer	Phthisis, — months. Certified.
„ 8	28	Copper miner	Phthisis, 9 months. Not certified.
„ 10	60	Copper miner	Diseased heart. Certified.
„ 16	65	Engineer	Bronchitis, — years. Certified.
„ 16	66	Butcher	Ruptured blood vessel of lungs. Inquest.
„ 21	59	Copper miner	Fall down a shaft. Inquest.
„ 16	47	Copper miner	Phthisis, 2 years. Not certified.
„ 31	17	Copper miner	Smallpox, 9 days. Certified.
„ 28	37	Carpenter, journeyman.	Asthma, 9 months. Certified.
Nov. 6	37	Copper miner	Phthisis. Certified.
„ 4	19	Tailor, journeyman.	Phthisis, 8 months. Not certified.
„ 30	29	Assayer	Confluent smallpox, 14 days. Certified.
Dec. 2	42	Copper miner	Diseased lungs, 8 weeks. Certified.
„ 2	58	Copper miner	Phthisis, 12 months. Not certified.
Nov. 30	35	Agric. labourer	Fits. Inquest.
Dec. 6	20	Mine labourer	Epilepsy. Certified.
„ 12	19	Stoker, railway	Diseased liver. Certified.
„ 22	26	Watchmaker, journeyman.	Catarrh, 2 months. Certified.
„ 21	28	Tinman	Phthisis, 6 months. Certified.
„ 23	47	Copper miner	Phthisis, 4 months. Not certified.
„ 20	63	Accountant	Pneumonia, 10 days. Certified.
„ 27	85	House agent	Old age, Certified.
„ 30	11	Son of copper miner.	Rheumatic carditis, 3 weeks Certified.
„ 28	74	Engraver	Diseased kidneys, 12 months. No medical attendant.
1860.			
Jan. 3	22	Tin miner	Killed underground; fall from a ladder. Inquest.
„ 16	76	Seedsman	Cardiac disease. Certified.
„ 23	45	Copper miner	Pulmonary consumption. Certified.
„ 25	27	Draper	Diseased heart, 14 months. Certified.
Feb. 2	58	Copper miner	Phthisis, 5 years. Not certified.
„ 2	60	Copper miner	Pneumonia. Certified.
„ 5	73	Copper miner	Old age. No medical attendant.
„ 5	45	Copper miner	Bronchitis, 2 years. Certified.
„ 8	66	Printer	Diseased heart. Certified.
„ 10	19	Copper miner	Pericarditis, 3 months. Not certified.
„ 11	47	Copper miner	Phthisis. Certified.
„ 18	56	Farmer	Fall into an open mine shaft. Inquest.
„ 29	50	Copper miner	Abscess, 2 years. Certified.
Mar. 3	38	Cellarman	Pleuro-pneumonia, 4 weeks. Certified.
„ 6	38	Copper miner	Phthisis. Certified.
„ 17	42	Copper miner	Diseased lungs, 3 months. Certified.
„ 17	49	Copper miner	Phthisis. Certified.
„ 27	48	Grocer	Phthisis, 12 months. Certified.
Apr. 12	10	Son of agricultural labourer.	Fall into an open shaft. Inquest.
„ 25	69	Gardener, journeyman.	Pneumonia, 7 days. Certified.
„ 21	58	Itinerant draper	Internal hæmorrhage. Inquest.
„ 23	12	Tin washer	Crushed by a water wheel. Inquest.
May 2	78	Grocer	Bronchitis, 4 days. Certified.
„ 15	55	Baker, &c.	Diseased heart. No medical attendant.
„ 14	66	Farmer	Phthisis, 2 years. No medical attendant.
„ 18	60	Groom	Bronchitis. Certified.
„ 18	40	Mine labourer	Pyæmia. Certified.
„ 22	87	Builder	Debility. Certified.
June 7	60	Copper miner	Phthisis, 7 months. Certified.
„ 11	65	Mine agent	Diseased heart. Certified.
„ 20	77	Labourer	Mortification. Certified.
„ 21	39	Copper miner	Injuries underground: arm broken by the engine rod. Inquest.
July 9	56	Copper miner	Cancer. Not certified.
„ 15	43	Mine agent	Phthisis, 3 years. Certified.
Aug. 3	42	Printer	Phthisis, 8 months. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Aug. 7	80	Engineer -	Influenza, 2 months. Certified.
„ 8	44	Copper miner	Killed underground by a stone falling down the shaft. Inquest.
Sept. 4	71	Draper -	Diseased heart, many months. Certified.
„ 7	42	Labourer -	Pneumonia, 20 days. Certified.
„ 20	66	Copper miner	Fever, 7 weeks. Certified.
Oct. 1	22	Mine engine man.	Scrofula of hip joint. Not certified.
Sept. 30	19	Copper miner	Pneumonia, 15 days. Certified.
Oct. 1	55	Copper miner	Bronchitis. Certified.
„ 19	41	Copper miner	Consumption. Certified.
„ 25	11	Son of copper miner.	Convulsions. Certified.
„ 25	76	Assayer -	Decay of nature. Not certified.
„ 28	36	Copper miner	Phthisis. Certified.
Oct. 22	75	Mason, master	Bronchitis. Certified.
Nov. 13	47	Pawnbroker -	Cancer of liver, 12 months. Certified.
„ 20	17	Billiard marker.	Scarlatina, 3 weeks. Certified.
Dec. 2	21	Telegraph clerk.	Phthisis, 12 months. Certified.
„ 5	59	Carrier - -	Phthisis, 9 months. Not certified,
„ 7	54	Copper miner	Phthisis, 14 months. Certified.
„ 4	28	Copper miner	Phthisis, 8 months. Certified.
„ 3	76	Retired excise officer.	Cardiac disease. Certified.
„ 3	35	Copper miner.	Rupture of blood vessels. Inquest.
„ 10	50	Copper miner	Bronchitis. Certified.
„ 12	14	Son of copper miner.	Fever, 3 days. Certified.
„ 14	23	Blacksmith, journeyman.	Typhus. Certified.
„ 31	46	Copper miner	Cancer. Certified.
„ 23	20	Copper miner	Phthisis, 18 months. Certified.
Dec. 24	40	Draper, master	Cardiac disease. Dropsy. Certified.
30	77	Farm labourer.	Paralysis, 4 months. Not certified.
1861.			
Jan. 5	11	Son of dressmaker.	Fever, 14 days. Certified.
„ 5	35	Gold miner -	Pneumonia, 3 weeks. Certified.
„ 14	67	Mine agent -	Pneumonia. Certified.
„ 16	30	Mine labourer	Cardiac disease, 9 years. Not certified.
„ 20	53	Copper miner	Phthisis, 3 years. Certified.
„ 19	24	Blacksmith, master.	Typhus, 4 weeks. Certified.
Feb. 2	23	Blacksmith, journeyman.	Consumption. Certified.
„ 2	39	Mine agent -	Diseased lungs, 4 months. Certified.
„ 4	52	Copper miner	Apoplexy. Certified.
„ 17	57	Greengrocer -	Cardiac disease. Dropsy. Certified.
„ 27	52	Mine agent -	Phthisis. Certified.
Mar. 24	66	Baker, master	Diseased stomach. Certified.
Apr. 1	36	Copper miner	Bronchitis, 2 years. Certified.
„ 6	78	Cordwainer -	Diseased kidneys. Certified.
„ 13	62	Copper miner	Bronchitis, 7 years. Certified.
„ 13	67	Mason - -	Cardiac disease. Certified.
„ 19	64	Engineer -	Bronchitis. Certified.
„ 29	45	Malster -	Cardiac disease, 2 years. Certified.
May 1	59	Carrier -	Phthisis, 12 months. Certified.
„ 14	86	Mason - -	Bronchitis. Certified.
„ 15	48	Copper miner	Phthisis. Certified.
„ 23	40	Waggoner -	Phthisis. Certified.
„ 25	54	Fishmonger -	Catarrh. Certified.
„ 22	35	Copper miner	Diseased heart. Inquest.
„ 26	46	Innkeeper -	Pneumonia. Certified.
„ 30	80	Farm labourer	Old age. No medical attendant.
June 14	62	Cordwainer -	Pleuro-pneumonia, 7 days. Certified.
„ 18	65	Mine accountant.	Nephria.
July 9	89	Tin dresser -	Old age. Not certified.
„ 18	66	Copper miner	Diseased lungs. Hæmoptysis. Certified.
„ 15	27	Copper miner	Injuries by a rock falling on him in South Tolgus Mine. Inquest.
„ 23	26	Copper miner	Rheumatic carditis, 6 months. Certified.
Aug. 5	66	Tin miner -	Bronchitis, 2 years. Certified.
„ 7	52	Copper miner	Phthisis, 7 years. Certified.
1861.			
Aug. 6	72	Innkeeper -	Diarrhœa, 1 month. Certified.
„ 6	32	Chaise driver	Injuries from a fall in climbing a cliff. Inquest.
„ 9	57	Copper miner	Rheumatism, 15 years. Not certified.
„ 12	55	Copper miner	Phthisis, 2 years. Not certified.
Sept. 4	36	Copper miner	Phthisis. Certified.
„ 15	30	Copper miner	Syphilis. Rupia, 2 years. Certified.
„ 17	66	Mine agent -	Malignant diseased lungs. Certified.
Oct. 7	57	Farmer - -	Cardiac disease. Dropsy, 12 months. Certified.
„ 9	21	Copper miner	Phthisis, 9 months. Certified.
„ 12	34	Glass blower -	Phthisis, 2 years, Certified.
„ 15	36	Copper miner	Killed by the explosion of a hole. Inquest.
„ 31	17	Son of mine broker.	Scrofula, 3 years. Certified.
Nov. 19	62	Copper miner	Bronchitis, 10 years. Certified.
„ 24	62	Engine worker	Diseased kidneys, 8 years. Certified.
Dec. 2	33	Copper miner	Pelvis abscess, 8 weeks. Certified.
„ 13	60	Copper miner	Pneumonia, 10 days. Certified.
„ 22	47	Copper miner	Diseased liver, 2½ years. Certified.
„ 21	16	Son of copper miner.	Crushed by a water-wheel. Inquest.

Sub-district - 3. Illogan.

1859.			
Jan. 1	56	Copper miner	Phthisis. Not certified.
„ 1	65	Copper miner	Paralysis. Epileptic fit, 2½ hours. Certified.
„ 6	40	Copper miner	Phthisis, 9 months. Certified.
„ 6	45	Mine engineman.	Found dead. Sudden. Inquest.
„ 11	10	Son of agent -	Fistula in arm, Certified.
„ 14	49	Copper miner	Decline, 12 years. Not certified.
Feb. 13	12	Son of copper miner.	Phthisis. Certified.
„ 15	61	Copper miner	Decline, — years. Not certified.
„ 23	74	Labourer -	Old age. Not certified.
Mar. 20	67	Labourer in copper mine.	Bronchitis. Certified.
Apr. 11	53	Copper miner	Fever. Certified.
„ 17	17	Son of copper miner.	Phthisis. Certified.
„ 16	27	Son of copper miner.	Decline. Not certfied.
May 6	12	Son of mine agent.	Fits from the fright of a dog. Not certified.
„ 9	73	Copper miner	Decline, 4 years. Not certified.
„ 9	26	Son of farm labourer.	Phthisis. Certified.
„ 10	62	Tin dresser -	Decline. Not certified.
„ 10	66	Copper miner	Chronic disease of liver. Certified.
„ 17	65	Copper miner	Bronchitis. Certified.
„ 20	65	Copper miner	Bronchitis. Certified.
„ 21	21	Copper miner	Injury from falling into a shaft in South Basset Copper Mine. Inquest.
„ 22	42	Miner - -	Natural death. Inquest.
„ 27	63	Copper miner	Pneumonia, 4 weeks. Abscess, 2 weeks. Certified.
„ 31	21	Copper miner	Phthisis, 3 years. Certified.
June 3	16	Son of copper miner.	Phthisis. Certified.
„ 8	73	Mine agent -	Pneumonia. Certified.
July 5	65	Copper mine agent.	Bronchitis. Certified.
„ 9	16	Son of labourer.	Accidental fall. Inquest.
„ 21	44	Copper miner	Pleuro-pneumonia. Certified.
Aug. 3	62	Copper miner	Phthisis. Certified.
„ 10	20	Copper miner	Pneumonia, 4 weeks. Certified.
Sept. 4	51	Sailor - -	Aneurism. Certified.
„ 10	17	Tin and copper miner.	Crushed to death. Inquest.
„ 16	43	Farm labourer	Smallpox, 12 days. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Sept 19	57	Mine agent -	Pneumonia. Gangrene. Certified.
„ 22	60	Copper miner	Decline, many years. Not certified.
„ 24	73	Painter -	Natural decay. Certified.
„ 27	75	Engineman in mine.	Fracture of leg, 12 days. Paralysis, 11 days. Certified.
„ 26	25	Son of copper miner.	Phthisis. Certified.
Oct. 5	60	Farmer -	Hæmoptysis. Certified.
„ 7	63	Copper miner	Apoplexy. Certified.
„ 17	66	Copper miner	Diseased heart. Certified.
„ 17	70	Farm labourer	Asthma. Certified.
„ 27	22	Son of gamekeeper.	Phthisis, 3 months.
„ 27	24	Mariner -	Found drowned. Inquest.
„ 27	45	Master mariner	Found drowned. Inquest.
„ 27	13	Mariner -	Found drowned. Inquest.
„ 27	27	Mariner -	Found drowned. Inquest.
„ 6	20	Son of copper miner.	Cancer in stomach. Certified.
„ 13	60	Copper miner -	Consumption. Certified.
„ 14	50	Copper miner -	Consumption. Not certified.
„ 17	44	Copper miner -	Bronchitis. Certified.
„ 22	13	Son of copper miner.	Decline. Not certified.
„ 24	35	Copper miner -	Killed underground, by falling from the 66-fathom level to the 145-fathom level. Inquest.
Dec. 14	58	Copper miner -	Bronchitis. Certified.
„ 16	61	Engineer -	Diseased liver. Jaundice. Certified.
„ 14	66	Surface miner	Pneumonia. Certified.
„ 18	55	Miner - -	Found dead in bed. Inquest.
„ 21	65	Copper miner	Miners' decline. Certified.
„ 24	22	Copper miner -	Fever, 23 days. Certified.
„ 23	61	Ostler - -	Congestion of lungs. Certified.
„ 29	45	Copper miner	Decline. Not certified.
„ 26	75	Mason - -	Natural decay. Not certified.
„ 22	17	Son of miner -	Accident. Injuries on head. Inquest.
„ 31	84	Copper miner	Natural decay. Certified.
1860.			
Jan. 4	67	Labourer -	Injuries to spine of long standing. Certified.
„ 6	34	Engine worker in mine.	Phthisis. Not certified.
„ 18	70	Copper miner	Old age. Not certified.
„ 20	69	Farm labourer	Ileus. No medical attendant.
„ 20	72	Farmer -	Decline. No medical attendant.
„ 25	40	Copper miner	Miners' decline, 2 years. No medical attendant.
„ 25	73	Farm labourer	Natural decay. Certified.
„ 21	46	Copper miner	Fracture from an iron pulley falling on him from the puppet head over a whin shaft. Inquest.
Feb. 2	29	Copper miner	Phthisis. Certified.
„ 4	49	Stud groom -	Bronchitis. Certified.
„ 9	48	Copper miner	Decline, 2 years. Not certified.
„ 7	23	Copper miner	Decline. Not certified.
„ 11	73	Farmer -	Cancer of liver. Certified.
„ 18	61	Copper miner	Bronchitis. Certified.
Ma. 1	49	Copper miner	Apoplexy. Bronchitis, 18 days. Certified.
„ 5	66	Mine labourer	Decline, 5 years. No medical attendant.
„ 5	75	Baker - -	Bronchitis. Certified.
„ 8	65	Engineman -	Diseased heart. Certified.
„ 10	35	Labourer -	Acute phthisis, 3 months. Certified.
„ 11	62	Shoemaker -	Bronchitis. Certified.
„ 15	21	Son of mason	Scarlatina, 3 weeks. Certified.
„ 16	47	Blacksmith -	Aneurism. Certified.
„ 25	73	Copper miner	Decline. No medical attendant.
„ 27	59	Labourer -	Gastritis, — years. Certified.
Apr. 2	29	Copper miner	Diarrhœa. Paralysis. Certified.
„ 4	80	Farmer -	Apoplexy, 4 days. Certified.
„ 13	18	Son of copper miner.	Phthisis. Certified.
„ 26	78	Copper miner	Old age. No medical attendant.
May 2	52	Copper miner	Bronchitis, 5 years. Certified.
„ 10	58	Copper miner	Dropsy. Certified.
„ 19	49	Farmer -	Fever, 13 days. Bronchitis, 6 months. Certified.
„ 17	53	Copper miner	Bronchitis, 5 years. Certified.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
May 23	67	Farm labourer	Decline, 2 years. No medical attendant.
„ 31	18	Son of copper miner.	Phthisis. Certified.
June 8	23	Son of copper miner.	Phthisis. Certified.
„ 12	73	Copper miner	Bronchitis. Certified.
„ 23	62	Copper miner	Bronchitis. Certified.
„ 25	53	Copper miner	Bronchitis. Certified.
„ 30	33	Copper miner	Decline. Not certified.
July 4	83	Labourer -	Debility. Certified.
„ 9	21	Son of copper miner.	Phthisis. Certified.
„ 12	64	Labourer -	Bronchitis. Certified.
„ 13	46	Miner - -	Injuries: crushed under some rubbish. Inquest.
„ 16	21	Miner -	Visitation of God. Inquest.
„ 21	24	Son of labourer	Phthisis. Certified.
Aug. 2	35	Copper miner	Bronchitis. Certified.
„ 2	47	Copper miner	Paralysis, 3 years. Certified.
„ 8	14	Son of beer-seller.	Rheumatic carditis, 8 days. Certified.
„ 10	12	Son of miner	Fracture: fall into a shaft. Inquest.
„ 18	40	Copper miner	Phthisis. Certified.
„ 24	21	Miner -	Supposed from fright occasioned by falling 4 fathoms in Tin Croft mine. Inquest.
„ 29	47	Copper miner	Bronchitis. Certified.
Sept. 6	64	Copper miner	Bronchitis. Certified.
„ 6	56	Copper miner	Phthisis, some months. Certified.
„ 22	49	Copper miner	Diseased liver, 4 years. Certified.
„ 26	36	Copper miner	Breaking of a blood-vessel. Not certified.
„ 27	60	Copper miner	Bronchitis. Certified.
„ 27	43	Copper miner	Diseased heart, 8 years. Not certified.
„ 29	54	Labourer -	Enteritis. Certified.
Oct. 6	43	Copper miner	Cerebritis, 7 days. Certified.
„ 7	56	Copper miner	Phthisis. Certified.
„ 12	42	Copper miner	Phthisis, 2 years. Certified.
„ 21	33	Copper miner	Phthisis, 12 months. Certified.
„ 25	37	Son of labourer	Diseased heart. Congestion of lungs. Certified.
Nov. 2	38	Copper miner	Cancer. Certified.
„ 4	81	Copper miner and farmer.	Old age. Not certified.
„ 12	48	Miner -	Fractured skull. Inquest.
„ 19	75	Drover -	Old age. Certified.
Dec. 4	50	Blacksmith -	Pneumonia, 5 days. Certified.
„ 12	80	Copper miner	Old age. Certified.
„ 13	14	Son of copper	Scarlatina. Certified.
„ 15	18	Mariner -	Accidentally drowned. Inquest.
„ 19	34	Copper miner	Phthisis. Certified.
„ 25	75	Farm labourer	Old age. No medical attendant.
„ 30	27	Copper miner	Phthisis. Certified.
„ 30	75	Cart driver -	Old age. Certified.
1861.			
Jan. 1	29	Copper miner	Diseased kidneys. Dropsy. Certified.
„ 1	32	Miner -	Injuries to his head. Inquest.
„ 4	57	Copper miner	Phthisis. Certified.
„ 11	11	Son of copper miner	Typhus. Not certified.
„ 16	22	Copper miner	Consumption. Not certified.
„ 19	23	Copper miner	Phthisis. Certified.
„ 22	90	Labourer -	Old age. No medical attendant.
„ 25	18	Son of copper miner	Phthisis. Certified.
„ 24	65	Butcher -	Visitation of God. Inquest.
Feb. 1	59	Copper miner	Diarrhœa Certified.
„ 8	39	Copper miner	Consumption. Not certified.
„ 9	10	Son of copper miner	Scarlatina. Certified.
„ 11	42	Copper miner	Decline, 2 years. Not certified.
„ 12	25	Copper miner	Phthisis. Certified.
„ 8	32	Copper miner	Skip falling down the shaft on him. Inquest.
„ 19	16	Son of copper miner	Phthisis. Certified.
„ 24	17	Son of copper miner	Scarlatina. Certified.
Mar. 20	68	Copper miner	Bronchitis. Certified.
Apr. 3	53	Boatmen -	Suffocation. Inquest.
„ 10	14	Engine driver	Accident: explosion of a safety fuse manufactory. Inquest.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
Apr.18	34	Copper miner	Pleurisy, 8 weeks. Certified.
„ 18	38	Pilot - -	Diseased lungs, 3 weeks. Inquest.
„ 23	67	Copper miner	Pneumonia. Certified.
„ 18	25	Miner -	Fractured skull. Inquest.
May 2	59	Farm labourer	Consumption. Not certified.
„ 4	71	Labourer -	Old age. Not certified.
„ 8	42	Servant -	Hypertrophy of heart. Certified.
„ 13	35	Copper miner	Consumption. Certified.
„ 14	60	Labourer -	Bronchitis. Certified.
„ 18	57	Barber -	Dropsy. Certified.
„ 22	54	Engineman -	Phthisis. Certified.
„ 26	72	Farmer -	Diseased heart. Certified.
„ 29	18	Son of copper miner.	Smallpox. Certified.
June11	52	Copper-mine agent.	Diseased kidneys, 6 months. Certified.
„ 13	51	Copper miner	Meningitis, 9 weeks. Certified.
„ 14	67	Copper miner	Bronchitis, 24 days. Certified.
„ 21	20	Copper miner	Fever. Certified.
„ 23	42	Copper miner	Decline. Not certified.
July 3	67	Labourer -	Decline. No medical attendant.
„ 4	16	Son of copper miner.	Epilepsia. Not certified.
„ 16	58	Copper miner	Diarrhœa. Certified.
„ 11	35	Copper miner	Killed underground by a stull giving way on which he was standing.
„ 21	86	Coast Guard -	Old age. Not certified.
„ 24	21	Miner - -	Fall into a shaft. Inquest.
„ 25	15	Son of copper miner.	Jaundice, 1 month. Certified.
Aug. 1	17	Miner - -	Fall into a shaft. Inquest.
„ 7	13	Son of labourer	Variola. Purpura. Certified.
„ 5	15	Son of miner -	Found dead. Inquest.
„ 8	77	Copper miner	Dropsy. Certified.
„ 26	72	Sexton - -	Diarrhœa. Certified.
Sept.13	75	Farm labourer	Old age. Not certified.
„ 19	31	Copper miner	Phthisis. Certified.
„ 22	22	Son of copper miner.	Typhus, 2 days. Certified.
Oct. 7	62	Copper miner	Old age. No medical attendant.
„ 6	54	Copper miner	Decline. Not certified.
„ 7	40	Copper miner	Phthisis. Certified.
„ 17	75	Copper miner	Diseased heart. Certified.
Nov. 6	64	Copper miner	Diseased heart. Certified.
„ 14	54	Copper miner	Decline and dropsy. Not certified.
Dec. 8	60	Copper miner	Phthisis. Certified.
„ 7	62	Mine clerk -	Found dead. Inquest.
„ 17	17	Sailor - -	Phthisis. Certified.
„ 16	71	Copper miner	Cancer. Certified.
„ 25	10	Son of copper miner.	Rheumatic fever. Certified.
„ 27	77	Labourer -	Old age. No medical attendant.
Aug.30	28	Miner - -	Injuries from the explosion of a hole whilst preparing for blasting. Inquest.

Sub-district - 4. Camborne.

1859.			
Jan. 8	54	Tin miner -	Phthisis. Certified.
„ 11	50	Mine agent -	Phthisis. Certified.
„ 11	19	Copper miner	Injuries from explosion of gunpowder. Inquest.
„ 10	65	Waggoner -	Spasm of the stomach. Certified.
„ 16	30	Copper miner	Acute rheumatism. Pericarditis. 5 weeks. Certified.
„ 17	55	Farmer -	Chronic bronchitis. Certified.
„ 18	47	Tin miner -	Natural death. Inquest.
„ 21	29	Tin miner -	Accident. Injury in Dolcoath Mine. Inquest.
„ 23	14	Blacksmith -	Typhus, 15 days. Certified.
„ 25	10	Son of copper miner.	Catarrh, 2 weeks. Diphtheritis, 5 days. Certified.
Feb. 12	39	Tin miner -	Phthisis, — years. Certified.
„ 16	55	Grocer - -	Phthisis, 3 months. Certified.
„ 21	48	Tin miner -	Diseased heart. Dropsy. Certified.
„ 21	12	Son of copper miner.	Phthisis. Certified.
„ 23	36	Copper miner-	Phthisis, 10 months. Certified.
„ 23	59	Moulder -	Carditis. Ascites. Certified.
„ 23	65	Tin miner -	Diseased brain, 6 weeks. Certified.
„ 22	48	Copper miner	Phthisis, 16 months. Certified.
1859.			
Feb. 26	59	Copper miner	Bronchitis, 2 days. Certified.
„ 28	28	Moulder -	Phthisis. Certified.
Mar. 3	69	Tin miner -	Bronchitis, 3 days. Certified.
„ 4	25	Shoemaker -	Phthisis. Certified.
„ 6	74	Mine labourer	Stricture of Pylorus. Certified.
„ 12	75	Engine man -	Old age. No medical attendant.
„ 25	70	Mat maker -	Unknown. No medical attendant.
„ 25	50	Farm labourer	Chronic hepatitis. Certified.
„ 31	53	Shoemaker -	Phthisis. Certified.
„ 30	57	Copper miner	Accident. Killed falling into a shaft. Inquest.
Apr. 3	65	Copper miner	Affection of liver, 4 months. Certified.
„ 7	22	Tin miner -	Phthisis, 10 months. Certified.
„ 12	59	Copper miner	Phthisis, 7 months. Certified.
„ 16	22	Tin miner -	Phthisis. Certified.
„ 23	27	Copper miner	Smallpox (natural), 3 weeks. Certified.
„ 24	25	Copper miner	Pleurisy, 5 days. Certified.
„ 21	19	Accountant -	Phthisis. Certified.
„ 28	47	Copper miner	Pneumonia. Typhus, 12 days.
May 11	16	Copper miner	Tubercular peritonitis. Certified.
„ 16	65	Farm labourer	Bronchitis, 7 days. Certified.
„ 20	69	Copper miner	Phthisis. Certified.
„ 22	67	Sawyer -	Diseased heart. Dropsy. Certified.
„ 25	60	Engineman -	Phthisis. Certified.
„ 25	22	Copper miner	Phlebitis of femoral vein, purulent absorption. Certified.
„ 27	28	Copper miner	Phthisis. Certified.
June 4	74	Tin miner -	Phthisis. Certified.
„ 18	65	Tin miner -	Scirrhus of stomach. Certified.
„ 20	20	Tin miner -	Phthisis. Dropsy. Certified.
„ 21	57	Blacksmith -	Phthisis. Certified.
„ 26	60	Road labourer	Epilepsy. Certified.
„ 27	17	Son of merchant	Emphysema. Low fever. Certified.
July 1	20	Copper miner	Phthisis. Certified.
„ 2	48	Copper miner	Phthisis. Certified.
June30	50	Copper miner	Hepatitis. Certified.
July 4	49	Tin miner -	Typhoid fever, 8 days. Certified.
„ 18	56	Copper miner	Phthisis, 3 years. Certified.
Aug.17	42	Copper miner	Diseased liver, 7 months. Certified.
Sept. 4	67	Copper miner	Paralysis, 9 days. Certified.
„ 10	17	Copper miner	Phthisis. Certified.
„ 14	86	Mine agent -	Old age. No medical attendant.
„ 14	59	Tin miner -	Phthisis. Certified.
„ 28	66	Carpenter -	Anasarca. Certified.
„ 27	69	Fund holder,&c.	Insanity, 29 years. Paralysis, 5 weeks. Certified.
Oct. 10	29	Copper miner	Phthisis. Certified.
„ 9	36	Miner - -	Injury. Accident in Dolcoath Mine. Inquest.
Nov. 4	47	Tin miner -	Phthisis. Certified.
„ 5	34	Tin miner -	Pleuro-pneumonia, 7 days. Certified.
„ 10	62	Tin miner -	Diseased brain, 6 months. Certified.
„ 17	47	Tin miner -	Phthisis, 3 years. Certified.
„ 21	24	Seaman -	Drowned. Inquest.
Dec. 2	34	Gold miner -	Hepatitis, 4 weeks. Congestion of lungs. Certified.
„ 4	17	Copper miner	Scarlatina maligna, 24 hours. Certified.
„ 3	14	Copper miner	Typhoid fever. Certified.
„ 9	52	Tin miner -	Bronchitis. Certified.
„ 17	22	Copper miner	Scrofula. Certified.
„ 19	68	Copper miner	Phthisis, 12 months. Certified.
„ 27	57	Tin miner -	Phthisis. Certified.
„ 31	15	Copper miner	Scarlatina, 4 weeks. Certified.
„ 30	31	Tailor - -	Diseased heart. Dropsy. Certified.
1860.			
Jan. 1	61	Tin miner -	Phthisis. Certified.
„ 3	35	Tin miner -	Diabetes, 4 months. Certified.
„ 5	14	Mine labourer	Scarlatina, 3 weeks. Œdema of lungs, 24 hours. Certified.
„ 8	19	Mine labourer	Phthisis. Certified.
„ 14	59	Hatter - -	Diseased heart. Dropsy. Certified.
„ 20	17	Farm labourer	Diseased spine. Anasarca. Certified.
„ 19	43	Copper miner	Phthisis. Certsfied.
„ 20	77	Tin miner -	Old age. No medical attendant.
„ 23	36	Mason - -	Bronchitis, 14 days. Certified.
„ 24	32	Copper miner	Phthisis. Certified.
„ 25	44	Engine man -	Diseased brain, 18 months. Certified.
„ 28	52	Tin miner -	Typhus, 10 days. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Jan. 24	40	Mine labourer	Fractures. Tetanus. Inquest.
Feb. 10	54	Copper miner	Phthisis. Certified.
„ 12	21	Copper miner	Phthisis. Certified.
„ 13	18	Copper miner	Typhoid fever, 14 days. Certified.
„ 17	49	Tin miner -	Diseased heart. Dropsy. Certified.
„ 17	23	Miner - -	Injury from rock falling on him. Inquest.
„ 24	16	Son of copper miner.	Fever, 15 days. Certified.
„ 25	70	Tin miner -	Phthisis. Certified.
„ 26	61	Farm labourer	Pleurisy, 3 days. Certified.
„ 27	14	Mine labourer	Laryngitis, 6 days. Certified.
Mar. 3	54	Tin miner -	Bronchitis, 7 days. Certified.
„ 6	18	Mason - -	Phthisis, 4 months. Certified.
„ 8	59	Copper miner	Phthisis, 4 months. Certified.
„ 8	28	Blacksmith -	Pneumonia. Certified.
„ 16	24	Copper miner	Hepatitis, 14 days. Certified.
„ 23	46	Mason - -	Phthisis. Certified.
„ 26	13	Plasterer -	Diphtheria, 2 days. Certified.
„ 28	50	Grocer - -	Diseased kidneys. Certified.
„ 26	59	Schoolmaster	Ileus, 7 days. Certified
Apr. 2	50	Farmer - -	Phthisis, 2 years. Certified.
„ 8	59	Tin miner -	Bronchitis. Certified.
„ 14	65	Mine proprietor	Apoplexy, 36 hours. Certified.
„ 25	73	Sawyer -	Dropsy. Certified.
May 1	50	Copper miner	Phthisis. Certified.
„ 4	11	Son of copper miner.	Cerebritis, 7 days. Certified.
„ 5	18	Waggoner -	Phthisis, 3 months. Certified.
„ 9	58	Tin dresser -	Diseased liver. Certified.
„ 11	68	Engine man -	Bronchitis, 8 days. Certified.
„ 17	41	Copper miner	Hepatitis, 6 weeks. Certified.
„ 24	62	Copper miner	Phthisis, 2 years. Certified.
„ 29	80	Railway gate keeper.	Cancer, 12 months. Certified.
„ 29	45	Tin miner -	Phthisis. Certified.
June 9	22	Copper miner	Phthisis, 18 months. Certified.
„ 13	17	Mine labourer	Typhus, 3 weeks. Certified.
„ 9	66	Copper miner	Phthisis. Certified.
„ 20	62	Copper miner	Bronchitis. Certified.
July 28	52	Copper miner	Phthisis. Certified.
Aug. 6	29	Miner - -	Injuries from fall into a shaft. Inquest.
„ 7	60	Butcher -	Apoplexy, 3 days. Certified.
„ 10	24	Miner - -	Accident. Injuries in blasting a rock. Inquest.
„ 20	55	Tin miner -	Pneumonia. Certified.
„ 26	68	Copper miner	Congestion of lungs. Certified.
„ 24	64	Copper miner	Phthisis, 9 months. Certified.
„ 31	65	Farm labourer	Pneumonia, 8 days. Certified.
Sept 21	10	Son of tailor -	Diseased lungs. Epistaxis. Certified.
Oct. 3	53	Copper miner	Diseased liver. Certified.
„ 8	85	Farm labourer	Old age. No medical attendant.
„ 6	54	Tin miner -	Diseased brain, 5 months. Certified.
„ 19	75	Farmer -	Diseased brain. Certified
„ 30	20	Tin miner -	Typhus, 5 weeks. Certified.
Nov. 4	65	Copper miner	Bronchitis, 5 weeks. Certified.
„ 6	36	Copper miner	Phthisis, 10 months. Certified.
„ 6	10	Mine labourer	Erysipelas. Certified.
„ 12	48	Tin miner -	Phthisis, 12 months. Certified.
„ 13	61	Tin miner -	Phthisis. Certified.
„ 18	52	Copper miner	Bronchitis, 4 days. Certified.
„ 23	63	Tin miner -	Phthisis. Certified.
Dec. 2	46	Copper miner	Phthisis, 3 years. Certified.
„ 4	31	Copper miner	Phthisis. Certified.
„ 6	45	Tin miner -	Phthisis, 18 months. Certified.
„ 6	63	Engineman -	Phthisis. Certified.
„ 6	35	Copper miner	Fever, 5 weeks. Certified.
„ 6	21	Tin miner -	Pneumonia, 7 days. Certified.
„ 16	76	Farmer -	Gangrene senilis. Certified.
„ 17	36	Farmer -	Diseased liver. Certified.
„ 19	68	Copper miner	Phthisis. Certified.
„ 17	87	Mine labourer	Old age. No medical attendant.
„ 23	38	Copper miner	Diseased spleen. Anasarca. Certified.
„ 25	33	Copper miner	Phthisis. Certified.
„ 25	18	Mine labourer	Phthisis, 4 months. Certified.
„ 30	61	Shoemaker -	Old age. Certified.
1861.			
Jan. 6	22	Copper miner	Typhus. Certified.
„ 9	49	Copper miner	Bronchitis, 6 months. Certified.
„ 17	60	Farm labourer	Phthisis. Certified.
„ 20	40	Copper miner	Phthisis. Certified.
„ 21	60	Surgeon -	Epilepsy, 8 years. Certified.
1861.			
Jan. 23	14	Son of miner	Injuries from fall into a shaft. Inquest.
„ 28	68	Tin miner -	Bronchitis. Certified.
Feb. 5	86	Tin miner -	Old age. No medical attendant.
„ 12	17	Tin miner -	Typhus, 5 weeks. Certified.
„ 19	15	Tin miner -	Pneumonia. Certified.
„ 19	62	Copper miner	Palsy. Certified.
„ 18	73	Engine man -	Old age. No medical attendant.
„ 26	15	Copper miner	Fever, 4 weeks. Certified.
Mar. 6	11	Mine labourer	Scarlatina. Certified.
„ 9	28	Tin miner -	Phthisis. Certified.
„ 15	70	Copper miner	Old age. No medical attendant.
„ 25	55	Tin miner -	Phthisis. Certified.
„ 26	50	Copper miner	Diseased heart. Dropsy. Certified.
„ 28	25	Miner - -	Fall into a shaft in descending to his labour. Inquest.
„ 30	66	Tin miner -	Paralysis. Certified.
April 6	71	Farmer -	Phthisis. Certified.
„ 9	65	Tin miner -	Bronchitis. Certified.
„ 9	66	Copper miner	Phthisis. Certified.
„ 9	50	Copper miner	Phthisis. Certified.
„ 10	16	Copper miner	Pneumonia, 10 days. Certified.
„ 9	68	Mine agent -	Congestion of lungs. Certified.
„ 15	53	Copper miner	Fever, 7 weeks. Certified.
„ 22	47	Copper miner	Phthisis. Certified.
„ 25	52	Miner - -	Rock falling on him. Inquest.
„ 30	63	Copper miner	Phthisis. Certified.
May 7	17	Copper miner	Peritonitis, 21 days. Certified.
„ 7	21	Mine labourer	Typhus. Bronchitis, 14 days. Certified.
„ 4	84	Farmer -	Old age. Certified.
„ 10	80	Tin miner -	Old age. Certified.
„ 18	19	Accountant -	Enteritis, 48 hours. Certified.
June 2	13	Son of tin miner	Scrofula. Certified.
„ 2	69	Farmer -	Old age. Certified.
„ 5	72	Tin miner -	Old age. No medical attendant.
„ 6	32	Copper miner	Nephria. Certified.
„ 20	57	Tin miner -	Diseased brain. Certified.
„ 20	17	Tin miner -	Hæmorrhage from bowels. Certified.
„ 25	58	Mine labourer	Diseased brain. Certified.
„ 27	61	Carpenter -	Diseased lungs. Certified.
July 5	73	Manager copper works.	Apoplexy, 11 hours. Certified.
„ 7	34	Copper miner	Phthisis, 12 months. Certified.
„ 10	11	Son of dentist	Diseased heart. Certified.
„ 24	20	Copper miner	Accident. Killed. Not certified.
„ 23	21	Copper miner	Hematemesis, 3 days. Certified.
„ 27	62	Copper miner	Phthisis. Certified.
Aug. 2	26	Copper miner	Phthisis. Certified.
„ 3	19	Son of chair maker.	Scrofula. Certified.
„ 8	36	Engine man -	Phthisis. Certified.
„ 5	77	Baker - -	Asthma. Certified.
„ 16	63	Tin miner -	Phthisis, 8 weeks. Certified.
„ 20	10	Son of tin miner	Phthisis. Certified.
„ 23	55	Miner - -	Natural death. Inquest.
Sept. 2	65	Tin miner -	Phthisis. Aneurism. Certified.
„ 1	51	Copper miner	Diseased heart. Dropsy. Certified
„ 6	56	Copper miner	Phthisis. Certified.
„ 7	77	Farm labourer	Age. Certified.
„ 13	11	Son of gardener	Diarrhœa. Certified.
„ 26	39	Copper miner	Diseased brain. Certified.
Oct. 3	23	Waggoner -	Scarlatina. Certified.
„ 9	20	Copper miner	Phthisis. Certified.
„ 18	53	Copper miner	Diseased kidneys. Certified.
„ 20	90	Cooper - -	Old age. No medical attendant
„ 19	31	Copper miner	Meningitis, 4 weeks. Certified.
„ 24	54	Copper miner	Remittent fever. Certified.
„ 26	34	Miner - -	Injuries by falling into a shaft. Inquest.
„ 31	62	Tin miner -	Phthisis, 2 weeks. Certified.
Nov. 8	63	Copper miner	Phthisis, 2 years. Certified.
„ 5	60	Mine agent.	Diseased liver. Certified.
„ 11	46	Copper miner	Phthisis, 18 months. Certified.
„ 8	45	Banker's clerk	Epilepsy. Certified.
„ 24	58	Copper miner	Phthisis. Certified.
„ 26	59	Copper miner	Phthisis, 6 months. Certified.
„ 25	35	Copper miner	Diseased hip joint. Nephria. Certified.
Dec. 8	21	Tin miner -	Phthisis. Certified.
„ 11	24	Copper miner	Phthisis. Certified.
„ 21	66	Shoemaker -	Phthisis. Certified.
„ 26	67	Tin miner -	Phthisis. Certified.
„ 26	16	Mine labourer	Typhus, 8 days. Certified.

COUNTY OF CORNWALL.

Sub-district - 5. Phillack.

When Died.	Age.	Occupation.	Cause of Death.
1858			
Dec. 29	38	Innkeeper -	Apoplexy, 32 hours. Certified.
1859.			
Jan. 2	65	Labourer -	Intussusception. Certified.
,, 5	38	Innkeeper -	Meningitis. Certified.
,, 7	51	Copper miner-	Asthma. No medical attendant.
,, 21	28	Copper miner-	Phthisis, 2 years. Diarrhœa, 3 months. Certified.
Feb. 11	100	Miner - -	Natural decay. No medical attendant.
,, 17	80	Miner - -	Natural decay. No medical attendant.
,, 26	33	Labourer -	Accident. Injuries to his head from a fall. Inquest.
,, 28	64	Dyer - -	Bronchitis. Certified.
Mar. 15	68	Miner - -	General debility. No medical attendant.
,, 22	80	Farmer -	Decay of nature. No medical tendant.
Apr. 6	17	Son of mason	Consumption. No medical attendant.
,, 23	76	Cordwainer -	Decay of nature. No medical attendant.
,, 23	11	Son of miner-	Typhus. Certified.
May 13	15	Son of farmer	Hydrocephalus. Certified.
,, 16	22	Miner - -	Fractured skull. Inquest.
,, 28	16	Copper miner-	Fall into a shaft. Inquest.
,, 29	60	Farmer -	Consumption. Not certified.
June 2	20	Son of labourer	Typhoid pneumonia, 10 days. Certified.
,, 3	83	Sawyer - -	Natural decay. No medical attendant.
,, 25	77	Farmer -	Natural decay. No medical attendant.
July 3	67	Miner - -	Bronchitis. Certified.
,, 7	65	Farm bailiff -	Enteritis. Certified.
,, 5	29	Accountant -	Phthisis. Certified.
,, 17	22	Blacksmith -	Diseased lungs. Certified,
,, 18	52	Copper miner-	Apoplexy, 2 months. Certified.
,, 27	80	Draper - -	Decay of nature. Certified.
,, 28	35	Accountant -	Diseased lungs. Certified.
Aug 27	60	Carpenter -	Diseased liver, bronchitis, 3 years. Certified.
Sept. 9	12	Tin and copper miner.	Fractured skull from falling into a shaft. Inquest.
,, 15	75	Copper miner-	General debility. No medical attendant.
Oct. 9	73	Mason - -	Gastritis. Certified.
,, 19	75	Mine agent -	Natural decay. No medical attendant.
,, 26	14	Son of miner-	Epilepsy. Certified.
,, 29	25	Mariner -	Accident. Drowned. Inquest.
Nov. 4	20	Seaman -	Found drowned. Inquest.
,, 6	75	Hawker -	Hydrothorax. Certified.
,, 8	84	Copper miner-	Palsy. Not certified.
,, 17	78	Labourer -	Natural decay. No medical attendant.
,, 23	74	Labourer -	Icterus. Certified.
,, 25	67	Shipwright -	Natural death. Inquest.
,, 27	25	Seaman -	Drowned. Inquest.
Dec. 1	30	Seaman -	Drowned Inquest.
,, 11	82	Copper miner-	Bronchitis. Certified.
,, 18	71	Mariner -	Asthma. No medical attendant.
,, 22	20	Son of iron moulder.	Typhus. Certified.
,, 27	72	Copper miner-	Natural decay. No medical attendant.
,, 28	25	Copper miner-	Pneumonia. Certified.
1860.			
Jan. 4	27	Copper miner-	Pneumonia. Certified.
,, 12	83	Copper miner-	Age. No medical attendant.
Feb. 8	27	Miner - -	Fall into a shaft in Wheal Unity Mine. Inquest.
,, 18	25	Shipwright -	Phthisis. Certified.
,, 23	20	Copper miner-	Phthisis. Certified.
Mar. 9	57	Copper miner-	Atrophy. Certified.
,, 9	48	Gentleman -	Ascites. Certified.
,, 10	72	Labourer -	Age. No medical attendant.
,, 10	56	Labourer -	Consumption. Certified.
,, 17	57	Coal porter -	Consumption. Certified.
,, 21	69	Copper miner-	Consumption. Not certified.
,, 21	42	Stoker, steam boat.	Consumption. Certified.
,, 28	76	Labourer -	Cancer in face. Certified.
Apr. 17	76	Blacksmith -	Bronchitis, 10 days. Certified.
,, 21	53	Mariner -	Apoplexy. Certified.
1860.			
Apr. 25	21	Boiler builder	Cephalitis, 10 days. Certified.
,, 28	69	Copper miner-	Hæmoptysis, 3 weeks. Certified.
May 1	48	Miner - -	Pneumonia, 1¾ years. Certified.
,, 6	21	Agric. labourer	Consumption. Certified.
,, 10	52	Blacksmith -	Pleurisy, 10 days. Certified.
,, 26	73	Carpenter -	Cancer. Certified.
June 7	33	Engine smith-	Apoplexy. Certified.
,, 12	80	Miner - -	Natural decay. No medical attendant.
,, 14	77	Miner - -	Natural decay. No medical attendant.
,, 15	65	Miner - -	Apoplexy. Certified.
,, 25	13	Son of railway porter.	Cephalitis. Certified.
,, 27	21	Miner - -	Injuries to his head. Inquest.
July 4	60	Miner - -	Consumption. No medical attendant.
,, 8	26	Mariner -	Consumption. Certified.
,, 14	87	Coast Guard -	Decay of nature. Certified.
,, 28	54	Miner - -	Bronchitis. Certified.
Aug 11	41	Miner - -	Fall into a shaft. Inquest.
Sept. 1	22	Miner - -	Typhoid pneumonia. Certified.
,, 5	40	Miner - -	Diseased kidneys. Certified.
,, 5	58	Mariner -	Erysipelas. Certified.
,, 17	35	Pattern maker	Phthisis, 11 months. Certified.
Oct. 6	54	Miner - -	Consumption. Certified.
,, 20	62	Shoemaker, master.	Hepatitis, 4 weeks. Certified.
Nov. 4	79	Farmer -	Natural decay. No medical attendant.
,, 14	20	Son of miner-	Meningitis, 14 days. Certified.
,, 23	19	Son of miner-	Consumption. Not certified.
,, 26	65	Engineman -	Hydrothorax. Certified.
Dec. 5	29	Son of labourer.	Consumption. Certified.
,, 2	85	Gentleman -	Natural decay. Not certified.
,, 3	10	Son of miner-	Fractured skull. Inquest.
,, 10	66	Miner - -	Diseased spinal marrow. Not certified.
,, 12	12	Son of stoker-	Enteritis. Certified.
,, 16	16	Son of blacksmith.	Phthisis. Certified.
,, 22	59	Farmer - -	Vomiting of blood. No medical attendant.
,, 28	86	Farmer - -	Natural decay. No medical attendant.
,, 29	39	Chemist -	Scrofula. Meningitis, 3 months. Certified.
1861.			
Jan. 1	11	Son of miner-	Cephalitis, 2 weeks. Certified.
,, 6	74	Miner - -	Age. Certified.
,, 3	22	Engineer -	Pleuro-pneumonia. Certified.
,, 6	72	Miner - -	Age Certified.
—	39	Miner - -	Loss of blood from a fractured leg. Inquest.
,, 29	45	Miner - -	A rock falling on him. Inquest.
,, 30	47	Boiler builder	Cancer. Certified.
Feb. 11	54	Miner - -	Fractured ribs. Certified.
,, 21	26	Mariner -	Drowned. Inquest.
,, 26	76	Yeoman -	Natural death. Inquest.
,, 25	55	Blacksmith -	Cancer. Certified.
Mar. 3	61	Schoolmaster-	Hydrothorax. Certified.
,, 30	78	Carpenter -	Old age. Certified.
Apr. 4	69	Gentleman -	Bronchitis. Certified.
,, 7	20	Son of labourer.	Consumption. Not certified.
,, 20	17	Son of miner-	Phthisis, 4 months. Certified.
,, 18	73	Copper miner	Age. Certified.
,, 25	81	Agric. labourer	Natural decay. No medical attendant.
May 1	11	Son of miner-	Consumption. Certified.
Apr. 29	59	Miner - -	Consumption. Certified.
May 5	22	Copper miner	Hæmorrhage. Certified.
,, 6	30	Acountant -	Consumption. Certified.
June 3	14	Son of engineman.	Diseased liver, 9 months. Diarrhœa. Certified.
,, 6	63	Miner - -	Bronchitis. Certified.
,, 14	84	Shipwright -	Age. Certified.
,, 25	60	Mine agent -	Consumption. Not certified.
Aug 21	85	Cordwainer -	Natural decay. No medical attendant.
Sept. 8	48	Engine smith	Phthisis. Certified.
,, 13	65	Agric. labourer	Cancer. Certified.
,, 30	77	Mine agent -	Natural decay. No medical attendant.
,, 30	64	Pattern maker	Diseased heart. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
Oct. 17	21	Miner - -	Injuries from an explosion. Inquest.
Nov. 3	71	Agric. labourer	Enlarged prostate gland. Certified.
„ 18	74	Carpenter -	Paralysis. No medical attendant.
„ 27	77	Miner - -	Decay of nature. Certified.
Dec. 3	65	Mariner -	Bronchitis. Certified.
„ 14	64	Porter - -	Cancer. Not certified.

Superintendent Registrar's District.

PENZANCE.

Registrar's Sub-District.

1. Uny Lelant.
2. St. Ives.
3. Marazion.
4. Penzance.
5. St. Just-in-Penwith.
6. St. Buryan.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859–1861.

Sub-district - 1. Uny Lelant.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 7	42	Labourer -	Pneumonia. Certified.
„ 10	21	Tin miner -	Diabetes, 2 years. Not certified.
„ 10	64	Agric. labourer	Old age. Certified.
„ 10	72	Tin miner -	Consumption, 6 weeks. Not certified.
„ 16	28	Chelsea pensioner.	Phthisis, 12 months. Certified.
„ 22	38	Miner - -	Suffocated. Buried in a mass of rubbish. Inquest
Feb. 7	21	Tin miner -	Diseased heart. Dropsy. Certified.
„ 14	53	Tin miner -	Diseased heart. Certified.
„ 23	54	Miner - -	Consumption, 12 months. No medical attendant.
„ 27	58	Agric. labourer	Pneumonia. Certified.
Mar. 6	25	Tin miner -	Phthisis, 6 months. Certified
„ 29	68	Tin miner -	Consumption, 4 years. Not certified.
Apr. 6	11	Son of tin miner.	Cephalitis. Certified.
Mar. 29	16	Son of labourer.	Consumption, 2 years. No medical attendant.
Apr. 9	14	Mine labourer	Natural death. Inquest.
„ 12	83	Farmer - -	Old age. Not certified.
„ 14	90	Agric. labourer	Old age. No medical attendant.
„ 27	57	Mason - -	Bronchitis. Pleuro-pneumonia. Certified.
May 10	83	Not stated -	Age. Not certified.
„ 9	60	Tin miner -	Fever. Certified.
„ 13	63	Tin miner -	Consumption, 2 years. Not certified.
„ 18	54	Tin miner -	Suffocated from being buried under a large quantity of rubbish. Inquest.
„ 22	59	Tin miner -	Natural decay. Certified.
June 11	49	Tin miner -	Consumption, 3 years. Not certified.
„ 14	33	Tin smelter -	Diseased liver. Ulcerated throat, 1 week. Certified.
„ 17	22	Copper miner	Accident. Explosion of gunpowder. Inquest.
Aug 11	29	Blacksmith -	Phthisis. Certified.
„ 21	50	Tin miner -	Consumption, 1 year. No medical attendance.
„ 22	32	Tin miner -	Consumption, 4 months. Not certified.
„ 23	65	Mariner -	Ascites. Hydrothorax. Certified.
Sept. 6	26	Mariner -	Diseased brain, 3 weeks. Not certified.
Oct. 4	31	Tin miner -	Phthisis, 5 years. Certified.
„ 26	61	Tin miner -	Consumption, 3 months. Not certified.
Nov. 1	51	Tin miner -	Consumption, 3 months. Not certified.
„ 2	25	Seaman -	Drowned. Inquest.
„ 10	88	Agric. labourer	Old age. Not certified.
1859.			
Nov. 17	53	Tin miner -	Consumption, 2 months. Not certified.
July 6	13	Son of miner -	Fall into a shaft at Wheal Mary Mine. Inquest.
Nov. 29	49	Agric. labourer	Pleurisy, 8 days. Certified.
Dec. 4	34	Tin miner -	Aneurism. Certified.
„ 16	22	Tin miner -	Consumption, 2 years. Not certified.
„ 22	44	Tin miner -	Pneumonia. Certified.
„ 27	85	Farmer - -	General debility. Certified.
1860.			
Jan. 3	43	Tin miner -	Consumption, 2 years. Not certified.
„ 23	19	Miner - -	Natural death. Inquest.
„ 23	70	Miner - -	Pneumonia, 1 week. Certified.
„ 25	32	Labourer -	Natural death. Inquest.
Feb. 4	49	Tin dresser -	Enteritis. Certified.
„ 10	76	Agric. labourer	Old age. No medical attendant.
„ 24	18	Agric. labourer	Consumption, 2 years. No medical attendant.
Mar. 1	45	Tin miner -	Phthisis, 2 years. Certified.
Feb. 24	38	Mason, master	Diseased heart. Certified.
„ 23	85	Labourer, farm	Old age. No medical attendant.
„ 29	48	Coal porter -	Consumption. Certified.
Mar. 5	24	Tin miner -	Consumption, 2 years. Not certified.
„ 15	48	Copper miner	Diseased liver, 4 years. Diarrhœa, 3 weeks. Certified.
„ 20	67	Farmer - -	Consumption. Certified.
„ 23	43	Tin miner -	Consumption, 2 years. Not certified.
„ 16	75	Tin miner -	Consumption, 2 years. Not certified.
Apr. 17	54	Tin miner -	Consumption, 8 weeks. Not certified.
„ 17	59	Tin miner -	Consumption, 6 months. No medical attendant.
May 1	60	Tin miner -	Consumption, 4 years. No medical attendant.
„ 13	55	Miner - -	Found dead in bed. Inquest.
„ 26	52	Tin miner -	Pneumonia, 4 days, Certified.
„ 26	52	Agric. labourer	Bronchitis, 4 weeks. Certified.
„ 26	21	Agric. labourer	Fever. Empyema. Certified.
„ 28	65	Mason - -	Manslaughter. Inquest,
June 3	23	Tin miner -	Consumption, 3 months. Not certified.
„ 9	17	Son of mine agent.	Consumption, 4 months. Not certified.
„ 3	61	Tin miner -	Stricture of œsophagus. Certified.
„ 14	32	Tin miner -	Consumption, 6 months. Not certified.
„ 29	56	Farmer - -	Diseased stomach, 2 years. Certified.
July	41	Butcher -	Diseased brain. Certified.
„	21	Miner - -	Accident Fall. Inquest.
Aug. 1	93	Farmer -	Old age. No medical attendant.
„ 23	48	Tin miner -	Consumption, 12 months. Not certified.
Sept. 8	26	Farmer -	Pleurisy. Certified.
„ 13	10	Son of cordwainer.	Diphtheria. Certified.
„ 20	57	Tin miner -	Consumption. Certified.
Oct. 7	55	Tin miner -	Consumption. Certified.
Nov. 3	17	Shipwright -	Typhoid fever. Certified.
Oct. 26	44	Tin miner -	Consumption, 6 months. Not certified.
Nov. 24	24	Tin miner -	Dropsy, 3 months. Not certified.
Dec. 6	15	Miner - -	Injuries from falling into a shaft. Inquest.
„ 10	43	Tin miner -	Consumption, 12 months. Not certified.
„ 23	24	Sawyer -	Pneumonia, 6 days. Not certified.
„ 27	13	Son of miner -	Injuries from fall into a shaft. Inquest.
1861.			
Jan. 2	53	Farmer -	Consumption. No medical attendant.
„ 13	14	Son of tin miner.	Typhus, 2 weeks. Certified.
„ 4	48	Tin miner -	Consumption. Certified.
„ 8	65	Miner - -	Consumption. Not certified.
„ 7	60	Farmer - -	Natural death. Inquest.
„ 9	73	Farmer - -	Old age. Not certified.
Feb. 16	22	Tin miner -	Fever. Certified.
„ 21	80	Sawyer -	Old age. Not certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
Feb. 22	21	Copper miner	Consumption, 12 months. Certified.
,, 23	51	Miner - -	Consumption. Not certified.
Mar. 3	58	Mine agent -	Consumption. Certified.
,, 20	51	Engine worker	Consumption, 2 years. Certified.
,, 25	51	Tin miner -	Consumption, 2 years. Not certified.
, 25	43	Tin miner -	Consumption, 3 years. Not certified.
,, 28	19	Tin miner -	Fever. Not certified.
Apr. 1	65	Farmer -	Fever, 3 weeks. Not certified.
, 10	70	Tin miner -	Palsy, 2 years. No medical attendant.
,, 17	58	Tin miner -	Consumption, 3 years. No medical attendant.
,, 17	30	Miner - -	Injuries from explosion of a hole. Inquest.
,, 20	22	Tin miner -	Enterites. Certified.
,, 22	78	Farmer -	Bronchitis. Certified.
May 3	66	Agric. labourer	Nephria. Certified.
,, 3	56	Grocer - -	Hæmoptysis. Certified.
,, 6	32	Basket maker	Pyæmia. Certified.
,, 17	70	Farmer -	Old age. Not certified.
,, 25	79	Farmer -	Dispepsia. Certified.
,, 31	18	Son of tin miner.	Phthisis. Certified.
June 19	12	Son of tin miner.	Injury from the kick of a donkey. Inquest.
July 4	13	Son of tin miner.	Consumption. No medical attendant.
,, 15	20	Tin miner -	Consumption, 6 months. Not certified.
,, 23	60	Farmer -	Jaundice, 12 months. Certified.
,, 20	23	Miner - -	Fractured skull. Inquest.
,, 24	36	Agric. labourer	Peritonitis, 1 month. Certified.
Aug. 29	10	Son of miner	Injuries received in a mine. Inquest.
,, 30	63	Mine agent -	Softening of brain. Certified.
Sept. 16	91	Tin miner -	Phthisis, 9 months. Certified.
Oct. 6	60	Miner - -	Consumption, 3 years. Certified.
,, 5	58	Tin miner -	Bronchitis. Certified.
,, 16	19	Tin miner -	Fall into a shaft. Inquest.
,, 21	24	Tin miner -	Enteritis. Certified.
,, 25	80	Blacksmith -	Decay of nature. Certified.
,, 25	57	Farmer - -	Suffocated by being buried. Inquest.
,, 31	34	Tin miner -	Fever. Certified.
Nov. 4	56	Tin miner -	Consumption, 9 months. Not certified.
,, 4	19	Son of tin miner.	Consumption, 12 months. Certified.
,, 5	14	Son of farmer	Cephalitis, 14 days. Certified.
,, 4	55	Tin miner -	Consumption, 12 months. Not certified.
,, 6	72	Miller - -	Consumption. Certified.
,, 21	33	Miner - -	Injuries to the head. Inquest.
Dec. 9	20	Son of mine agent.	Phthisis. Certified.
,, 23	67	Agric. labourer	Debility. Certified.

Sub-district - 2. St. Ives.

1859.			
Jan. 9	33	Miner - -	Accident. Drowned by falling into a pool of water in a fit. Inquest.
,, 21	32	Omnibus proprietor.	Pneumonia, 2 years. Not certified.
,, 27	65	Mine agent -	Phthisis, 12 months. Not certified.
,, 31	12	Son of master mariner.	Atrophy. Not certified.
Mar. 8	59	Joiner - -	Natural death. Inquest.
,, 11	51	Labourer -	Accident. Fractured skull. Inquest.
,, 19	55	Tin miner -	Fever, 10 days. Not certified.
,, 23	75	Gardener -	Dropsy, 12 months. Phthisis, 3 months. Certified.
Apr. 8	49	Fisherman -	Congestion of lungs. Not certified.
,, 16	52	Tin miner -	Fever, 1 week. Not certified.
May 13	31	Tailor - -	Diseased vertebræ. Softening of brain. Certified.
,, 13	20	Seaman -	Phthisis, 5 months. Certified.
,, 24	82	Son of tin dresser	Croup, 6 days. Not certified.
,, 25	30	Shoemaker -	Dropsy. Pneumonia. Not certified.
1859.			
July 3	49	Tin miner -	Tubercular peritonitis, 3 months. Certified.
,, 4	73	Fisherman -	Cancer in stomach, 6 months. Not certified.
,, 6	12	Miner - -	Fall into a shaft at Wheal Mary Mine. Inquest.
,, 14	68	Fisherman -	Asthma, 8 years. Not certified.
Aug. 5	22	Shipwright, apprentice.	Accident. Drowned, bathing. Inquest.
Oct. 9	79	Master mariner	Old age. Not certified.
,, 13	38	Tin dresser -	Diarrhœa, 6 days. Dysentery, 4 days. Not certified.
,, 16	53	Labourer -	Injuries from a fall. Inquest.
,, 19	81	Fisherman -	Old age. Not certified.
,, 21	62	Fisherman -	Dropsy, 6 months. Not certified.
,, 23	68	Van driver -	Apoplexy, 2 days. Certified.
,, 23	25	Tin miner -	Phthisis, 3 weeks. Not certified.
,, 27	52	Tin miner -	Phthisis, 2 years. Not certified.
Nov. 14	57	Tin miner .	Phthisis, 5 months. Certified.
,, 23	62	Miller - -	Suicide (not stated how). Inquest.
Dec. 1	79	Fisherman -	Old age. No medical attendant.
,, 12	50	Fisherman -	Dropsy. Certified.
,, 24	79	Carpenter -	Old age. No medical attendant.
,, 29	61	Tin miner -	Diseased brain. Not certified.
1860.			
Jan. 11	36	Tin miner -	Phthisis, 2 years. Certified.
,, 29	15	Son of tin miner	Smallpox, 12 days. Certified.
,, 26	82	Shoemaker -	Old age. No medical attendant.
Feb. 2	84	Fisherman -	Old age. No medical attendant.
,, 7	36	Seaman, merchant service.	Phthisis, 9 months. Certified.
,, 11	16	Son of cooper	Diseased liver, 4 weeks. Not certified.
,, 20	43	Fisherman -	Cancer. Certified.
,, 20	62	Master mariner	Natural death. Inquest.
,, 20	80	Fisherman -	Paralysis, 24 hours. Certified.
,, 28	66	Yeoman -	Phthisis, 6 months. Certified.
Mar. 7	59	Tin miner -	Phthisis, 7 years. Certified.
,, 4	70	Coast Guard -	Diseased stomach. Dropsy. Certified.
,, 12	12	Son of carpenter	Purpura, 7 days. Certified.
May 2	65	Copper miner	Phthisis, 9 months. Certified.
June 4	15	Son of tin miner	Phthisis, 2 years. Not certified.
,, 17	52	Shipwright -	Diseased heart, 12 months. Certified.
July 12	50	Mine agent -	Phthisis, 5 months. Certified.
,, 12	24	Tin miner -	Meningitis, 2 weeks. Certified.
,, 21	73	Seaman, merchant service.	Paralysis, 3 years. No medical attendant.
Aug. 19	15	Tin dresser -	Diseased joints, 5 months. No medical attendant.
,, 25	70	Labourer -	Atrophia. Certified.
,, 28	66	Agric. labourer	Diseased stomach, 3 months. Not certified.
,, 23	56	Tin miner -	Pneumonia, 2 years. Certified.
,, 25	80	Fisherman -	Old age. No medical attendant.
,, 29	38	Tin miner -	Abscesses, 12 months. Certified.
Oct. 18	71	Tin miner -	Phthisis, 12 months. Not certified.
,, 23	77	Fisherman -	Old age. No medical attendant.
Nov. 11	55	Tin miner -	Phthisis, 3 months. Not certified.
,, 21	71	Carpenter -	Apoplexy. Certified.
,, 23	83	Farmer -	Old age. Not certified.
,, 25	51	Tin miner -	Bronchitis, 3 years. Phthisis. Certified,
,, 30	70	Fisherman -	Age. Certified.
Dec. 22	85	Shoemaker -	Age. No medical attendant.
,, 27	78	Carpenter -	Bronchitis, 7 years. Certified.
1861.			
Jan. 4	48	Tin miner -	Phthisis, 3 years. Certified.
,, 4	48	Fisherman -	Cancer. Certified.
,, 11	80	Hotel keeper -	Old age. Not certified.
,, 30	57	Tin miner -	Phthisis, 6 months. No medical attendant.
,, 29	43	Tin miner -	Diseased kidneys, 18 months. Certified.
Feb. 6	42	Coast Guard -	Natural death. Inquest.
,, 9	80	Seaman, merchant service.	Palsy, 9 months. Not certified.
,, 27	62	Tin miner -	Epilepsy, 12 hours. Apoplexy. Certified.
,, 27	41	Fisherman -	Phthisis, 2 years. Certified.
Mar. 5	34	Tin miner -	Phthisis, 6 months. Not certified.
,, 13	10	Son of grocer	Gastric fever, 14 days. Certified.
,, 27	48	Tin miner -	Hepatitis. Certified
,, 27	81	Farmer -	Old age. No medical attendant.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
Apr. 2	13	Son of seaman, merchant service.	Diseased bowels, 3 months. Certified.
„ 6	60	Seaman, merchant service.	Phthisis, 3 months. Certified.
„ 15	37	Mine engine worker.	Dropsy, 12 months. Not certified
„ 18	24	Tin miner -	Phthisis, 5 months. Certified.
„ 24	81	Farmer -	Old age. No medical attendant.
May 4	74	Engine worker	Cystitis, 1 weeks. Certified.
„ 12	23	Tin miner -	Enteritis, 7 days. Not certified.
„ 13	74	Farmer - -	Palsy, 5 days. Certified.
„ 14	41	Tin miner -	Purpura, 7 days. Certified.
„ 20	74	Town crier -	Phthisis, 6 months. Certified.
„ 21	78	Fisherman -	Old age. No medical attendant.
„ 27	78	Labourer -	Old age. No medical attendant.
„ 30	55	Tin miner -	Phthisis, 12 months. Not certified.
July 6	42	Miner - -	Fall from the flat. Inquest.
„ 12	40	Miner - -	Fracture from a kibble falling on him. Inquest.
„ 18	82	Fisherman -	Old age. Not certified.
„ 20	68	Fisherman -	Apoplexy, 7 hours. Certified.
Aug. 18	70	Labourer -	Tumour in stomach, 6 months. Certified.
„ 24	72	Tin dresser -	Diseased liver. Jaundice. Certified.
Sep. 11	21	Tin miner -	Fever, 4 days. Apoplexy, 6 hours. Certified.
„ 13	35	Chemist -	Natural causes. Inquest.
„ 25	73	Fisherman -	Natural causes. Inquest.
„ 29	31	Tin miner -	Cholera, 20 hours. Certified.
„ 30	65	Tin dresser -	Phthisis, 3 years. Certified.
„ 27	76	Mason - -	Found dead. Inquest.
Oct. 8	59	Shipwright -	Natural causes. Inquest.
„ 17	45	Tin miner -	Bronchitis, 6 months. Certified.
Nov. 11	61	Tin miner -	Pneumonia, 3 days. Certified.
„ 29	63	Gardener -	Natural decay. No medical attendant.
Dec. 19	27	Seaman, merchant service	Typhoid Bronchitis. Certified.
„ 26	25	Tin miner -	Phthisis, 6 months. Not certified.
„ 29	77	Farmer - -	Old age. No medical attendant.

Sub-district - 3. Marazion.

1859.			
Jan. 24	14	Son of tin miner	Phthisis pulmonalis, 2 years. Certified.
„ 29	31	Tin miner -	Enlargement of liver, 12 months. Certified.
Feb. 6	76	Agric. labourer	Old age. No medical attendant.
„ 21	60	Blacksmith -	Palsy, 6 months. Certified.
Mar. 21	11	Son of copper miner.	Rheumatic fever, 11 weeks. Certified.
Apr. 2	54	Farmer - -	Fever, 1 week. Certified.
„ 4	33	Tin miner -	Phthisis, 3 years. Certified.
„ 13	68	Tin miner -	Phthisis, 3 years. Certified.
„ 26	14	Son of tin miner	Cephalitis, 1 week. Certified.
May 7	27	Engineer -	Phthisis, 5 months. Certified.
Apr. 26	14	Son of miner	Cephalitis. Certified.
May 2	73	Market gardener.	Found dead, cause unknown. Inquest.
June 30	50	Tin miner -	Phthisis, 2 years. Certified.
July 4	24	Tin miner -	Not stated.
„ 10	62	Copper miner	Hepatitis, 5 weeks. Certified.
„ 24	20	Son of tin miner	Congestive fever, 1 week. Certified.
„ 28	72	Gardener -	Paralysis, 1 year. Certified.
Aug. 22	66	Tin miner -	Hepatitis. Juandice, 6 months. Certified.
„ 25	16	Son of tin miner	Apoplexy, 5 weeks. Certified,
Sep. 5	34	Mariner, merchant service.	Consumption, 3 years. Certified.
„ 20	57	Mine agent -	Phthisis, 3 months. Certified.
Oct. 9	23	Son of baker -	Phthisis, 4 weeks. Certified.
„ 9	84	Farm labourer	Dysentery, 1 week. Certified.
„ 24	15	Miner - -	Fall through a shaft at Wheal Ann Mine. Inquest.
„ 24	56	Miller - -	Diseased heart, 1 year. Certified.
Nov. 6	25	Son of carpenter	Phthisis, 3 months. Certified.
„ 12	61	Farmer - -	Diseased heart, 8 years. Asthma, 4 weeks. Certified.
„ 26	10	Son of miner -	Pleurisy, 10 days. Certified,
Dec. 2	20	Miner - -	Fractured skull. Inquest.
„ 18	75	Farmer - -	Jaundice, 5 months. Certified.
„ 18	45	Tin miner -	Phthisis pulmonalis, 2 years. Certified.
24	44	Miner - -	Accident: run over by a cart. Certified.
1860.			
Jan. 2	82	Carpenter -	Paralysis, 3 weeks. Certified.
„ 5	63	Copper miner	Phthisis, 3 months. Certified.
„ 9	80	Copper miner	Age. No medical attendant.
„ 10	84	Blacksmith -	Age. No medical attendant.
„ 13	41	Copper miner	Phthisis, 6 months. Certified.
„ 21	48	Blacksmith -	Diseased liver, 12 months. Certified.
„ 22	61	Copper miner	Phthisis, 1 year. Certified.
Feb. 4	45	Tin miner -	Phthisis, 3 years. Certified.
„ 24	84	Watchmaker -	Age. No medical attendant.
Mar. 12	18	Son of mariner	Phthisis, 2 years. Certified.
„ 16	83	Husbandman	Age. No medical attendant.
„ 16	54	Innkeeper -	Dropsy, 1 year. Certified.
„ 26	57	Copper miner	Diseased brain, 2 years. No medical attendant.
Apr. 11	80	Tin miner -	Old age. Certified.
May 5	50	Tin miner -	Phthisis, 2 years. Certified.
„ 18	25	Son of baker -	Phthisis, 3 months. Certified.
June 10	29	Son of copper miner.	Dropsy. No medical attendant.
„ 17	18	Son of farmer	Diseased heart, 6 years. Certified.
„ 21	56	Husbandman -	Locked jaw, 3 weeks. Certified.
„ 27	69	Copper miner	Phthisis, 2 years. Certified.
July 3	30	Son of tin miner	General debility. Certified.
„ 22	52	Tin miner -	Phthisis, 2 years. Certified.
„ 18	18	Son of carpenter.	Diphtheria, 13 days. Certified.
Aug. 18	19	Son of tin miner	Epilepsy, 3 hours. No medical attendant.
„ 23	55	Civil engineer	Injuries from being crushed. Inquest.
Sep. 15	62	Tin miner -	Phthisis, 2 years. Certified.
„ 25	61	Thatcher -	Found dead in bed. Inquest.
Oct. 13	17	Ore dresser -	Accident. Scalded. Inquest.
„ 14	20	Miner - -	Accident. Scalded. Inquest.
„ 29	33	Copper miner	Accident. Scalded, 16 days. Not certified.
Nov. 15	44	Copper miner	Phthisis, 1 year, Certified.
„ 24	55	Copper miner	Diseased heart. Asthma. Certified.
Dec. 9	63	Innkeeper -	Phthisis, 10 months. Certified.
„ 26	41	Tin miner -	Phthisis, 2 years. Certified.
1861.			
Jan. 16	69	Mariner -	Phthisis, 2 years. Certified.
„ 19	67	Grocer - -	Ulcerated intestines, 6 months. Certified.
„ 26	15	Son of porter	Diseased heart, 12 months. Certified.
Feb. 7	46	Husbandman -	Phthisis, 1 year. Certified.
„ 12	53	Engineer -	Diseased heart, 2 years. Certified.
„ 22	60	Miller -	Fever, 2 weeks. Certified.
„ 24	51	Copper miner	Diseased heart, 2 years. Certified.
„ 25	17	Son of tin miner	Scrofula, 12 months. Certified.
Apr. 9	16	Son of tin miner	Phthisis, 6 months. Certified.
May 12	43	Copper miner	Scirrhus of liver, 6 months. Certified.
„ 18	22	Son of tin miner	Injury of finger, 1 week. Tetanus, 2 days. Certified.
„ 22	56	Tin miner -	Phthisis, 2 years. Certified.
June 12	23	Copper miner	Diseased heart, 4 months. Certified.
„ 4	53	Butcher -	Phthisis. Certified.
Aug. 13	52	Copper miner	Phthisis, 3 years. Certified.
„ 19	25	Copper miner	Drowned. Inquest.
Sept. 16	78	Coast Guard pensioner.	Old age. Certified.
Nov. 10	72	Mason - -	Natural death. Inquest.
Dec. 15	22	Son of tin miner	Scrofula. Certified.

Sub-district - 4. Penzance.

1858.			
Dec. 31	25	Druggist's shopman.	Phthisis. Certified.
„ 29	53	Farm labourer	Fever. Certified.
1859.			
Jan. 6	79	Carpenter -	Age. Certified.
„ 12	10	Son of tin dresser	Hydrocephalus, 4 weeks. Certified.
„ 10	61	Ropemaker -	Cut his throat. Suicide. Inquest.
„ 14	18	Draper's assistant.	Diabetes. Certified.
„ 15	70	Fisherman -	Dry gangrene of toes. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 22	86	Formerly tide-waiter H.M's C.	Old age. No medical attendant.
„ 27	89	Farm labourer	Old age. No medical attendant.
„ 30	17	Fisherman -	Pneumonia. Pleurisy, 18 days. Certified.
Feb. 1	19	Mariner -	Fall from rigging. Inquest.
„ 4	52	Fisherman -	Diseased liver. Certified.
„ 6	39	Coast Guard -	Diseased brain, 12 months. Certified.
„ 8	50	Tailor, master	Diseased liver. Ascites, 2 months, Jaundice, 4 days. Certified.
„ 9	26	Labourer -	Pulmonary consumption, 6 months. Certified.
„ 15	58	Farmer - -	Apoplexy, 2 days. Certified.
„ 13	71	Fisherman -	Hæmatemesis, 5 weeks. Certified.
„ 22	19	Shoemaker, journeyman.	Necrosis, 2 years. Dropsy, 2 months. Certified.
„ 24	54	Labourer -	Pneumonia. Certified.
„ 24	37	Mason, journeyman.	Diseased kidneys, 4 months. Diabetes. Certified.
„ 27	61	Labourer -	Rheumatism, 7 days. Pleurisy, 2 days. Certified.
„ 27	17	Seaman -	Found drowned. Inquest.
„ 28	14	Son of labourer	Injuries: crushed under a cart wheel. Inquest.
Mar. 9	23	Farm labourer	Decline, 6 years. Not certified.
„ 14	23	Mariner -	Phthisis. Not certified.
„ 14	23	Blacksmith, journeyman.	Consumption, 6 months. Certified.
„ 16	28	Gold miner -	Hepatization of lungs, 12 months. Pleurisy, 3 weeks. Certified.
„ 20	69	Innkeeper -	Diseased liver, —years. Certified.
1858.			
Dec. 28	72	Mariner, merchant service.	Paralysis. Certified.
1859.			
Mar. 22	80	Clerk - -	Congestion of brain. Certified.
„ 28	66	Shoemaker, journeyman.	Hypertrophy of heart. Certified.
29	61	Sailmaker -	Paralysis, 4 months. Certified.
„ 30	66	Fisherman -	Diseased heart. Certified.
„ 29	73	Farmer -	Old age. No medical attendant.
Apr. 2	70	Farm bailiff -	Diseased heart. Certified.
„ 3	77	Fisherman -	Mortification of legs. Certified.
„ 11	20	Shoemaker, journeyman.	Consumption, 9 months. Certified.
„ 8	68	Millwright -	Chronic bronchitis, 5 years. Certified.
„ 7	25	Blacksmith -	Consumption, 4 months. Not certified.
„ 8	30	Cooper, master	Phthisis, 3 years. Certified.
„ 13	52	Farm labourer	Diseased heart, 1 year. Not certified
„ 14	41	Clown at a travelling circus	Hypertrophy of heart. Certified.
„ 15	25	Clerk - -	Consumption, 4 years. Not certified.
„ 22	45	Carpenter -	Hypertrophy of heart. Certified.
„ 25	18	Seaman -	Phthisis. Rupture of blood vessel. Certified.
„ 27	40	Farm labourer	Hydrothorax, 3 weeks. Certified.
„ 29	50	Tinman, master	Diseased heart, 18 months. Dropsy, 6 months. Certified.
May 8	77	Seaman, R.N.	Morbus cordis. Certified.
„ 11	87	Fisherman -	Old age. Not certified.
„ 13	76	Tanner -	Bronchitis. Certified.
„ 15	52	Farmer -	Palsy, 3 years. Not certified.
„ 22	31	Master mariner	Phthisis pulmonalis. Certified.
June 12	74	Thatcher -	Myelitis, 3 months. Certified.
„ 19	37	Ostler - -	Nephria. Palsy. Certified.
„ 19	62	Farm labourer	Age. Certified.
„ 21	22	Clerk - -	Phthisis. Certified.
25	16	Shoemaker's apprentice.	Tubercular peritonitis, 3 months. certified.
27	74	Shoemaker -	Bronchitis, 3 months. Certified.
„ 26	54	Grocer - -	Diseased kidneys. Abscess in pelvis. Certified.
„ 28	76	Farmer and miller.	Gout. Epilepsy. Certified.
July 5	54	Farm labourer	Consumption, 18 months. Certified.
„ 20	43	Labourer -	Encephalitis. Certified.
„ 21	30	Farm labourer	Phthisis, 18 months. Certified.
„ 21	80	Farm labourer	Old age. No medical attendant.
„ 23	69	Wheelwright	Apoplexy. Certified.
„ 29	65	Shoemaker, master.	Paralysis, 9 years. Certified.
„ 27	98	Master mariner	Bronchitis. Certified.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
July 30	27	Butcher -	Diseased heart. Certified.
„ 30	66	Fisherman -	Paralysis, 11 months. Not certified.
Aug. 4	69	Tin miner -	Fever. Certified.
„ 11	52	Blacksmith -	Phthisis, 12 months. Certified.
„ 17	19	Ropemaker's apprentice.	Rheumatism. Pericarditis. Certified.
„ 23	65	Postmaster -	Carbuncles. Certified.
„ 25	58	Brewer, journeyman.	Phthisis, 8 months. Certified.
„ 27	51	Coast Guard -	English cholera, 11 days. Certified.
„ 26	14	Son of mariner	Accident. Drowned. Inquest.
„ 29	17	Son of blacksmith.	Phthisis. Certified.
„ 27	55	Fundholder -	Rheumatic gout. Bronchitis. Certified.
„ 26	19	Carpenter's apprentice.	Phthisis, 3 months. Certified.
Sept. 1	80	Shoemaker -	Old age. No medical attendant.
„ 6	31	Painter - -	Diseased kidneys. Phthisis. Certified.
„ 9	82	Paper maker -	Old age. Certified.
„ 1	58	Printer - -	Suicide. Strangulation. Inquest.
„ 11	51	Fisherman	Diseased heart, 12 months. Certified.
„ 13	73	Ropemaker, master.	Paralysis, 14 months. Certified.
„ 13	67	Farmer - -	Premature old age. Certified.
„ 10	63	Shoemaker, master.	Rheumatism. Certified.
„ 15	81	Shoemaker, master.	Old age. Not certified.
„ 18	28	Tin miner -	Diseased brain. Certified.
„ 29	29	Clerk - -	Unknown. Certified.
„ 26	64	Farmer - -	Paralysis. Certified.
Oct. 5	22	Mariner, merchant service.	Consumption, 11 weeks. Not certified.
„ 4	36	Dealer in marine stores.	Palsy, 12 months. Certified.
„ 8	56	Blacksmith, journeyman.	Palsy, 2 years. Diarrhœa, 2 months. Certified.
„ 11	71	Fisherman -	Stomach complaint. Not certified.
„ 11	62	Farmer	Phthisis, 6 months. Certified.
„ 17	54	Labourer -	Dropsy, 4 months. Certified.
„ 20	38	Master mariner	Typhoid fever, 11 days. Certified.
„ 16	69	Schoolmaster	Apoplexy, 2 hours. Certified.
„ 24	77	Wheelwright	Diseased heart. Certified.
„ 29	74	Street sweeper	Old age. Certified.
Nov. 2	74	Miner - -	Old age. No medical attendant.
„ 2	18	Tanner's apprentice.	Typhus, 8 weeks. Certified.
„ 5	37	Shoemaker, journeyman.	Phthisis, 3½ years. Diarrhœa, 3 months. Certified.
„ 8	31	Farm labourer	Typhoid fever, 6 months. Certified.
„ 16	49	Son of farm labourer.	Epilepsy. Idiotic from infancy. Certified.
„ 7	22	Son of farmer	Pleurisy. Dropsy. Certified.
„ 20	57	Farm labourer	Hydrothorax, 6 months. Certified.
„ 24	81	Clockmaker, master.	Influenza, 5 days. Bronchitis. Certified.
„ 25	65	Innkeeper -	Hypertrophy of heart. Fever. Certified.
„ 21	37	Seaman, R.N.	Diseased heart, 12 months. Certified.
„ 23	11	Son of yeoman	Typhus, 20 days. Congestion of brain, 12 days. Certified.
„ 27	59	Cabinet maker	Paralysis. No medical attendant.
„ 27	38	Groom - -	Phthisis, 5 months. Certified.
Dec. 1	85	Farm labourer	Old age. Certified.
„ 1	83	Fisherman -	Palsy. Certified.
Nov. 23	80	Seaman, R.N.	Paralysis. Certified.
Dec. 5	83	Shoemaker, master.	Old age. Certified.
„ 6	21	Thread manufacturer.	Phthisis. Certified.
„ 8	78	Superannuated, Coast Guard.	Old age. Not certified.
„ 10	78	Farm labourer	Old age. Not certified.
„ 12	21	Miner - -	Injuries in a mine. Inquest.
„ 15	28	Barrister -	Consumption, 3 years. Certified.
„ 12	56	Farmer - -	Phthisis, 18 months. Certified.
„ 19	19	Butcher -	Phthisis, 7 months. Certified.
„ 20	36	Farmer - -	Congestion of lungs. Certified.
„ 20	21	Fisherman -	Consumption, 1 year. Certified.
„ 25	64	Farmer - -	Pneumonia, 14 days. Certified.
„ 29	75	Fisherman -	Stomach complaint, 2 years. Not certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Dec. 30	79	Fisherman -	Senile gangrene, 11 weeks. Certified.
„ 30	30	Stonemason, journeyman.	Pneumonia. Jaundice. Certified.
„ 30	63	Shoemaker -	Paralysis, 2 months. Certified.
1860.			
Jan. 7	87	Groom - -	Old age. No medical attendant.
„ 13	75	Fisherman -	In consequence of a fall. Certified.
„ 21	61	Soldier, pensioner.	Injury of knee. Diarrhœa. Certified.
„ 23	47	Farm labourer	Pneumonia, 2 days. Certified.
„ 24	64	Shipwright -	Softening of brain, 2 years. Certified.
„ 16	85	Soldier, pensioner.	Age. Certified.
„ 26	76	Tin miner -	Age. No medical attendant.
Feb. 1	81	Sawyer - -	Paralysis. Certified.
Jan. 28	68	Hatter - -	Consumption, 12 months. Certified.
Feb. 9	20	Son of clergyman.	Phthisis, 5 years. Certified.
„ 15	74	Builder -	Influenza. Certified.
„ 16	82	Fisherman -	Paralysis. Certified.
„ 15	59	Collector of poor rates.	Paralysis, 8 months. Certified.
„ 16	51	Labourer -	Consumption. Certified.
„ 17	76	Farm labourer	Age. Certified.
„ 19	76	Mason - -	Age. Certified.
„ 22	85	Cellarman -	Dementia. Certified.
„ 25	75	Farm labourer	Pneumonia. Certified.
„ 27	92	Mariner -	Bronchitis, 10 days. Certified.
„ 28	74	Shoemaker, master.	Asthma. Certified.
Mar. 3	27	Tanner -	Scrofula. Certified.
„ 10	47	Clergyman -	Diseased liver, 18 months. Certified.
„ 12	43	Waggon driver	Fever, 6 weeks. Certified.
„ 16	76	Farmer - -	Pneumonia, 8 days. Certified.
„ 16	23	Gardener, journeyman.	Cephalitis, 3 days. Certified.
„ 11	20	Seaman -	Found drowned. Inquest.
„ 27	66	Clerk - -	Congestion of lungs, 8 days. Certified.
„ 28	63	Market gardener.	Diseased stomach, 1 year. Certified.
April 3	53	Labourer -	Phthisis, 16 months. Certified.
„ 3	60	Farm labourer	Bronchitis. Influenza, 2 months. Certified.
„ 5	72	Tanner, journeyman.	Apoplexy. Certified.
„ 11	15	Son of farmer	Cephalitis, 2 days. Certified.
„ 14	85	Solicitor -	Old age. Certified.
„ 15	68	Farmer - -	Bronchitis. Influenza. Certified.
„ 22	32	Mariner, merchant service	Diseased liver, 2 years. Dropsy, 9 months. Certified.
„ 23	65	Farm labourer	Consumption, 3 years. Certified.
„ 23	59	Farm labourer	Phrenitis. Certified.
„ 21	14	Son of tin miner	Epilepsy, 6 years. Certified.
„ 27	55	Dealer in marine stores.	Bronchitis. Diseased heart. Certified.
„ 26	90	Carpenter, master.	Age. Certified.
„ 27	80	Farm labourer	Age. Certified.
„ 28	76	Yeoman -	Age. Certified.
May 1	57	Labourer -	Diseased brain. Certified.
„ 7	66	Gardener -	Dyspepsia, 1 year. Certified.
„ 5	62	Tin streamer	Cancer. Certified.
„ 11	65	Gardener -	Bronchitis. Certified.
„ 20	67	Fisherman -	Hydrothorax. Certified.
„ 24	58	Fisherman -	Diseased stomach. Certified.
„ 24	16	Carpenter's apprentice.	Intermittent fever. Certified.
June 4	72	Carpenter -	Diseased heart. Inquest.
„ 10	93	Landed proprietor.	Age. Certified.
„ 11	57	Labourer -	Fracture of skull. Inquest.
„ 17	82	Superannuated, Coast Guard	Old age. Certified.
„ 20	42	Farmer - -	Natural death. Inquest.
„ 26	20	Seaman, R.N.	Phthisis, 12 months. Certified.
„ 28	11	Son of solicitor	Tracheitis, 6 days. Certified.
„ 27	66	Labourer -	Hydrothorax. Certified.
July 16	65	Sawyer - -	Cerebritis. Certified.
„ 25	43	Fisherman -	Found dead in bed. Inquest.
Aug. 1	43	Mason, journeyman.	Pleurisy, 6 days. Certified.
July 31	74	Farm labourer	Age. Certified.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Aug. 11	16	Son of fisherman	Phthisis, 2 years. Certified.
„ 17	44	Tin miner -	Decline, 12 months. Not certified.
„ 23	11	Son of hawker	Diseased hip joint. Certified.
„ 28	49	Wheelwright, master.	Diseased heart, 4 months. Certified.
Sept. 1	82	Seaman, R.N.	Old age. No medical attendant.
„ 6	74	Gardener -	Hydrothorax. Certified.
„ 7	35	Farmer - -	Consumption, 12 months. Certified.
„ 9	66	Gentleman -	Diseased heart. Certified.
„ 15	78	Fisherman -	Age. Certified.
„ 19	70	Chimney sweep	Age. Certified.
„ 22	59	Schoolmaster	Hydrothorax. Certified.
„ 28	89	Tin streamer -	Old age. Certified.
Oct. 2	25	Clerk - -	Phthisis, 6 months. Certified.
„ 4	69	Baker, master	Unknown. No medical attendant.
„ 2	66	Carpenter -	Phthisis, 2 years. Certified.
Oct. 7	66	Tanner, journeyman.	Albuminuria. Certified.
„ 10	51	Copper miner	Phthisis, 6 months. Certified
„ 10	62	Mason, master	Cancer. Certified.
„ 5	41	Mason, journeyman.	Paralysis. Certified.
„ 12	33	Policeman -	Typhus, 4 weeks. Certified.
„ 20	60	Gentleman -	Visitation of God. Inquest.
„ 22	62	Corn factor -	Paralysis. Certified
„ 20	43	Tin miner -	Consumption. Certified
„ 20	39	Engine man -	Suicide, not stated how. Inquest.
„ 30	33	Coast Guard -	Consumption, 12 months, Certified.
Nov. 14	46	Farmer -	Pneumonia. Certified.
„ 18	77	Jewish Rabbi	Apoplexy. Certified.
„ 23	32	Officer, Inland Revenue.	Phthisis. Certified.
„ 13	33	Jeweller - -	Diseased prostate gland. Certified.
„ 28	77	Fisherman -	Diseased stomach, 12 months. Certified.
Dec. 1	66	Fisherman -	Incontinence of urine, 12 months. Certified.
„ 4	40	Tin miner -	Hydrothorax, 12 months. Certified.
„ 8	27	Stone cleaver -	Contusions. Tetanus, 2 days. Certified.
„ 6	19	Carpenter, apprentice.	Pulmonary consumption. Certified.
„ 9	85	Labourer, farm	Old age. Certified.
„ 18	65	Gardener -	Fever. Certified.
„ 24	50	Carpenter, master	Hydrothorax, 6 months. Certified.
„ 25	35	Mariner, merchant service.	Paralysis, 9 months. Certified.
„ 26	57	Mariner, merchant service.	Phthisis, 6 months. Certified.
„ 27	68	Smith, master	Dyspepsia, 1 year. Certified.
1861.			
Jan. 1	69	Cooper -	Diseased bladder. Certified,
„ 1	88	Farmer -	Old age. Not certified.
„ 1	45	Mine purser	Abscess, 9 months. Certified.
Jan. 5	32	Solicitor -	Consumption. Certified.
„ 15	89	Gardener -	Old age. Certified.
„ 14	46	Labourer -	Fever, 17 days. Certified.
„ 16	73	Wesleyan minister. - -	Congestion of lungs. Certified.
„ 14	66	Tin Miner -	Bronchitis. Phthisis. Certified.
„ 20	68	Fisherman -	Diseased prostate gland, 16 months. Certified.
„ 23	70	Lieut.Col., R.A.	Phthisis. Certified.
„ 25	42	Fisherman -	Ulcered intestines. Certified.
„ 29	16	Tin miner -	Phthisis. Certified.
Feb. 6	66	Mariner, merchant service.	Hepatitis, 5 months. Certified.
„ 8	16	Son of surgeon	Phthisis, 2 years. Certified.
„ 21	77	Postmaster -	Bronchitis. Ceriified.
„ 18	35	Seaman -	Drowned. Inquest.
„ 18	30	Master mariner	Drowned. Inquest.
„ 23	66	Carpenter -	Hydrothorax. Certified.
„ 18	31	Mariner -	Accident. Drowned. Inquest.
„ 18	34	Mariner -	Accident. Drowned. Inquest.
„ 18	18	Mariner -	Accident. Drowned. Inquest.
„ 28	17	Mariner -	Injuries. Fall from mast. Inquest.
„ 28	45	Seaman -	Found drowned. Inquest.
„ 18	24	Seaman -	Found drowned. Inquest.
Mar. 2	29	Clerk - -	Typhus, 18 days. Certified.
„ 6	54	Mariner -	Bronchitis. Certified.
„ 9	37	Gardener -	Diseased brain. Certified.
„ 10	73	Labourer -	Old age. No medical attendant.
„ 14	21	Pupil teacher -	Epilepsy. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
Mar. 14	63	Idiot - -	Apoplexy. Certified.
,, 20	19	Son of innkeeper	Typhus, 11 days. Certified.
,, 21	39	Artist - -	Consumption, 3 months. Certified.
,, 21	76	Land owner -	Jaundice. Certified.
,, 23	84	Fisherman -	Old age. Certified.
,, 25	25	Shoemaker, journeyman.	Phthisis, 5 months. Certified.
,, 27	41	Fisherman -	Diseased kidneys, 2 months. Certified.
,, 27	63	Printer - -	Ulcerated intestines, 12 months. Certified.
Apr. 3	17	Son of farmer	Phthisis, 3 years. Certified.
,, 6	23	Jewish Rabbi-	Ileus. Certified.
,, 12	10	Son of fisherman.	Meningitis, 4 days. Certified.
,, 16	26	Farm labourer	Consumption, 1 year. Certified.
,, 18	33	Master mariner	Suicide by hanging. Inquest.
,, 27	88	Master mariner	Hæmoptysis. Certified.
,, 30	80	Porter - -	Old age. Certified.
May 10	44	Painter, master	Phthisis, 3 months. Certified.
,, 9	52	Fisherman -	Caries. Certified.
,, 10	46	Farmer -	Typhus. Cancer.
,, 10	72	Builder -	Cancer. Certified.
,, 11	79	Woolstapler -	Age. Certified.
,, 11	73	Shoemaker -	Morbus cordis. Certified.
,, 14	19	Carpenter, apprentice.	Pneumonia, 12 days.
,, 19	39	Farmer -	Suicide by hanging. Inquest.
June 9	67	Shipwright, master.	Hernia. Certified.
,, 14	68	Coast Guard, superannuated.	Cancer. Certified.
,, 17	19	Serpentine turner.	Phthisis, 10 months. Certified.
,, 19	47	Mason - -	Fractured skull. Inquest.
,, 19	35	Shoemaker, journeyman.	Phthisis. Certified.
,, 21	20	Millwright, journeyman.	Typhus, 20 days. Certified.
,, 24	70	Shoemaker, master.	Paralysis. Certified.
July 2	30	Coach smith -	Consumption, 8 months. Certified.
,, 13	70	Farm labourer	Paralysis, 10 days. Certified.
,, 15	71	Mason, master	Stricture of intestine. Certified.
,, 20	67	Shoemaker -	Paralysis. Certified.
,, 23	80	Fisherman -	Diseased stomach, 3 years. Certified.
,, 28	25	Carrier - -	Drowned: upset out of a boat. Inquest.
Aug. 3	46	Solicitor -	Cancer. Certified.
,, 4	75	Farmer -	Paralysis, 10 days. Certified.
,, 8	67	Farm labourer	Phlegmon. Certified.
,, 18	60	Bailiff, County Court.	Diarrhœa, 5 days. Certified.
,, 21	71	Ropemaker, journeyman.	Pneumonia, 7 weeks. Certified.
,, 22	26	Printer, master	Phthisis, 9 months. Certified.
,, 23	76	Groom - -	English cholera. Certified.
,, 24	46	Fisherman -	Consumption, 9 months. No medical attendant.
,, 31	75	Builder, master	Jaundice, 3 weeks. Certified.
Sept. 6	20	Sailmaker, journeyman.	Consumption. Certified.
,, 14	19	Son of farmer	Fever, 14 days. Certified.
,, 15	31	General broker	Phthisis, 3 months. Certified.
,, 20	39	Beer-house keeper.	Diseased prostate gland, 6 years. Certified.
,, 22	25	Fisherman -	Diseased heart. Asthma, 6 months. Certified.
,, 29	24	Draper's assistant.	Phthisis, 3 years. Certified.
,, 29	71	Leather seller	Pneumonia. Certified.
,, 23	63	Fisherman -	Drowned. Inquest.
,, 29	19	Shoemaker, journeyman.	Typhus, 14 days. Certified.
,, 20	13	Son of chemist	Epilepsy, 10 years. Certified.
Oct. 7	85	Superannuated, Coast Guard.	Sudden. Age. Certified.
,, 8	18	Blacksmith -	Typhus. Certified.
Sept 23	13	Fisherman -	Accident. Drowned. Inquest.
Oct. 15	59	Carpenter, journeyman.	Fever, 8 weeks. Diseased kidneys. Post-mortem. Certified.
,, 22	41	Mariner, merchant service.	Consumption, 12 months. Certified.
,, 21	49	Cart driver -	Nephria, 10 months. Certified.
,, 26	74	Captain, R.N.	Enteritis, 4 weeks. Certified.
,, 25	17	Shipwright -	Typhus, 16 days. Certified.
1861.			
Oct. 28	68	Shoemaker -	Diseased heart. Certified.
,, 29	53	Lobourer -	Aneurism. Certified.
,, 31	72	Cabinet maker	Pulmonary congestion, 4 days. Certified.
Nov. 2	50	Tin miner -	Consumption, 12 months. Certified.
,, 3	78	Fisherman -	Diarrhœa. Certified.
,, 9	78	Fisherman -	Old age. No medical attendant.
,, 17	21	Gardener -	Typhus, 18 days. Certified.
,, 25	55	Coal porter -	Dropsy. Certified.
,, 19	60	Pedlar - -	Palsy. Certified.
,, 23	67	Builder, master	Tumour in neck. Certified.
,, 29	45	Barrister -	Œdema of glottis. Certified.
,, 26	40	Tin miner -	Bronchitis. Certified.
Dec. 14	32	Clergyman -	Phthisis. Certified.
,, 18	80	Cooper, master	Old age. No medical attendant.
,, 16	72	Bootmaker -	Palsy. Certified.
,, 22	67	Commander, R.N.	Apoplexy. Certified.
,, 28	75	Fisherman -	Old age. No medical atendant.
,, 22	67	Commander, R.N.	Sudden. Inquest.

Sub-district - 5. St. Just-in-Penwith.

1859.			
Jan. 12	44	Tin miner -	Phthisis. Hæmorrhage, 8 months. Certified.
,, 20	13	Son of labourer.	Accidental death: crushed. Inquest.
,, 29	50	Farmer - -	Laryngitis. Certified.
,, 29	13	Son of miner	Bronchitis. Certified.
Feb. 4	61	Miner - -	Apoplexy. Inquest.
,, 20	15	Son of miner	Rheumatic fever. Endocarditis. Certified.
,, 19	22	Mine labourer	Found dead in a shaft; supposed to have fallen in. Inquest
Mar. 9	25	Son of tin miner.	Scrofula. Certified.
,, 21	64	Schoolmaster -	Diseased prostate gland, 2 years. Cystitis, 6 weeks.
,, 31	48	Mine engine driver.	Phthisis pulmonalis. Certified.
Apr. 1	50	Tin miner -	Bronchitis. Certified.
,, 3	44	Tin miner -	Asthma. Anasarca. Certified.
,, 8	62	Tin miner -	Debility. Certified.
,, 12	50	Tin miner -	Debility. Certified.
,, 17	64	Tin miner -	Dyspepsia. Certified.
,, 27	66	Farmer - -	Bronchitis. Certified.
,, 29	74	Farm labourer	Senile gangrene. Certified.
May 4	27	Son of tin miner	Consumption. Certified.
,, 23	67	Mine agent -	Consumption. Not certified.
,, 30	41	Tin miner -	Phthisis, 6 months. Certified.
June 12	57	Tin miner -	Myelitis. Certified.
,, 11	35	Tin miner -	Nephria. Coma. Certified.
,, 19	66	Tin miner -	Synocha. Bronchitis. Certified.
,, 22	58	Tin miner -	Dropsy. Certified.
,, 25	26	Tin dresser -	Irritant poisoning by arsenic, 7 weeks. Epileptic convulsions, 8 days. Certified.
,, 25	43	Cart driver -	Accidental death. Upset with his cart while riding thereon. Inquest.
,, 29	32	Tin miner -	Phthisis. Certified.
July 18	38	Tin miner -	Bronchitis. Typhus. Certified.
,, 21	58	Miner - -	Accident. Crushed under a mass of rubbish. Inquest.
,, 25	68	Tin miner -	Anasarca. Certified.
,, 28	95	Farmer - -	Unknown. No medical attendant.
Aug 11	55	Farm labourer	Bronchitis. Phthisis. Certified.
,, 7	26	Son of clergyman.	Phthisis. Certified.
,, 29	25	Son of farmer	Phthisis, 8 months. Certified.
Sept. 4	39	Tin miner -	Phthisis. Certified.
,, 3	42	Civil engineer	Scalded. Inquest.
,, 20	37	Farmer - -	Consumption. Not certified.
,, 16	48	Merchant -	Natural death. Inquest.
Oct. 6	40	Tin miner -	Injury. Broken rib. Gastritis. Certified.
,, 6	57	Carpenter -	Enteritis. Ileus. Certified.
,, 11	96	Farmer - -	Senectus. Certified.
,, 16	49	Tin miner -	Bronchitis. Phthisis. Certified.
Nov. 6	66	Tin miner -	Jaundice. Certified.
,, 14	46	Tin miner -	Pneumonia. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Nov. 19	55	Tin miner -	Pneumonia, 7 days. Certified.
„ 21	68	Tin miner -	Fever, 6 days. Certified.
Dec. 8	53	Tin miner -	Asthma, 2 years. Certified.
„ 28	93	Farmer - -	Unknown. No medical attendant.
1860			
Jan. 10	35	Son of miner	Fever. Certified.
„ 26	49	Blacksmith -	Sudden death. Inquest.
Feb. 2	52	Tin miner -	Phthisis. Certified.
„ 7	23	Son of miner	Consumption. Certified.
„ 10	34	Tin dresser -	Phthisis. Hydrocephalus. Certified.
„ 20	88	Farmer - -	Old age. Certified.
„ 21	21	Miner - -	Injuries to his head. Inquest.
„ 26	23	Tin miner -	Scrofula, 1 year. Certified.
„ 26	45	Tin miner -	Phthisis. Certified.
„ 28	86	Tin miner -	Unknown. No medical attendant.
Mar. 2	59	Tin miner -	Phthisis. Certified.
„ 4	57	Farmer -	Debility. Certified.
„ 9	10	Son of mine labourer.	Croup. Certified.
„ 17	30	Tin miner -	Ulceration of stomach. Certified.
Apr. 1	22	Son of miner	Typhus. Certiffed.
„ 6	77	Farmer -	Debility. Certified.
„ 19	48	Farm labourer	Phthisis, 8 months. Certified.
„ 22	60	Tin miner -	Lumbar abscess. Certified.
„ 23	37	Tin miner -	Fever. Pneumonia. Certified.
„ 26	20	Tin miner -	Injuries. Crushed under a mass of rubbish. Inquest.
May 1	18	Son of tin miner	Fever, Certified.
„ 4	36	Son of farmer	Cancer of liver. Certified.
„ 14	66	Shoemaker -	Unknown. No medical attendant.
„ 11	43	Grocer and draper.	Diseased lungs, 2 years. Hæmoptysis. Certified.
„ 28	54	Farmer -	Influenza. Certified.
„ 29	49	Tin miner -	Unknown. No medical attendant.
„ 31	10	Son of miner -	Accident. Falling into a shaft. Inquest.
June 4	77	Tin miner -	Bronchitis, 2 months. Certified.
„ 12	55	Tin miner -	Diseased heart. Asthma. Certified.
„ 23	19	Miner - -	Injuries from fall into a shaft. Inquest.
July 6	50	Tin miner -	Bronchitis. Certified.
„ 7	49	Mine labourer	Paralysis. Certified.
„ 6	50	Farmer -	Enteritis, 3 weeks. Certified.
„ 25	34	Tin dresser -	Pneumonia. Phthisis. Certified.
„ 26	37	Tin miner -	Phthisis. Bronchitis. Certified.
„ 27	63	Tin miner -	Unknown. No medical attendant.
„ 29	45	Tin miner -	Phthisis. Certified.
Aug. 10	40	Tin miner -	Hepatitis. Ascites. Certified.
„ 20	17	Miner - -	Injuries by rubbish falling on him. Inquest.
Sept. 1	66	Tin miner -	Phthisis. Certified.
„ 6	42	Carpenter -	Dropsy. Certified.
„ 4	29	Miner - -	Injuries by the explosion of a hole in Spearn Consols Mine. Inquest.
„ 10	44	Tin miner -	Hypertrophy of heart. Certified.
„ 10	60	Tin miner -	Phthisis. Certified.
„ 6	38	Miner - -	Natural death. Inquest.
„ 25	56	Tin miner -	Phthisis. Certified.
„ 27	14	Son of miner -	Accident. Fall into a shaft. Inquest.
Oct. 18	36	Mine labourer	Atrophy of liver. Certified.
„ 27	16	Miner - -	Suffocated. Buried under a mass of rubbish. Inquest.
„ 29	54	Tin miner -	Bronchitis. Phthisis. Certified.
„ 30	20	Son of tin miner	Pneumonia. Certified.
Nov. 29	45	Farmer -	Hepatic disease. Certified.
Dec. 17	70	Farmer -	Paralysis. Not certified.
„ 23	80	Tin miner -	Bronchitis. Certified.
„ 25	72	Tin miner -	Angina pectoris. Certified.
„ 28	77	Farmer -	Ileus. Typhus. Certified.
„ 30	66	Tin miner -	Dropsy. Certified.
1861.			
Jan. 2	25	Seaman -	Drowned Inquest.
„ 5	10	Son of tin miner	Fever. Certified.
„ 6	62	Tin miner -	Debility. Certified.
„ 5	20	Labourer -	Accident. Drowned. Inquest.
„ 12	64	Tin miner -	Asthma, 4 years. Certified.
„ 12	53	Miner - -	Natural death. Inquest.
„ 11	17	Seaman -	Drowned. Inquest,
„ 13	45	Seaman -	Drowned. Inquest.
„ 6	35	Seaman -	Drowned. Inquest.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
Jan. 7	25	Seaman -	Drowned. Inquest.
„ 8	25	Seaman -	Drowned. Inquest.
Jan. 24	51	Mine agent -	Killed, whilst ascending in man engine, Levant Mine. Inquest.
„ 31	67	Tin miner -	Debility. Certified.
Feb. 7	63	Farmer - -	Bronchitis. Certified.
„ 22	83	Farmer - -	Unknown. No medical altendant.
„ 24	52	Tin miner -	Phthisis. Certified.
„ 27	55	Tin miner -	Neuralgia. Certified.
Mar. 5	89	Tin miner -	Unknown. No medical attendant.
„ 18	70	Tin miner -	Debility. Certified.
„ 25	48	Tin miner -	Asthma. Certified.
„ 27	48	Tin miner -	Bronchitis. Certified.
„ 30	48	Tin miner -	Phthisis. Certified.
Apr. 11	59	Tin miner -	Diseased heart. Asthma. Certified.
„ 24	44	Shoemaker -	Phthisis. Certified.
„ 26	19	Son of tin miner	Phthisis. Certified.
„ 26	59	Tin miner -	Abscess of liver. Certified.
May 31	12	Son of blacksmith.	Fever. Certified.
June 8	82	Farmer -	Diseased heart. Dropsy. Certified.
„ 8	40	Miner - -	Injuries to his back. Inquest.
July 2	18	Son of farmer	Phthisis. Certified.
„ 4	68	Gentleman -	Diseased liver and heart. Certified.
„ 9	51	Labourer -	Rupture of the lungs. Inquest.
„ 17	85	Farm labourer	Old age. Not certified.
„ 31	47	Tin miner -	Diseased heart. Bronchitis. Certified.
Aug 30	51	Mine agent -	Typhus. Carditis. Certified.
Sep. 20	37	Tin miner -	Phthisis. Asthma. Certified.
Oct. 2	50	Tin miner -	Bronchitis. Certified.
„ 3	21	Tin miner -	Phthisis, 1 year. Certified.
„ 4	45	Tin miner -	Diseased heart. Certified.
„ 10	41	Mine agent -	Found dead. Inquest.
Nov. 5	46	Tin miner -	Bronchitis. Certified.
„ 1	29	Tin miner -	Phthisis. Certified.
„ 9	61	Tin miner -	Bronchitis. Certified.
„ 23	44	Tin miner -	Phthisis pulmonalis. Certified.
„ 25	35	Civil engineer	Natural death. Inquest.
„ 30	77	Mine engine driver.	Bronchitis. Apnœa. Certified.
Dec. 8	57	Miner - -	Accident : falling down a flight of steps. Inquest.
„ 14	59	Tin miner -	Bronchitis Not certified.
„ 25	21	Tin Miner -	Phthisis. Diarrhœa. Certified.
„ 27	72	Blacksmith -	Paralysis. Certified.

Sub-district - 6. St. Buryan.

1859.			
Jan. 7	11	Son of farm labourer.	Diphtheria. Certified.
„ 6	10	Son of farmer	Cynanche maligna. Certified.
„ 15	13	Son of farmer	Cynanche maligna. Certified.
Feb. 18	29	Fisherman -	Phthisis. Certified.
Mar. 5	84	Farm labourer	Diarrhœa. No medical attendant.
Apr. 1	69	Farm labourer	Debility. No medical certificate.
„ 29	70	Farmer -	Phthisis. No medical attendant.
„ 27	65	Son of farmer	Disease of stomach, Not certified.
May 19	69	Farmer -	Ulcerated stomach. Certified.
„ 36	19	Son of farm labourer.	Diarrhœa. Not certified.
June 3	76	Farmer -	Retention of urine. No medical attendant.
„ 10	38	Farm labourer	Synocha, 7 days. Pleurisy, 5 days. Certified.
July 7	83	Farmer -	Phlegmon. No medical attendant.
„ 9	72	Farmer -	Cancer of stomach. Certified.
Aug. 15	79	Fisherman -	Debility. No medical attendant.
Oct. 4	57	Farm labourer	Dyspepsia. Certified.
Dec. 3	19	Farmer -	Accident. Discharge of a gun. Inquest.
„ 20	59	Farmer -	Cancer of stomach. Certified.
„ 24	36	Farm labourer	Phthisis. Not certified.
1860.			
Mar. 23	74	Farm labourer	Retention of urine. Certified.
Apr. 21	69	Farm labourer	Dyspepsia. Certified.
May 2	45	Carpenter -	Consumption, 3 months. Certified.
„ 31	49	Farm labourer	Phthisis. No medical attendant.
June 21	64	Farm labourer	Debility. No medical attendant.
July 1	77	Farm labourer	Enteritis. Certified.
„ 1	66	Gardener -	Paralysis. Certified.

COUNTY OF CORNWALL.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
July 29	69	Farmer -	Debility. No medical attendant.
Aug. 31	67	Farm labourer	Bronchitis. Certified.
Sept. 15	63	Farmer -	Fever. Certified.
Aug. 4	87	Shoemaker -	Old age. Certified.
Oct. 5	18	Farm labourer	Injuries from the wheel of a waggon passing over him. Certified.
„ 6	48	Lieut., R.N. -	Consumption, 6 months. Certified.
Nov. 12	45	Farm labourer	Congestion of liver. Certified.
Dec. 18	84	Farm labourer	Debility. No medical attendant.
1861.			
Jan. 3	56	Farmer -	Typhoid. Abscess. Certified.
„ 10	90	Farm labourer	Debility. No medical attendant.
1861.			
„ 11	95	Farmer -	Debility. Certified.
„ 9	77	Farm labourer	Debility. No medical attendant.
„ 17	29	Farm labourer	Phthisis. Certified.
May 15	78	Farm labourer	Idiotcy. Scrofula. Not certified.
July 12	81	Farmer -	Debility. No medical attendant.
„ 15	65	Fisherman -	Debility. No medical attendant.
„ 18	64	Farm labourer	Apoplexy. Certified.
Aug. 15	71	Thatcher -	Diseased stomach. No medical attendant.
„ 29	85	Farm labourer	Cancer. No medical attendant.
„ 30	26	Labourer -	Found dead. Inquest.
Sept. 28	37	Lighthouse keeper.	Suicide by stabbing. Inquest.
Dec. 23	69	Farmer -	Jaundice. Certified.
„ 30	78	Farm labourer	Debility. No medical attendant.

DISTRICTS IN NORTH OF ENGLAND.

COUNTY OF LANCASTER.

Superintendent Registrar's District.	Registrar's Sub-District.
486. ULVERSTONE.	3. Ulverstone.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859–60–61.

Sub-district - 3. Ulverstone.

1859.			
Jan. 9	75	Agric. labourer	Influenza. Certified.
„ 15	65	Farmer -	Hypertrophy of heart. Certified.
„ 27	42	Agric. labourer	Disease of brain. Certified.
„ 27	23	Agric. labourer	Phthisis, 9 months. Certified.
„ 29	51	Agric. labourer	Dropsy, 2 weeks. Certified.
Feb. 5	68	Carpenter -	Palsy, many years. Certified.
„ 8	49	Farmer -	Diseased heart. Certified.
„ 12	84	Farmer -	Influenza, 3 weeks. Certified.
„ 13	73	Agric. labourer	Old age. Certified.
„ 18	45	Joiner - -	Phthisis, 2 years. Certified.
„ 24	70	Cooper - -	Senile decay. Certified.
„ 21	19	Labourer iron mine.	Struck by something falling down an iron-ore pit at Lindale Moor in the parish of Dalton. Inquest.
„ 28	70	Horsebreaker	Diseased heart. Certified.
Mar. 1	80	Farmer -	Senile decay. Certified.
„ 6	77	Flax dresser -	Old age. Not certified.
„ 12	25	Iron miner -	Pneumonia. Certified.
„ 7	66	Labourer iron mine.	Natural causes. Not Certified.
„ 25	76	Mariner -	Hemiplegia. Certified.
„ 24	50	Mariner -	Diseased liver, 6 months. Certified.
„ 29	85	Master mariner	Senile decay. Certified.
„ 30	50	An idiot -	Gastritis, 6 months.
Apr. 8	41	Shoemaker, journeyman.	Diarrhœa, 14 days. Gastritis, 4 days. Certified.
„ 9	53	Agric. labourer	Phthisis, 2 years. Certified.
„ 15	57	Painter -	Phthisis, 1 year. Certified.
„ 20	61	Iron miner -	Diseased brain. Certified.
„ 25	71	Basket maker	Phthisis. Certified.
„ 25	49	Railway labourer	Phthisis, 2 years. Certified.
„ 24	13	Son of hawker	Phthisis. Certified.
May 1	73	Gentleman -	Peritonitis. Certified.
„ 24	59	Watchmaker -	Delirium tremens. Certified.
July 6	73	Greenwich Pensioner.	Asthma, 3 months. Certified.
„ 4	10	Son of engineer.	Accident. Drowned. Inquest.
„ 19	46	Cabinet maker, master.	Disease of liver. Ascites. Certified.
„ 30	14	Son of labourer	Scrofula, 2 years. Certified.
Aug. 4	27	Agric. labourer	Scrofula. Certified.
„ 11	19	Son of farmer	Phthisis. Certified.
„ 15	84	Labourer -	Visitation of God. Inquest.
„ 18	75	Carrier -	Decay of nature. Certified.
„ 22	82	Agric. labourer	Decay of nature. Certified.
Sep. 12	68	Seller of small wares.	Asthma, 3 months. Certified.
1859.			
Sep. 15	77	Brickmaker, master.	Senile decay. Certified.
„ 18	69	Tailor, master	Febris. Certified.
„ 17	15	Son of slate dresser.	Phthisis, 2 years. Certified.
Oct. 2	64	Agric. labourer	Palsy. Certified.
„ 6	30	Agric. labourer	Arthritis. Certified.
„ 5	77	Cotton manufacturer.	Decay of nature. Certified.
„ 26	51	Solicitor -	Phthisis, 2 years. Certified.
Nov. 13	42	Cotton spinner	Diseased lungs. Certified.
„ 17	82	Wool carder -	Stricture of œsophagus. Certified.
Dec. 3	73	Tailor - -	Phthisis. Certified.
„ 1	37	Draper, master	Diseased liver. Certified.
„ 4	61	Solicitor -	Palsy, 3 years. Certified.
„ 18	70	Labourer -	Diseased heart. Certified.
„ 19	19	Waller, apprentice -	Pneumonia, 9 days. Certified.
„ 25	78	Spade-shaft maker.	Senile decay. Certified.
„ 25	61	Nail maker, journeyman.	Phthisis, 6 months. Certified.
„ 26	72	Tailor, master	Sudden visitation of God. Inquest.
1860			
Jan. 1	79	Labourer	Old age. Certified.
„ 7	79	Tailor -	Old age. Certified.
„ 7	31	Carpenter, journeyman.	Phthisis, 18 months. Certified.
„ 15	72	Agric. labourer	Old age. Certified.
„ 19	66	Tailor, journeyman.	Paralysis, 2 years. Certified.
„ 21	83	Carpenter -	Senile decay. Certified.
Feb. 2	40	Tile maker - -	Abscess. Certified.
„ 3	75	Labourer -	Asthma. Debility. Certified.
„ 6	73	Labourer -	Senile decay. Certified.
„ 5	61	Labourer -	Senile decay. Certified.
„ 5	81	Hand loom weaver.	Senile decay. Certified.
Mar. 2	74	Master mariner	Congestion of lungs. Certified.
„ 6	71	Basket maker journeyman.	Old age. Certified.
„ 4	75	Farmer -	Paralysis. Certified.
„ 23	53	Brewer -	Cirrhosis apoplexy. Certified.
„ 22	53	Stone mason -	Diseased heart, 2 years. Certified.
„ 30	59	Brewer -	Diseased liver, 2 years. Certified.
Apr. 8	46	Iron miner -	Fever, 2 weeks. Certified.
„ 17	42	Labourer -	Epilepsy, 6 months. Certified.
„ 26	22	Clog maker -	Phthisis, 3 months. Certified.
„ 27	19	Confectioner's apprentice.	Phthisis, 3 months. Certified.
„ 30	59	Tanner -	Gangrene. Certified.
May 6	44	Sawyer -	Elephantiasis, 8 years. Certified.
„ 6	71	Gentleman -	Parotitis. Gangrene. Certified.
„ 9	75	Shoemaker -	Old age. No medical attendant.
„ 12	32	Blacksmith -	Phthisis, 6 months. Certified.
„ 15	77	Shoemaker, journeyman.	Asthma. Bronchitis, 1 week. Certified.
„ 16	45	Servant -	Diarrhœa, 1 month. Certified.
„ 16	76	Landed proprietor.	Natural decay. Certified.

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
May 17	52	Spade maker	Pneumonia, 5 days. Certified.
„ 9	39	Station-master	Diseased liver, 1 year. Certified.
„ 25	70	Joiner	Senile decay. Certified.
„ 30	72	Shoemaker, master.	Senile decay. Certified.
June 3	22	Son of hawker	Phthisis, 2 months. Certified.
„ 3	76	Agric. labourer	Senile decay. Certified.
„ 12	71	Shoemaker, journeyman.	Dyspepsia. Certified.
„ 15	60	Engine-driver	Hemiplegia, 1 year. Certified.
July 4	48	Iron miner	Pneumonia, 7 days. Certified.
„ 3	55	Agric. labourer	Diseased liver. Certified.
„ 4	29	Iron miner	Pneumonia. Certified.
„ 5	90	Labourer	Decay of nature. Certified.
June 30	34	Farmer	Fall of ore in iron-ore pit. Inquest.
July 7	84	Labourer	Decay of nature. Certified.
„ 19	65	Carpenter, journeyman.	Diseased heart, 5 years. Certified.
„ 19	57	Labourer	Phthisis, 6 months. Certified.
„ 28	50	Agric. labourer	Phthisis, 6 months. Certified.
Aug. 3	80	Land proprietor	Senile decay. Certified.
„ 8	64	Handloom weaver.	Typhus fever, 7 days. Certified.
„ 13	68	Wesleyan missionary.	Diseased heart. Certified.
„ 13	81	Farmer	Old age. Not certified.
„ 14	28	Tailor	Phthisis, 6 months. Not certified.
„ 17	40	Iron miner	Pleuro-pneumonia, 6 days. Certified.
„ 27	27	Son of land proprietor.	Typhus. Certified.
Sep. 12	56	Painter	Phthisis, 12 months. Certified.
Oct. 3	31	General labourer.	Phthisis, 12 months. Certified.
„ 5	71	General labourer.	Cancer, 12 months. Certified.
„ 10	77	Landed proprietor.	Paralysis, 14 days. Certified.
„ 14	90	Farmer	Decay of nature. Certified.
„ 15	55	Labourer	Typhus fever, 9 days. Certified.
„ 16	21	Son of carpenter.	Phthisis. Certified.
„ 21	68	Cooper, master	Phthisis. Certified.
„ 24	23	Iron miner	Emphysema, 6 weeks. Certified.
Nov. 14	81	Farmer	Decay of nature. Certified.
„ 24	23	Son of labourer	Phthisis, 8 months. Certified.
Dec. 1	74	Mariner	Bronchitis, 2 weeks. Certified.
„ 3	90	Sawyer journeyman.	Senile decay. Certified.
„ 5	36	Iron miner	Pleuro-pneumonia, 3 days. Certified.
„ 14	92	Labourer	Senile decay. Certified.
„ 19	39	Labourer at iron mine.	Fall down a shaft. Inquest.
„ 27	43	Innkeeper	Cephalitis, 24 hours. Certified.
„ 29	13	Son of iron miner.	Phthisis, 5 months. Certified.
„ 31	75	Hawker	Asthma, some years. Certified.
1861.			
Jan. 7	25	Iron miner	Pericarditis. Certified.
„ 4	74	Hawker	Asthma, 12 months. Certified.
„ 4	64	Block maker, master.	Disease of heart. Certified.
„ 12	36	Woollen draper, assistant.	Diabetes. Certified.
„ 15	74	Agric. labourer	Diseased liver, 3 weeks. Not certified.
1861.			
Jan. 15	40	Labourer	Disease of heart. Certified.
„ 20	66	Cellarman	Pneumonia, 4 days. Certified.
„ 21	57	Labourer	Ulcerated legs. Certified.
„ 24	31	Cabinet maker	Phthisis, 6 months. Certified.
„ 25	88	Greenwich pensioner.	Old age. Certified.
Feb. 5	12	Son of blacksmith.	Diseased spine, 6 years. Certified.
„ 15	73	Farmer	Heart disease. Certified.
„ 17	76	Landed proprietor.	Diseased heart, some years. Certified.
„ 26	80	Forgeman, journeyman.	Diarrhœa, 3 months. Certified.
Mar. 2	28	Veterinary surgeon, master.	Delirium tremens. Typhus. Certified.
„ 5	79	Labourer	Senile decay. Certified.
„ 6	36	Nail maker	Natural causes. Inquest.
„ 21	52	Gardener	Typhus fever. Certified.
„ 22	23	Tailor, journeyman.	Phthisis. Certified.
Apr. 2	66	Cotton carder	Dyspepsia, 16 years. Certified.
„ 8	42	Iron miner	Chronic rheumatism, 9 months. Certified.
„ 12	48	Gardener	Phthisis. Certified.
„ 13	68	Weaver	Diseased bladder, 3 weeks. Certified.
„ 22	67	Weaver	Paralysis, 3 months. Certified.
„ 22	61	Ostler	Phthisis. Certified.
May 18	74	Basket maker	Old age. Certified.
„ 22	81	Landed proprietor.	Decay of nature. Certified.
„ 21	44	Iron miner	Fall down an iron-ore shaft. Inquest.
„ 29	18	Son of nail maker.	Phthisis. Certified.
„ 31	48	Solicitor	Diarrhœa, 1 month. Certified.
June 15	54	Basket maker	Diseased heart, 6 months. Certified.
„ 15	74	Agric. labourer	Decay of nature. Certified.
„ 14	48	Tanner	Cut his throat (suicide). Inquest.
May 1	75	Joiner, master	Bronchitis, 6 days. Certified.
July 20	21	Son of butcher	Phthisis. Certified.
„ 27	82	Formerly a soldier.	Natural causes. Inquest.
„ 31	13	Son of a waller	Dragged by a cow. Inquest.
Aug 13	75	Handloom weaver.	Paralysis. Certified.
„ 19	36	Stonemason, journeyman.	Phthisis, 18 months. Certified.
„ 29	59	Blacksmith, journeyman.	Axillary abscess, 3 months. Certified.
Sept. 6	81	Labourer	Senile decay. Certified.
„ 19	46	Mariner	Abscess of the thigh. Certified.
„ 28	70	Labourer	Asthma. Certified
Oct. 13	71	Labourer	Old age. Not certified.
Nov. 4	49	Agric. labourer	Intussusceptio, 4 days. Certified.
„ 14	19	Son of ironmonger, master.	Phthisis, 16 months. Certified.
„ 13	55	Iron miner	Accident. Fall down the shaft of an iron-ore pit. Inquest.
„ 19	72	Joiner, journeyman.	Chronic cystitis, 4 months. Certified.
„ 25	37	Plasterer	Cirrhosis. Certified.
„ 28	71	Surgeon	Diseased brain, 2 years. Certified.
Dec. 10	16	Son of Surgeon	Synochus, 9 days. Certified.
„ 19	79	Labourer	Senile gangrene, 2 weeks. Certified.

COUNTY OF YORK.

Superintendent Registrar's District.	Registrar's Sub-District.
522. SKIRLAUGH.	2. Skirlaugh.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859–1861.

Sub-district - 2. Skirlaugh.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 2	13	Agric.labourer	Enteritis, 1 week. Certified.
Feb. 15	69	Agric.labourer	Diarrhœa, 7 days. Certified.
Mar 1	73	Farmer -	Diseased heart. Not certified.
June12	67	Agric.labourer	Apoplexy, 14 hours. Certified.
Aug. 3	30	Agric.labourer	Diseased heart Certified.
„ 18	42	Agric.labourer	Cholera, 2 days. Certified.
Sept.13	81	Agric.labourer	Old age. Diarrhœa. Certified.
„ 19	62	Agric.labourer	Diarrhœa. Not certified.
Oct. 6	22	Wheelwright	Phthisis, 5 months. Certified.
„ 24	82	Agric.labourer	Apoplexy. Certified.
Nov. 2	85	Agric.labourer	General decay. Not certified.
Dec. 18	11	Son of Grocer	Nephritis, 14 days. Certified.
1860.			
Jan. 3	79	Agric.labourer	Gradual decay. No medical attendant.
Feb. 21	66	Tailor, master	Hydrothorax, 12 months. Certified.
„ 24	81	Agric.labourer	Bronchitis, 2 days. Certified.
Mar. 2	86	Agric.labourer	Cerebral congestion. Certified.
Apr. 2	64	Agric.labourer	Diseased heart ; anasarca. Certified.
„ 10	79	Farmer -	Apoplexy, 5 hours. Certified.
July 3	12	Son of servant	Rubeola, 9 days. Certified.
„ 25	56	Tailor, master	Hepatitis. Certified.
„ 28	56	Agric.labourer	Femoral hernia, 11 days. Certified.
Aug.14	77	Agric.labourer	Apoplexy, 4 days. Certified.
Sep. 12	55	Farmer -	Cephalitis. Certified.
Oct. 15	62	Innkeeper -	Angina pectoris. Certified.
Nov.30	27	Son of agricultural labourer.	Diabetes, 3 years. Certified.
Dec. 13	11	Son of tailor -	Convulsions, 4 days. Certified.
„ 13	48	Agric.labourer	Diarrhœa, 3 months. Certified.
„ 30	72	Agric.labourer	Low fever. Certified.
1861.			
Jan. 16	79	Gentleman -	Hanged himself. Inquest.
Apr.25	77	Farmer -	Gradual decay. No medical attendant.
May 5	80	Grocer -	Gradual decay. No medical attendant.
„ 20	41	Labourer -	Accident. Fall from a tree. Inquest.
June15	44	Innkeeper -	Delirium tremens, 3 days. Certified.
July 2	64	Tailor, master	Paraplegia. Certified.
„ 15	77	Agric.labourer	Anasarca, 3 months. Certified.
„ 18	30	Agric.labourer	Bronchitis, 4 days. Certified.
Aug 16	76	Wheelwright-	Gastric fever. Certified.
„ 30	67	Agric.labourer	Bronchitis, 12 months. Certified.
Sep. 25	54	Farmer -	Inflammation. Certified.
Nov. 1	46	Cordwainer, journeyman.	Phthisis. Certified.
„ 30	78	Agric.labourer	Dysentery, 7 days. Certified.
„ 30	60	Farmer -	Apoplexy, 5 hours. Certified.

Superintendent Registrar's District.	Registrar's Sub-District.
532. GUISBOROUGH.	2. Marske. 3. Kirkleatham.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859–61.

Sub-district - 2. Marske.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 10	22	Agric.labourer	Low fever. Certified.
Feb. 6	82	Agric.labourer	Old age. Not certified.
„ 5	86	Farmer -	Old age. Not certified.
„ 14	63	Pilot -	Atrophy, 1 year. Certified.
„ 18	52	Farmer -	Pneumonia. Certified.
Mar.20	15	Son of iron miner.	Epilepsy. Certified.
Apr.21	30	Ironstone miner	Consumption, 6 months. Certified.
„ 19	12	Son of tailor -	Scarlatina. Not certified.
„ 27	67	Fisherman -	Senile gangrene. Certified.
May 7	32	Mine labourer	Consumption. Certified.
„ 20	10	Son of ironstone miner.	Jaundice, 10 days. Certified.
„ 4	40	Farmer -	Found drowned. Inquest.
„ 10	24	Miner - -	Accident. Fall of iron stone in Upleatham Iron Mines. Inquest.
July 12	70	Farmer -	Asthma ; dropsy. Certified.
Aug.21	48	Gardener -	Consumption. Certified.
Sep. 1	45	Shoemaker -	Stone. Not certified.
Oct. 4	38	Ironstone miner	By fall of ironstone. Inquest.
„ 11	60	Clergyman -	Apoplexy. Certified.
„ 12	64	Spirit merchant	Orchitis. Certified.
„ 16	67	Butcher -	Cancer. Certified.
„ 28	29	Ironstone miner	Fall of ironstone in Upleatham Mines. Inquest.
„ 30	44	Fishmonger -	Rheumatic fever. Diseased heart. Certified.
Nov.18	72	Farmer - -	Age. Certified.
„ 18	26	Seaman -	Found drowned on the shore. Inquest.
Dec.31	67	Farmer - -	General decay. Not certified.
1860.			
Jan. 1	10	Son of labourer	Scrofula. Certified.
„ 5	68	Mariner -	Bronchitis. Certified.
„ 29	51	Tailor - -	Consumption, 2 years. Certified.
Mar. 1	84	Agric. labourer	General decay. Not certified.
Feb.16	58	Stonemason -	Asthma. Certified.
Jan.19	20	Ironstone miner	Accident. Fall of ironstone in the Upleatham Iron Mines. Inquest.
Mar.29	25	Ironstone miner	Accident. Fall of ironstone in the Upleatham Iron Mines. Inquest.
Apr. 5	29	Ironstone miner	Fever. Certified.
„ 26	67	Pilot - -	Phthisis, 12 weeks. Certified.
May 4	76	Farmer - -	Diseased bladder. Certified.
June23	93	Agric. labourer	General decay. No medical attendant.
„ 25	72	Agric. labourer	Visitation of God. Inquest.
July 9	66	Shoemaker, master.	Ileus, 11 days. Certified.
„ 16	56	Shoemaker, master.	Diabetes. Certified.
„ 24	unk.	Mariner -	Found drowned. Inquest.
Nov.18	57	Agric. labourer	Palsy, 6 weeks. Certified.
Dec.17	37	Builder - -	Consumption. Certified.
1861.			
Jan. 16	40	Mariner -	Found drowned. Inquest.
„ 16	50	Mariner -	Found drowned. Inquest.
„ 16	17	Mariner -	Found drowned. Inquest.
„ 22	33	Butcher's servant.	Chorea-fever, 9 weeks. Certified.
Feb. 6	77	Agric. labourer	Diseased heart. Certified.
12	35	- - -	Found drowned in the German Ocean. Inquest.

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
Feb. 13	22	- - -	Found drowned in the German Ocean. Inquest.
„ 14	22	- - -	Found drowned in the German Ocean. Inquest.
„ 25	25	Farmer -	Encephalitis, 3 weeks. Certified.
Mar. 20	72	Pilot - -	Bronchitis, 4 weeks. Certified.
„ 14	18	Son of ship-owner.	Phthisis. Certified.
„ 20	72	Pilot - -	Bronchitis, 4 weeks. Certified.
Apr. 24	26	Shoemaker -	Diseased lungs. Certified.
„ 24	unk.	Mariner -	Found drowned. Inquest.
„ 24	unk.	Mariner -	Found drowned. Inquest.
May 20	22	Ironstone miner	Accident. Fall of ironstone. Inquest.
„ 29	37	Stone mason, journeyman.	Tuberculosis. Certified.
June 3	43	Ironstone miner	Tuberculosis. Certified.
May 31	77	Farmer -	Diseased prostate gland, ischuria. Certified.
June 18	unk.	Mariner -	Found drowned. Inquest.
July 5	17	Clerk - -	Accidentally drowned, bathing. Inquest.
„ 5	22	Ironstone miner	Accident. Fall of ironstone in Upleatham Mine. Inquest.
„ 5	60	Publican -	Visitation of God. Inquest.
Sep. 18	24	Joiner - -	Phthisis, 9 months. Certified.
Oct. 18	76	Fisherman -	Old age. Certified.
„ 20	62	Shoemaker, master.	Anemia. Certified.
Nov. 13	49	Clergyman -	Apoplexy. Certified.
„ 14	80	Farmer -	Old age. Certified.
„ 15	56	Agric. labourer	Mortification. Certified.
„ 30	71	Shopkeeper -	Diseased heart. Dropsy. Certified.
Dec. 16	68	Plate layer -	Diseased heart. Certified.
„ 19	66	Shoemaker -	Low fever. Certified.
„ 20	98	Agric. labourer	Old age. Not certified.

Sub-District - 3. Kirkleatham.

1859.			
Jan. 1	34	Iron miner -	Fall of ironstone in the Eaton Iron Mines. Inquest.
„ 13	16	Farm servant	Scarlatina. Certified.
„ 16	65	Builder -	Diseased stomach. Certified.
„ 23	10	Son of carter -	Scarlatina. Certified.
Feb. 22	81	Agric. labourer	Asthma. Certified.
Mar. 11	60	Stone mason -	Diseased heart. Certified.
„ 11	40	Iron miner -	Fever. Certified.
„ 25	20	Blacksmith -	Fever. Apoplexy. Certified.
„ 30	30	Labourer at furnaces.	Pneumonia. Certified.
Apr. 17	19	Joiner -	Consumption. Not certified.
„ 19	25	Agric. labourer	Rheumatism and diseased heart. Certified.
„ 12	40	Ironstone miner	Consumption. Certified.
May 10	15	Agric. labourer	Kicked by a horse. Inquest.
„ 15	40	Ironstone miner	Fever. Pneumonia. Certified.
„ 19	11	Son of blacksmith.	Hydrocephalus. Certified.
„ 24	35	Ironstone miner	Smallpox. Certified.
June 14	25	Iron moulder	Pneumonia. Certified.
„ 17	38	Ironstone miner	Scarlatina. Certified.
„ 15	46	Ironstone miner	A quantity of shale falling on him at Eston Iron Mines. Inquest.
„ 17	25	Labourer at iron works.	Shot himself (suicide). Inquest.
July 4	24	Labourer -	Scarlatina. Smallpox. Certified.
„ 5	19	Labourer, ironstone mine.	Phthisis. Certified.
„ 6	10	Son of contractor.	Smallpox. Certified.
„ 10	30	Ironstone miner	Smallpox. Certified.
„ 7	18	Fireman -	Fractures by railway waggon. Inquest.
„ 17	20	Blacksmith -	Smallpox. Certified.
Aug. 5	28	Ironstone miner	Erysipelas. Certified.
„ 13	22	Printer -	Phthisis. Certified.
„ 13	16	Waggon driver	Smallpox. Certified.
„ 15	47	Plate layer -	Accident. Fall of a stone. Certified.
„ 18	56	Farmer -	Phthisis. Certified.
„ 18	21	Ironstone miner	Fall of ironstone in the Eston Mines. Inquest.
„ 29	23	Ironstone miner	Smallpox. Diarrhœa. Certified.
1859.			
Aug 30	20	Miner - -	Fall from a gangway in the Eston Works. Inquest.
„ 31	10	Son of miner -	Run over by waggons. Inquest.
Sep. 11	53	Ironstone miner	Smallpox. Certified.
„ 27	41	Tidewaiter -	Confluent smallpox. Certified.
„ 26	71	Agric. labourer	Paralysis. Not certified.
Oct. 5	10	Son of smith -	Scarlatina. Certified.
„ 6	49	Ironstone miner	Hernia. Certified.
„ 7	21	Labourer at furnaces.	Pneumonia. Certified.
„ 12	22	Ironstone labourer.	Run over by railway waggon. Inquest.
„ 18	35	Ironstone miner	Fever. Certified.
Nov. 11	56	Labourer, ironstone mines.	Apoplexy. Certified.
„ 14	12	Son of labourer, ironstone mines.	Run over by waggons on a tramway. Inquest.
„ 15	36	Farm servant	Smallpox. Certified.
Dec. 5	34	Ironstone miner	By a fall of ironstone. Inquest.
„ 5	40	Master mariner	Found drowned. Inquest.
1860.			
Jan. 11	31	Butcher -	Delirium tremens. Certified.
„ 12	63	Carter - -	Apoplexy. Certified.
„ 16	11	Son of ironstone miner.	Remittent fever. Certified.
Feb. 28	17	Son of ironstone miner.	Fever. Certified.
„ 24	35	Furnace labourer.	Cephalitis. Certified.
Mar. 23	20	Ironstone miner	Diseased heart. Certified.
Apr. 19	27	Ironstone miner	Accident. Fall of ironstone in Eston Iron Mines. Inquest.
„ 19	28	Ironstone miner	Accident. Fall of ironstone in Eston Iron Mines. Inquest.
„ 29	14	Son of ironstone miner.	Fever. Certified.
„ 28	21	Ironstone miner	Accident. Fall of ironstone in Eston Iron Mines. Inquest.
May 7	36	Ironstone miner	Pneumonia. Certified.
May 4	85	Farmer -	Old age. Certified.
„ 9	46	Ironstone miner	Pneumonia. Certified.
„ 9	66	Jeweller, journeyman.	Diseased liver. Certified.
„ 22	66	Farmer -	Abscess of liver. Certified.
„ 23	42	Platelayer -	Bronchitis. Diseased liver. Certified.
„ 28	47	Mariner -	Found drowned. Inquest.
June 10	14	Waggon driver	Diseased brain from injury. Certified.
„ 7	21	Ironstone miner	Phthisis. Certified.
„ 13	26	Labourer -	Ulcered intestines. Certified.
„ 15	86	Agric. labourer	Gangrene of foot. Certified.
July 15	23	Joiner - -	Accident. Breaking of scaffold. Inquest.
„ 18	24	Ironstone miner	Accident. Fall of ironstone at Eston. Inquest.
„ 18	58	Overlooker in ironstone mine.	Apoplexy. Certified.
„ 25	30	Engine driver.	Abscess of head. Certified.
„ 27	42	Horsekeeper -	Accident. Run over by waggon. Inquest.
Aug. 2	69	Labourer -	Pneumonia. Certified.
„ 14	30	Engine fireman	Accident. Run over by a railway waggon. Inquest.
„ 24	28	Ironstone miner	Phthisis pulmonalis. Certified.
„ 26	42	Bricklayer -	Typhus fever Certified.
Sep. 21	75	Coastguard -	Dropsy. Certified.
„ 30	45	Farm servant	Epilepsy. Certified.
Nov. 3	27	Butcher -	Gastric fever. Certified.
„ 7	76	Agric. labourer	Disease of bladder. Certified.
„ 14	15	Son of ironstone miner.	Accident. Fall of ironstone in the Eston Mines. Inquest.
„ 24	35	Grocer -	Fever. Certified.
Dec. 12	31	Ironstone miner	Phthisis. Certified.
„ 10	13	Driver - -	Accident. Run over by waggon. Inquest.
„ 14	48	Gardener -	Hepatitis. Certified.
„ 20	37	Shoemaker, master.	Disease of kidneys. Certified.
„ 29	60	Rag gatherer	Visitation of God. Inquest.
1861.			
Jan. 9	49	Coal carter -	Fever. Certified.
„ 17	20	Ironstone miner	Fever. Certified.
Feb. 13	68	Dealer in game	Hemiplegia. Certified.
„ 13	31	Ironstone miner	Fever. Certified.
„ 16	35	Ironstone miner	Rheumatism. Fever. Certified.
„ 14	51	- - -	Found drowned. Inquest.

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
Feb. 13	18	- - -	Found drowned. Inquest.
„ 28	11	Son of blacksmith.	Spinal affection. Certified.
Mar. 9	11	Son of iron miner.	Fever. Pneumonia. Certified.
„ 17	11	Son of iron miner.	Marasmus. Certified.
Apr. 3	57	Ironstone miner	Constitutional debility. Certified.
„ 9	27	Ironstone miner	Accidental fall of ironstone in Eston Iron Mines. Inquest.
„ 13	37	Ironstone miner	Accidental fall of ironstone in Eston Iron Mines. Inquest.
„ 17	37	Ironstone miner	Accidental fall of ironstone in Eston Iron Mines. Inquest.
„ 18	15	Labourer in ironstone mine.	Lockjaw from accidental injuries in Eston Iron Mines. Inquest.
„ 23	21	Iron moulder	Phthisis. Diarrhœa. Certified
„ 26	49	Ironstone miner	Delirium tremens. Certified.
„ 24	75	Under steward	Diseased heart. Certified.
„ 30	26	Miner -	Accidental fall of stone at Eston Mines. Inquest.
May 13	64	Curate -	Bright's disease. Certified.
„ 31	44	Farmer -	Exhaustion. Certified.
June 13	36	Inspector of railway waggons.	Phthisis. Certified.
July 20	22	Miner -	Accidental fall of ironstone. Inquest.
„ 23	27	Platelayer -	Visitation of God. Inquest.
Aug. 7	80	Farmer -	Bronchitis. Certified.
„ 23	37	Iron miner -	Accidental explosion of powder in blasting. Inquest.
„ 22	82	Seaman -	Old age. Not certified.
„ 21	23	Iron moulder	Phthisis. Not certified.
Sept. 6	64	Agric. labourer	Pneumonia. Certified.
„ 2	72	Carpenter -	Diseased kidneys. Not certified.
„ 5	49	Iron moulder	Excessive drinking. Inquest.
„ 19	68	Labourer -	Gastritis. Certified.
„ 20	35	Seaman -	Fever. Not certified.
„ 20	19	Labourer, iron mines.	Accident by a waggon on a tramway. Inquest.
„ 20	25	Labourer, iron works.	Accident. Breaking of a chain. Inquest.
„ 28	34	Coal agent -	Fever. Certified.
„ 26	62	Labourer, iron furnaces.	Apoplexy. Certified.
„ 29	21	Bricklayer -	Typhus fever. Certified.
Oct. 11	37	Agric. labourer	Nephritis. Certified.
„ 17	11	Son of labourer	Ricketts. Certified.
„ 17	22	Blacksmith, journeyman.	Diabetes. Certified.
„ 25	19	Labourer -	Accident; fall of shale at Eston Bank. Inquest.
Nov. 4	unk.	A man; unknown.	Found dead in the German Ocean. Inquest.
„ 6	40	Miner - -	Accident by a fall of ironstone. Inquest.
„ 13	28	Fireman -	Accident. Run over by a train. Inquest.
„ 24	48	Labourer at furnaces.	Typhus. Apoplexy. Certified.
„ 29	72	Gardener -	Diseased brain. Certified.
Dec. 10	27	Ironstone miner	Accident by fall of ironstone at Eston Mine. Inquest.
„ 18	29	Labourer -	Fever. Certified.
„ 13	17	Puddler -	Accident by the explosion of a slag ball. Inquest.

Superintendent Registrar's District.	Registrar's Sub-District.
535. BEDALE.	1. Bedale. 2. Masham.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859–61.

Sub-district. - 1. Bedale.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 14	81	Agric. labourer	Bronchitis, 2 days. Certified.
„ 27	86	Agric. blaourer	Diseased heart. Not certified.
„ 25	42	Draper's servant	Diarrhœa. Not certified.
Feb. 9	72	Agric. labourer	Diseased heart. Not certified.
1859.			
Mar. 10	36	Schoolmaster	Diphtheria, 2 months. Certified.
„ 16	62	Farmer -	Consumption. Not certified.
Apr. 8	43	Surgeon -	Scrofula, 3 months. Certified.
„ 9	80	Independent -	Paralysis, 18 days. Certified.
„ 18	76	Independent -	Decay of nature. Certified.
May 9	44	Brick and tile maker.	Consumption, 2 years. Certified.
„ 12	77	Shoemaker, journeyman.	Old Age. Not certified.
„ 15	41	Joiner - -	Renal dropsy, 6 months. Certified.
„ 22	82	Agric. labourer	Old age. Not certified.
„ 30	23	Son of brewer	Epilepsy. Certified.
June 7	36	Farmer -	Phthisis, 3½ years. Certified.
„ 10	79	Labourer -	Diseased heart. Not certified.
„ 27	42	Agric. labourer	Phthisis, — month. Certified.
July 3	39	Agric. labourer	Convulsions, 1 week. Certified.
„ 24	71	Farmer -	Paralysis, 10 days. Certified.
Aug. 1	44	Brick and tile maker, journeyman.	Dysentery, 3 days. Certified.
„ 1	64	Agric. labourer	Accidental Injury, 50 hours. Inquest.
„ 4	81	Gardener -	Anasarca, many months. Certified.
„ 17	78	Butler - -	Palsy, 20 months. Certified.
„ 15	80	Rag gatherer	Old age. Certified.
„ 15	80	Innkeeper -	Sudden death. Inquest.
Sept. 7	83	Farmer -	Old age. Certified.
„ 22	68	Agric. labourer	Enteritis, 3 days.
Oct. 15	80	Agric. labourer	Diseased prostate gland, 12 months. Certified.
„ 6	82	Woolcomber -	Old age. Not certified.
„ 24	53	House proprietor.	Cancer, 3 months. Certified.
„ 31	25	Innkeeper -	Consumption, 4 years. Certified.
Nov. 8	75	Farmer -	Diseased heart. Certified.
„ 22	52	Agric. hind -	Diseased heart. Certified.
„ 26	84	Agric. labourer	Old age. Certified.
„ 30	56	Horse breaker	Pneumonia. Certified.
„ 30	50	Corn dealer -	Diseased heart,—years. Certified.
Dec. 20	58	Brewer - -	Diseased lungs. Certified.
1860.			
Jan. 2	76	Bricklayer -	Old age. No medical attendant.
„ 8	73	Schoolmaster	Old age. Certified.
„ 10	37	Butler (servant)	Diseased lungs. Certified.
„ 19	18	Tailor, apprentice.	Fever. Certified.
Feb. 3	71	Agric. labourer	General decay. Certified.
„ 2	26	Agric. labourer	Diseased lungs, 12 months. Certified.
„ 5	12	Son of shoemaker.	Diphtheria, 9 days. Certified.
Mar. 18	14	Son of agric. labourer.	Measles. Certified.
Apr. 25	62	Innkeeper -	Diseased heart. Certified.
May 3	60	Farmer -	Irritation of spinal chord. Certified.
„ 8	16	Son of corn dealer.	Diphtheria, 8 days. Certified.
„ 8	93	Bricklayer -	Old age. Not certified.
„ 12	59	Independent -	Hepatitis, jaundice. Certified.
„ 18	82	Fellmonger -	Old age. Certified.
May 18	70	Grocer, master	Decay of nature. Certified.
June 5	78	Agric. labourer	Decay of nature. Certified.
„ 2	60	Wood turner -	Ulceration of face, 12 months. Certified.
„ 18	74	Stonemason -	Spinal irritation, 12 months. Certified.
July 5	31	Joiner - -	Phthisis pulmonalis. Certified.
„ 6	50	Whitesmith -	By hanging (suicide). Inquest.
Aug. 8	73	Carpenter, master.	Bronchitis, 2 months. Certified.
„ 15	29	Shoemaker, master.	Phthisis pulmonalis, 12 months. Certified.
„ 17	62	Agric. labourer	General decay. Certified.
„ 26	78	Bricklayer -	Pulmonary apoplexy, 3 days. Certified.
„ 29	54	Blacksmith -	Diseased heart, 3 years. Certified.
Sep. 10	39	Farmer - -	Diseased heart. Inquest.
Oct. 2	71	Farmer - -	Decay of nature. Not certified.
Sep. 28	19	Labourer -	Consumption. Not certified.
Oct. 30	71	County magistrate.	Suicide by drowning. Inquest.
Dec. 25	12	Son of farmer	Catarrh, 3 days. Certified.
1861			
Jan. 9	83	Agric. labourer	Old age. Certified

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
Jan. 14	85	Shoemaker -	Old age. No medical attendant.
„ 14	76	Proprietor of houses.	Natural decay. Certified.
„ 15	23	Carpenter -	Phrenitis, 14 days. Certified.
Feb. 3	81	Agric. labourer	Enteritis. Certified.
Apr. 15	78	Agric. labourer	Diseased heart. Certified.
„ 23	15	Son of farmer	Synochus, 3 weeks. Certified.
„ 29	79	Carpenter -	Old age. Not certified.
May 13	74	Proprietor of houses.	Cystitis, 3 weeks. Certified.
„ 21	65	Agric. labourer	Pneumonitis, 10 months. Certified.
„ 15	25	Butler, servant	Phthisis, 6 months. Certified.
„ 28	76	Proprietor of houses.	Diphtheria, 6 days. Certified.
June 3	12	Son of agric. labourer.	Scarlatina, 8 days. Certified.
„ 4	57	Farmer -	Accident by a thrashing machine. Inquest.
„ 17	24	Butler, servant	Phthisis. Certified.
„ 24	74	Blacksmith -	Diseased liver, 2 or 3 years. Certified.
„ 21	20	Son of butler	Consumption, 2 years. Not certified.
July 1	86	Dealer in hardware.	Natural decay. Certified.
„ 11	41	Agric. labourer	Diseased lungs. Certified.
„ 22	61	Agric. labourer	Apoplexy, 35 hours. Certified.
„ 31	72	Farmer -	Phthisis, 2 months. Certified.
„ 31	30	Agric labourer	Hæmoptysis. Certified.
„ 31	70	Clergyman -	Diseased heart, 10 years. Certified.
Aug. 13	33	Agric. labourer	Ulcered stomach. Certified.
Sept. 2	79	Letter-carrier	Decay of nature. Certified.
„ 3	81	Agric. labourer	Old age. No medical attendant.
„ 15	81	Blacksmith -	Old age. No medical attendant.
„ 14	63	Agric. labourer	Cancer. Certified.
„ 21	50	Farmer -	Cancer. Certified.
„ 26	52	Agric. labourer	Angina pectoris. Certified.
Oct. 8	59	Esquire -	Congestion of lungs, 14 days. Certified.
Nov. 6	67	Butcher -	Decay of nature. Certified.
„ 20	74	Agric. labourer	Old age. No medical attendant.
Dec. 23	47	Innkeeper -	Apoplexy. Inquest.

Sub-district - 2. Masham.

1859.			
Jan. 14	81	Shoemaker -	Natural decay. Not certified.
„ 20	57	Labourer -	Bronchitis. Certified.
Feb. 16	21	Tallow chandler	Phthisis. Certified.
„ 24	64	Farmer -	Diseased heart. Not certified.
Apr. 11	63	Sawyer -	Decay of nature. Certified.
„ 19	75	Labourer -	Apoplexy. Certified.
„ 30	80	Agric. labourer	Apoplexy. Certified.
„ 30	66	Agric. labourer	Consumption, 1 year. Certified.
June 5	73	Farmer -	Apoplexy. Not certified.
„ 28	60	Agric. labourer	Asthma and dropsy. Not certified.
July 12	60	Schoolmaster	Diseased liver, 2 years. Certfied.
Sep. 5	30	Plumber and glazier.	Phthisis, 2 years. Certified.
„ 6	28	Agric. labourer	Phthisis, 16 months. Certified.
„ 13	60	Agric. labourer	Phthisis, 2 years. Certified.
„ 24	36	Butcher -	Delirium tremens. Certified.
Dec. 7	35	Carpenter -	Bronchitis, 10 days. Certified.
1860.			
Jan. 4	80	Agric. labourer	Decay of nature. Not certified.
„ 19	22	Son of glazier	Phthisis, 7 months. Certified.
„ 25	53	Agric. labourer	Diarrhœa. No medical attendant.
Feb. 3	76	Lime burner -	Cancer, 12 months. Certified.
„ 5	82	Agric. labourer	Decay of nature. Certified.
Mar. 20	81	Agric. labourer	Dropsy, 3 years. No medical attendant.
„ 22	64	Stone mason -	Bronchitis. Certified.
„ 28	73	Blacksmith, master.	Apoplexy, 2 weeks. Certified.
Apr 18	63	Innkeeper -	Morbus cordis. Certified.
„ 27	82	Groom -	Apoplexy, 3 hours. Certified.
June 14	78	Farmer -	Decay of nature. Certified.
July 16	60	Butcher -	Apoplexy.
„ 24	31	Grocer -	Delirium tremens, 2 days. Certified.
„ 25	80	Chelsea pensioner.	Senile gangrene, 2 years. Certified.
Nov. 4	67	Stonemason, master.	Apoplexy. Inquest.
„ 11	15	Son of labourer	Tubercular arachnitis, 5 days. Certified.
Dec. 1	76	Ironmonger -	Softening of brain, 2 years. Certified.

Superintendent Registrar's District.	Registrar's Sub-District.
536. LEYBURN.	1. Middleham. 2. Leyburn.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859–60–61.

Sub-District - 1. Middleham.

1859.			
Feb. 7	56	Grocer - -	Bronchitis, 14 days. Certified
„ 20	80	Tailor, master	Natural decay. Not certified.
„ 7	78	Farmer -	Chronic diarrhœa. Certified.
Apr. 7	82	Agric. labourer	Natural decay. Not certified.
„ 11	78	Agric. labourer	Natural decay. Not certified.
„ 29	68	Farmer -	Enteritis, 5 days. Certified.
May 9	61	Farmer -	Hernia. Peritonitis. Certified.
„ 15	68	Farmer -	Epilepsy, 3 days. Certified.
„ 26	74	Farmer -	Natural decay. Not certified.
June 24	30	Farmer -	Consumption, 4 years. Not certified.
„ 11	78	Agric. labourer	Epistaxis, 10 days. Certified.
July 7	30	Coal miner -	Typhus fever, 7 days. Certified.
„ 11	27	Race horse trainer.	Delirium tremens, 6 days. Certified.
„ 17	18	Labourer -	Accident. Drowned, bathing. Inquest.
„ 26	61	Draper - -	Natural decay. Not certified.
„ 27	77	Agric. labourer	Natural decay. Not certified.
Sep. 11	26	Joiner, journeyman.	Consumption, 2 years. Not certified.
„ 16	67	Stonemason, master.	Diarrhœa, 6 years. Not certified.
„ 4	69	Agric. labourer	Dropsy. Not certified.
„ 29	81	Farmer -	Diarrhœa, 7 days. Not certified.
Oct. 22	76	Farmer -	Natural decay. Not certified.
„ 29	21	Farmer -	Consumption, 15 weeks. Not certified.
Dec. 15	20	Farmer -	Brain fever, 3 weeks. Not certified.
1860.			
Jan. 6	40	Lead miner -	Pneumonia, 1 month. Not certified.
„ 12	11	Son of tailor, master.	Measles, 2 weeks. Certified
„ 15	91	Farmer -	Old age. No medical attendant.
„ 17	23	Engine worker	Consumption, 2 months. Not certified.
„ 30	25	Lead miner -	Consumption, 3 months. Certified.
Feb. 2	65	Agric. labourer	Bronchitis, 6 years. Certified.
„ 16	20	Farm servant	Amputation. Pneumonia, 1 week. Certified.
Jan. 21	74	Landed proprietor.	Pneumonia, 7 days. Certified.

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Feb. 24	80	Agric. labourer	Bronchitis. Certified.
Mar. 18	84	Tailor, master	Natural decay. Certified.
,, 20	44	Linen draper, assistant.	Phthisis, 2 years. Certified.
Apr. 14	17	Son of agric. labourer.	Diabetes, 1 year. Certified.
May 12	18	Son of schoolmaster.	Consumption. Not certified.
,, 17	56	Registrar of births and deaths.	Consumption. Not certified.
June 10	53	Farmer -	Disease of kidneys. Certified.
,, 17	67	Revenue officer	Apoplexy. Inquest.
,, 23	75	Stonemason -	Enlarged prostate gland. Certified.
July 10	83	Agric. labourer	Dropsy, 3 months. Certified.
,, 14	31	Son of joiner -	Epilepsy, many years. Certified.
,, 29	88	Farmer -	Mitral disease, 10 years. Certified.
Aug. 1	44	Farmer -	Apoplexy. Certified.
Sep. 20	12	Son of farmer	Phthisis pulmonalis, 1 year. Certified.
,, 24	61	Stone quarrier	Diseased heart. Not certified.
,, 29	74	Stonemason, master.	Gastritis. Certified.
Oct. 12	32	Lead miner -	Phthisis. Not certified.
,, 10	50	Shoemaker -	Drowned (suicide). Inquest.
,, 23	73	Agric. labourer	Natural death. No medical attendant.
,, 5	82	Agric. labourer	Natural decay. No medical attendant.
Nov. 4	78	Agric. labourer	Natural decay. Not certified.
,, 3	43	Saddler -	Enteritis, 6 days. Certified.
,, 14	21	Son of agric. labourer.	Abscess, many years. Not certified.
Dec. 2	34	Leadminer -	Accident; fall. Inquest.
,, 8	75	Agric. labourer	Dropsy, 3 months. No medical attendant.
,, 10	82	Porter -	Dysentery, 3 months. Certified.
,, 7	51	Wheelwright -	Morbus Brightü. Certified.
1861.			
Jan. 14	21	Son of farmer	Bronchitis. Certified.
,, 24	77	Blacksmith -	Inguinal hernia. Certified.
Mar. 6	93	Slate quarrier	Natural decay. No medical attendant.
Apr. 5	15	Son of joiner -	Phthisis pulmonalis, 5 months. Certified.
,, 9	72	Plumber and glazier.	Gout. Pneumonia. Certified.
,, 21	87	Farmer -	Decay of nature, 4 months. Certified.
,, 23	17	Son of shoemaker.	Consumption, 10 weeks. Not certified.
,, 23	64	Farmer -	Diseased heart, 18 months. Certified.
May 9	65	Coal miner -	Asthma. Bronchitis. Certified.
,, 11	68	Innkeeper -	Hydrothorax, 3 months. Certified.
,, 25	76	Parish clerk -	Enteritis, 7 days. Certified.
June 22	57	Coachman -	Cerebral softening, 1 year. Certified.
,, 25	70	Farmer -	Dysentery, 3 weeks. Certified.
July 6	28	Groom -	Phthisis pulmonalis, 2 years. Certified.
,, 16	56	Innkeeper -	Fever, 14 days. Not certified.
Aug. 7	42	Trainer of race horses.	Gastritis, 14 days. Certified.
Sept. 3	56	Farmer -	Cancer of throat. Inquest.
,, 21	41	Slate quarrier	Peritonitis. Certified.
,, 21	77	Tailor, master	Senile decay. No medical attendant.
Oct. 6	80	Discharged soldier.	Congestion of lungs, 2 months. Certified.
,, 12	23	Draper -	Phthisis, 3 years. Certified.
Nov. 6	41	Agric. labourer	Typhus, 5 weeks. Certified
,, 21	54	Farmer -	Apoplexy. Certified.
Dec. 25	33	Farmer -	Diseased heart, 6 years. Certified.

Sub-district - 2 Leyburn.

1858.			
Dec. 30	28	Lead miner -	Scrofula. Not certified.
1859.			
Jan. 16	61	Farmer -	Diseased bladder. Not certified.
,, 26	56	Farmer -	Diseased heart. Not certified.
,, 11	41	Farmer -	Diseased heart. Not certified.
Feb. 18	69	Farmer -	Apoplexy. Not certified.
1859.			
Feb. 27	57	Agric. labourer	Diseased lungs. Not certified.
Mar. 15	63	Groom -	Natural decay. Certified.
Apr. 3	74	Agric. labourer	Natural decay. Not certified.
,, 16	66	Agric. labourer	Epilepsy. Certified.
,, 14	71	Yeoman -	Natural decay. Not certified.
May 2	39	Wood cutter -	Brain fever, 9 days. Not certified.
,, 4	75	Gardener -	Pneumonia. Certified.
,, 12	70	Schoolmaster	Natural decay. Not certified.
June 22	39	Tea dealer -	Fever, 3 months. Certified.
,, 23	74	Agric. labourer	Old age. Certified.
July 4	73	Agric. labourer	Old age. Certified.
Aug. 4	62	Agric. labourer	Enteritis. Not certified.
,, 12	65	Yeoman -	Dropsy. Not certified.
,, 13	86	Grocer -	Old age. Certified.
,, 19	34	Agric. labourer	Consumption. Not certified.
,, 20	75	Horsebreaker	Old age. Certified.
,, 26	78	Agric. labourer	Dropsy. Not certified.
,, 25	76	Agric. labourer	Sudden. [Found dead in bed. Inquest.
,, 25	64	Farmer -	Sciatica, some months. Certified.
Sept. 1	73	Lead miner -	Natural decay. No medical attendant.
,, 3	19	Stonemason, journeyman.	Typhus fever, 14 days. Certified.
,, 12	29	Agric. labourer	Accident; Fall from a horse, 32 hours. Inquest.
,, 24	27	Lead miner -	Pneumonia. Not certified.
,, 30	65	Agric. labourer	Natural decay. Not certified.
Oct. 5	27	Farm servant	Paralysis. Not certified.
,, 4	40	Gentleman -	Enteritis. Not certified.
,, 24	75	Agric. labourer	Natural decay. No medical attendant.
Nov. 1	75	Agric. labourer	Natural decay. Not certified.
,, 6	84	Auctioneer -	Natural decay. No medical attendant.
,, 11	52	Cattle jobber	Insanity, 2 years. Certified.
,, 21	56	Farmer -	Enteritis. Not certified.
,, 22	27	Butcher, master	Phthisis. Certified.
Dec. 2	35	Tailor, master	Phthisis. Certified.
,, 6	10	Son of joiner -	Hydrocephalus, 10 days. Not certified.
,, 26	81	Farmer -	Natural decay. Not certified.
,, 29	73	Innkeeper -	Natural decay. Not certified.
1860.			
Jan. 4	71	Agric. labourer	Old age. Certified.
,, 11	71	Agric. labourer	Old age. No medical attendant.
,, 13	85	Shoemaker, master.	Old age. Certified.
,, 22	71	Tailor, master	Anasarca. Certified.
Feb. 13	91	Farm servant	Old age. Certified.
,, 22	18	Farm servant	Abscess in liver. Certified.
,, 29	50	Farmer -	Diseased liver. Not certified.
,, 14	20	Engine stoker	Accident. Injuries. Inquest.
Mar. 3	80	Esquire -	Concussion of spine, 20 months. Certified.
,, 12	76	Farmer -	Dropsy, many weeks. Certified.
,, 9	67	Agric. labourer	Paralysis, 2 weeks. Certified.
,, 18	60	Lead miner -	Typhus fever. Not certified.
,, 19	87	Agric. labourer	Natural decay. Not certified.
,, 31	84	Agric. labourer	Natural decay. Not certified.
Apr. 10	80	Shoemaker, master.	Natural decay. Certified.
,, 14	62	Draper, master	Diseased liver. Certified.
,, 18	68	Agric. labourer	Epilepsy. Certified.
,, 23	54	Farmer -	Mitral disease, Certified.
,, 23	32	Lead miner -	Scrofula. Certified.
June 5	86	Tailor, master	Natural decay. Certified.
,, 5	84	Agric. labourer	Natural decay. Certified.
,, 10	20	Agric. labourer	Consumption. Not certified.
,, 15	47	Lead miner -	Diseased kidneys. Not certified.
,, 18	19	Carpenter -	Congestion of lungs, 6 days. Certified.
,, 23	66	Agric. labourer	Dropsy. Not certified.
July 1	13	Son of joiner -	Consumption. Certified.
,, 7	48	Chelsea pensioner.	Phthisis, 2 years. Certified.
,, 8	28	Grocer -	Consumption. Not certified.
Aug 25	78	Agric. labourer	Accident. Injuries to head. Inquest.
Sept. 1	55	Farmer -	Accident. Fractures. Inquest.
,, 13	77	Farmer -	Natural decay. Not certified.
,, 10	74	Agric. labourer	Mortification of back. Certified.
,, 12	22	Son of farmer	Consumption. Not certified.
,, 25	17	Lead miner -	Pneumonia. Not certified.
Oct. 25	67	Butler (servant)	Natural decay. Not certified.
Nov. 1	35	Farmer -	Diseased bladder. Not certified.
,, 22	70	Stonemason, master.	Pneumonia. Not certified.

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Dec. 13	75	Farmer -	Dropsy. Not certified.
„ 21	16	Son of gardener	Hydrocephalus. Not certified.
„ 27	56	Excise officer	Diseased liver. Not certified.
1861.			
Jan. 1	83	Agric. labourer	Natural decay. No medical attendant.
1860.			
Dec. 27	74	Agric. labourer	Diseased heart. Certified.
1861.			
Jan. 19	49	Lead miner -	Rupture, blood vessel. Not certified.
Feb. 11	71	Farm labourer	Natural decay. No medical attendant.
„ 23	65	Farmer -	Asthma. Not certified.
„ 24	71	Farmer -	Diseased bladder. Not certified.
Mar. 16	66	Agric. labourer	Consumption. Not certified.
„ 29	58	Shoemaker, master.	Ileus. Certified.
„ 31	86	Innkeeper -	Natural decay. Not certified.
June 3	28	Groom -	Phthisis. Certified.
„ 7	80	Agric. labourer	Old age. Certified.
„ 24	73	Agric. labourer	Abscess, many months. Certified.
„ 24	80	Stonemason -	Ileus, 2 weeks. Certified.
„ 20	46	Agric. labourer	Scarlet fever, 1 week. Certified.
July 5	72	Landed proprietor.	Diseased heart. Not certified.
„ 12	75	Farmer -	Natural decay. Not certified.
„ 13	23	Agric. labourer	Diabetes, 2 years. Certified.
Aug. 4	62	Schoolmaster	Apoplexy, 36 hours. Certified.
„ 3	54	Ostler - -	Consumption. Not certified.
„ 20	55	Farmer -	Dropsy. Not certified.
„ 23	70	Agric. labourer	Accidental fall of earth. Inquest.
„ 30	75	Agric. labourer	Natural decay. Not certified.
Sept 11	66	Landed proprietor.	Diseased liver. Not certified.
Oct. 7	35	Agric. labourer	Glanders, 5 months. Inquest.
„ 12	50	Schoolmaster	Diseased kidneys. Not certified.
„ 26	32	Farmer -	Consumption. Not certified.
Nov. 1	47	Agric. labourer	Accidental fall from a cart. Inquest.
„ 5	74	Agric. labourer	Erysipelas. Not certified.
„ 3	41	Tailor, master	Consumption. Not certified.
„ 14	77	Lead miner -	Natural decay. Not certified.
Dec. 4	68	Agric. labourer	Decay of nature. Certified.
„ 3	79	Shoemaker, master.	Natural decay. Not certified.
„ 17	89	Farmer -	Natural decay. Not certified.
„ 24	33	Agric. labourer	Phthisis, many months. Certified.

Superintendent Registrar's District.	Registrar's Sub-District.
537 Askrigg.	1 Askrigg. 2 Hawes.

Deaths of Males aged 10 Years and upwards in each of the Years 1859–61.

Sub-District - 1 Askrigg.

1859.			
Jan. 29	64	Farmer -	Hydrothorax. Certified.
Feb. 7	81	Yeoman -	Decay of nature. Not certified.
„ 23	79	Farmer -	Diseased prostrate gland. Certified.
„ 26	81	Lead miner -	Decay of nature. Not certified.
Mar. 11	47	Shoemaker -	Consumption. Certified.
Apr. 4	66	Barber -	Diseased prostrate gland. Certified.
„ 27	95	Late a lead miner.	Decay of nature. Certified.
May 4	70	Butcher -	Found dead in bed. Inquest.
June 25	47	Farmer -	Consumption. Certified.
July 1	74	Stoker -	Decay of nature. Not certified.
„ 12	10	Son of farmer	Pneumonia. Certified.
„ 15	89	Late a tailor -	Decay of nature. Certified.
„ 18	30	- - -	Dropsy. Certified.
Sept. 8	77	Lead miner -	Decay of nature. Not certified.
Oct. 1	66	Joiner -	Decay of nature. Certified.
Nov. 21	30	Farmer -	Diseased heart. Certified.
Dec. 7	99	Late a rag dealer	Decay of nature. Not certified.
1859.			
Dec. 19	35	Waggoner -	Hæmatemesis. Certified.
„ 30	41	Woollen manufacturer.	Cystitis. Certified.
1860.			
Jan. 2	17	Son of agricultural labourer.	Diphtheria. Certified.
„ 14	77	Grocer -	Natural decay. Certified.
Jan. 16	68	Gentleman -	Apoplexy, 11 days. Certified.
„ 24	30	Agric. labourer	Diaphragmitis. Certified.
Feb. 1	50	Agric. labourer	Consumption. Not certified.
„ 16	46	- - -	General debility. Certified.
„ 16	69	Stonemason -	Decay of nature. Certified.
„ 26	62	Lime burner -	Pneumonia. Certified.
Mar. 10	74	Schoolmaster-	Natural decay. Certified.
„ 12	86	Shoemaker -	Decay of nature. Not certified.
„ 11	44	Yeoman -	Consumption. Certified.
„ 25	40	Farmer -	Consumption. Certified.
May 18	82	Farmer -	Natural decay. Not certified.
„ 24	35	Coal miner -	Consumption. Certified.
June 21	49	Farmer -	Diseased heart. Certified.
July 12	54	Agric. labourer	Enteritis. Certified.
Aug 12	65	Yeoman -	Neuralgia. Certified.
„ 23	76	Cheesemonger	Decay of nature. Not certified.
Oct. 2	70	Hawker -	Decay of nature. Not certified.
„ 4	88	Yeoman -	Decay of nature. Certified.
„ 13	76	Blacksmith -	Cancer. Certified.
Dec. 3	87	Farmer -	Decay of nature. Not specified.
„ 5	78	Tailor -	Natural decay. Certified.
„ 23	85	Coal miner -	Decay of nature. Not specified.
„ 30	71	Cattle dealer -	Bronchitis. Certified.
„ 30	31	Shoemaker - -	Carditis. Certified.
1861.			
Jan. 12	65	Shoemaker -	Asthma. Certified.
„ 21	22	- - -	Consumption. Certified.
„ 29	83	Farmer -	Natural decay. Certified.
„ 28	51	Innkeeper -	Cancer. Certified.
Feb. 18	40	Shoemaker -	Phrenitis. Certified.
Mar. 22	12	Son of tailor -	Bronchitis. Certified.
„ 30	81	Farmer -	Decay of nature. Certified.
Apr. 16	57	Agric. labourer	Bronchitis. Diseased heart. Certified.
May 2	71	Yeoman -	Apoplexia. Certified.
„ 10	80	Innkeeper -	Decay of nature. Certified.
„ 7	14	Son of lead miner.	Asthma. Certified.
Aug 30	29	Son of farmer	Diseased liver. Certified.
Sep. 23	62	Clockmaker -	Scirrhus of liver. Certified.
Oct. 14	10	Son of lead miner.	Hydrocephalus. Certified.
„ 16	71	Lead miner -	Decay of nature. Certified.
Nov. 6	38	Stone mason -	Consumption. Certified.
„ 5	79	Farmer -	Natural decay. Certified.
„ 16	72	Schoolmaster-	Apoplexy. Not certified.
„ 15	98	Labourer -	Natural decay. Not certified.
„ 25	31	Farmer's Son	Phthisis. Certified.
Dec. 1	27	Son of joiner -	Diseased liver. Dropsy. Certified.
—	81	Lead miner -	Natural decay. Not certified.

Sub-district - 2. Hawes.

1859.			
Feb 4	17	Son of farmer	Consumption. Not certified.
„ 19	71	Farmer -	Hydrothorax. Certified.
Mar. 21	89	Farmer -	Old age. Certified.
„ 23	31	Farmer -	Bronchitis. Not certified.
„ 23	75	Farmer -	Paralysis. Certified.
„ 30	79	Yeoman -	Unknown. Not certified.
Apr. 4	25	Tinner and brazier.	Unknown. Not certified.
„ 1	81	Farmer -	Apoplexy. Certified.
„ 28	24	Son of farmer	Apoplexy. Certified.
May 11	82	Watchmaker	Dropsy. Not certified,
June 2	71	Yeoman -	Atony of the stomach. Certified.
„ 18	10	Son of joiner	Bronchitis. Certified.
„ 26	77	Farmer -	Unknown. Not certified.
July 3	84	Labourer -	Apoplexy. Certified.
Aug 18	34	Draper -	Fungus tumour of the testicle. Not certified.
Sept. 24	64	Builder, master	Stricture of intestine. Certified.
Oct. 3	70	Farmer -	Ulcered intestines.
„ 4	31	Farmer -	Diseased heart. Certified.

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Jan. 14	87	Yeoman -	Old Age. Certified.
„ 30	60	Coachman -	Paralysis. Certified.
Feb. 20	71	Farmer -	Unknown. No medical attendant.
Mar. 1	21	Son of collier	Lumbar abscess. Certified.
„ 7	82	Hawker -	Paralysis. Certified.
„ 21	41	Cowkeeper -	Scrofula. Certified.
„ 20	81	Farmer -	Old age. Certified.
„ 23	74	Woolcomber -	Atony of stomach. Certified.
May 11	17	Son of farmer	Diseased heart. Certified.
June 8	23	Son of nail-maker.	Diseased heart. Certified.
July 14	65	Greengrocer -	Accident. Injury to spine. Inquest.
Sept. 22	73	Road maker -	Spasmodic affection of bowels. Certified.
„ 28	16	Son of farmer	Typhus gravior. Certified.
Oct. 18	14	Son of woolcomber.	Typhus fever. Certified.
„ 21	57	Farmer -	Ileus, 14 days. Certified.
Nov. 6	71	Quarryman -	Atony of the stomach. Certified.
„ 21	31	Farmer -	Asthma. Dropsy. Certified.
„ 24	60	Hosier -	Typhus fever. Certified.
Dec. 13	69	Dyer - -	Debility. Certified.
„ 12	48	Joiner - -	Mortification of lungs. Certified.
„ 29	77	Clerk in orders	Paralysis. Certified.
1861.			
Feb. 3	77	Farmer -	Dropsy. Certified.
„ 6	31	Draper -	Epilepsy. Certified.
Mar. 27	73	Knitter -	Anasarca. Certified.
Apr. 5	27	Labourer -	Ulcered intestine. Certified.
„ 20	44	Stone mason -	Consumption. Certified.
„ 28	53	Spirit merchant	Atony of stomach. Certified.
May 5	84	Yeoman -	Retention of urine. Certified.
„ 29	19	Son of joiner	Pneumonia. Certified.
June 6	71	Farmer -	Diseased bladder. Certified.
Sept. 3	73	Mole catcher	Diarrhœa. Certified.
Oct. 4	72	Farmer -	Paralysis. Certified.
„ 10	69	Farmer -	Dysentery. Certified.
Dec. 1	45	Tailor, master	Diseased heart. Certified.

Superintendent Registrar's District.	Registrar's Sub-District.
538. REETH.	1. Muker. 2. Reeth.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859–61.

Sub-district - 1. Muker.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 26	43	Lead miner -	Bronchitis, 3 weeks. Certified.
„ 31	54	Lead miner -	Diseased liver, 6 months. Certified.
Feb. 26	54	Lead miner -	Bronchitis, 2 months. Certified.
Mar. 10	62	Lead miner -	Age and debility. No medical attendant.
„ 10	46	Lead ore smelter	Bronchitis, 2 months. Certified.
„ 9	61	Lead miner -	Bronchitis, 12 days. Certified.
„ 15	78	Farmer -	Diseased heart. Not certified.
„ 22	80	Landed pro prietor.	Old age. No medical attendant.
Apr. 5	36	Lead miner -	Consumption, 6 months. Certified.
Mar. 31	68	Landed pro prietor.	Natural decay. Certified.
Apr. 17	51	Lead miner -	Abscess of lung, 2 months. Certified.
May 15	62	Farmer -	Abscess of right lung. Certified.
„ 19	82	Farmer -	Age and debility. Certified.
„ 24	45	Farmer -	Ileus, 24 hours. Certified.
June 5	76	Lead miner -	Pneumonia, 7 days. No medical attendant.
„ 10	18	Miner - -	Fall of a stone in a lead mine. Inquest.
„ 14	69	Cordwainer -	Bronchitis, 10 days. Certified.
July 12	89	Landed proprietor.	Age and debility. No medical attendant.
Aug 27	40	Schoolmaster	Apoplexy, 36 hours. Certified.
Sept. 3	32	Lead miner -	Enteritis, 7 days. Not certified.
Oct. 22	49	Schoolmaster	Accidental fall. Inquest.
Nov. 22	76	Lead miner -	Pleurisy, 7 days. Not certified.
Dec. 4	44	Lead miner -	Diseased heart. Certified.
Jan. 6	17	Farm servant	Meningitis, 10 days. Certified.
„ 12	69	Lead miner -	Asthma, 6 years. No medical attendant.
Feb. 10	72	Agric. labourer	Old age. No medical attendant.
Mar. 24	21	Lead miner -	Disease of brain, 7 weeks. Certified.
Apr. 29	67	Farmer -	Bronchitis, 9 days. Certified.
June 5	41	Lead miner -	Consumption, 3 months. Certified.
„ 14	76	Agric. labourer	Diseased bladder. Certified.
„ 20	59	Lead miner -	Apoplexy, 2 days. Certified.
„ 20	68	Lead miner -	Debility and age. Certified.
„ 28	16	Lead miner -	Consumption, 6 months. No medical attendant.
„ 30	11	Lead miner -	Abscess, 5 months. Not certified.
„ 24	22	Joiner - -	Pneumonia, 14 days. Not certified.
Aug. 9	35	Lead miner -	Epistaxis, 14 months. Certified.
Oct. 24	37	Lead miner -	Pleurisy, 11 days. Certified.
„ 29	87	Landed proprietor.	Natural decay. No medical attendant.
Nov. 12	26	Lead miner -	Accident. Fall of earth in a lead mine. Inquest.
1861.			
Jan. 11	53	Lead miner -	Bronchitis, 2 years. Certified.
„ 22	10	Son of lead miner.	Consumption, 6 months. Certified.
Feb. 9	26	Lead miner -	Pneumonia, 8 days. Certified.
„ 9	17	Lead miner -	Consumption, 3 months. Certified.
Mar. 14	70	Lead ore smelter	Bronchitis, 6 weeks. Certified.
„ 17	51	Lead ore smelter	Bronchitis, 14 days. Certified.
„ 25	80	Butcher -	Bronchitis, 14 days. Certified.
„ 26	81	Farmer -	Bronchitis, 3 weeks. Certified.
Apr. 4	57	Lead miner -	Bronchitis, 10 days. Certified.
„ 11	28	Farmer -	Cut his throat (suicide). Inquest.
„ 30	39	Lead miner -	Consumption, 6 months. Certified.
May 1	61	Farmer -	Bronchitis, 10 weeks. Certified.
July 7	70	Farmer -	Pneumonia, 6 days. Certified.
Oct. 8	75	Publican -	Natural decay. No medical attendant.
„ 14	80	Tailor - -	Age and debility. Certified.
„ 28	49	Lead miner -	Consumption, 6 months. Not certified.
Nov. 20	70	Landed proprietor.	Diseased stomach, 3 months. Certified.

Sub-district - 2. Reeth.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 15	88	Butcher -	Nephritis, 3 weeks. Certified.
„ 24	50	Lead miner -	Consumption, 12 months. No medical attendant.
„ 25	46	Lead miner -	Pneumonia, 6 days. Certified.
Feb. 1	85	Farmer -	Apoplexy, 5 days. Certified.
„ 11	76	Surveyor -	Cancer of face, 12 months. Certified.
„ 24	49	Lead miner -	Abscess on lung, 3 months. Certified.
Mar. 16	13	Son of clogger	Scarlatina, 6 days. Certified.
„ 29	53	Lead miner -	Consumption, 12 months. Certified.
Apr. 20	87	Lead mine agent	Ileus, 3 weeks. Certified.
„ 24	28	Son of carpenter	Epileptic fits, 6 months. Certified.
May 21	23	Farmer - -	Abscess in the throat. Certified.
„ 22	38	Lead miner -	Consumption, 1 year. Certified.
„ 26	72	Carrier -	Bronchitis, 3 months. Certified.
„ 31	57	Lead miner -	Cephalitis, 5 days. Certified.
July 1	53	Lead miner -	Cancer, 6 months. Certified.
Aug 15	50	Lead miner -	Cephalitis, 4 days. Certified.
Oct. 5	37	Lead miner -	Consumption, 5 months. No medical attendant.
„ 16	47	Lead miner -	Miners' asthma, 6 months. Certified.
„ 17	49	Lead miner -	Consumption, 8 months. Certified.
„ 23	42	Lead miner -	Diseased lungs, 3 months. Certified.
„ 25	33	Lead miner -	Consumption, 8 months. Certified.

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Nov. 5	82	Carpenter, master.	Diseased liver, 6 months. Certified.
„ 17	20	Son of carpenter	Consumption, 7 months. Certified.
„ 28	58	Stonemason -	Palsy, 3 months. Certified.
Dec. 1	16	Son of lead miner.	Scrofula. Certified.
„ 4	50	Agric. labourer	Enteritis, 3 days. Certified.
„ 8	65	Lead ore smelter	Paralysis, 12 months. Certified.
„ 8	44	Lead ore carrier	Cephalitis, 10 days. Certified.
„ 15	45	Lead miner -	Consumption, 6 months. Certified.
„ 17	83	Agric. labourer	Pneumonia, 9 days. Certified.
1860.			
Jan. 20	57	Lead miner -	Consumption, 6 months. Certified.
„ 28	40	Lead miner -	Consumption, 8 months. Certified.
Feb. 6	60	Lead miner -	Consumption, 12 months. Certified.
„ 10	48	Labourer -	Consumption, 4 months. Certified.
„ 19	36	Lead miner -	Diseased kidneys, 7 months. Certified.
„ 17	33	Lead miner -	Consumption, 6 months. Certified.
Mar. 7	28	Lead miner -	Consumption, 7 months. Certified.
„ 10	36	Farmer - -	Nephritis, 10 days. Certified.
Apr. 1	55	Lead miner -	Bronchitis, 6 months. Certified.
„ 4	71	Labourer -	Diseased lungs, 7 months. Certified.
„ 27	37	Lead miner -	Pneumonia, 7 days. No medical attendant.
May 7	60	Lead miner -	Paralysis. Certified.
„ 8	67	Lead miner -	Diseased heart, 6 months. Certified.
„ 11	17	Lead miner -	Consumption, 6 months. Certified.
„ 25	23	Labourer -	Diseased heart, 6 months. Certified.
„ 28	69	Lead miner -	Miners' asthma. Certified.
June 1	81	Agric. labourer	Diseased heart. Certified.
„ 9	75	Lead ore smelter	Bronchitis, 3 weeks. Certified.
„ 16	55	Lead miner -	Diseased joints, 12 months. Certified.
„ 22	67	Agric. labourer	Bronchitis, 3 months. Certified.
„ 24	69	Carpenter	Cancer, 6 months. Certified.
July 2	58	Lead miner -	Diseased lungs, 8 months. Certified.
„ 23	32	Shoemaker -	Abscess in lungs, 8 weeks. Certified.
Aug 15	38	Lead miner -	Fever, 8 days. Certified.
„ 24	53	Lead miner -	Bronchitis, 14 days. Certified.
„ 30	63	Farmer -	Cut his throat (suicide). Inquest.
Sep. 22	62	Lead miner -	Consumption, 8 months. No medical attendant.
Dec. 18	57	Shoemaker, master.	Bronchitis, 6 weeks. Certified.
1861.			
Jan. 30	49	Lead miner -	Consumption, 9 months. Certified.
Feb. 28	80	Lead ore smelter.	Mortification of feet, 3 months. Certified.
Mar. 7	31	Lead miner -	Consumption, 2 years. Certified.
„ 21	29	Lead miner -	Diseased heart, 7 months. Certified.
„ 23	54	Lead miner -	Consumption, 6 months. Certified.
Apr. 4	37	Lead miner -	Consumption, 12 months. Certified.
„ 3	32	Lead miner -	Diseased heart. Inquest.
„ 16	80	Agric. labourer	Diseased heart, 3 months. Certified.
„ 24	68	Lead miner -	Miners' asthma, 3 years. Certified.
„ 25	22	Lead miner -	Consumption, 4 months. No medical attendant.
„ 25	50	Lead miner -	Diseased kidneys, 8 months. Certified.
May 11	67	Stonemason -	Pneumonia, 8 days. Certified.
„ 13	43	Lead miner -	Acute meningitis, 5 days. Certified.
„ 21	73	Agric. labourer	Diseased bladder, 3 months. Certified.
June 17	33	Lead miner -	Cephalitis, 14 days. Certified.
17	61	Lead miner -	Diabetes, 6 months. Certified.
1861.			
June 19	10	Son of lead miner.	Consumption, 8 months. Certified.
„ 24	27	Lead miner -	Consumption, 12 months. Certified.
„ 27	15	Son of lead miner.	Consumption, 6 months. Certified.
July	39	Lead miner -	Consumption, 18 months. Certified.
„ 19	12	Son of lead miner.	Diseased lungs, 6 months. Certified.
Aug 13	47	Lead miner -	Consumption, 8 months. Certified.
„ 28	26	Lead miner -	Diseased heart, 8 months. Certified.
Oct. 7	34	Lead miner -	Consumption, 14 months. Certified.
„ 22	84	Mining agent	Diseased heart, 2 years. Certified.
Nov. 4	11	Son of lead miner.	Accident. Fracture of skull. Inquest.
„ 28	70	Lead miner -	Bronchitis, 3 weeks. Certified.
Dec. 18	91	Farmer - -	Anasarca, 6 months. Certified.

Superintendent Registrar's District.	Registrar's Sub-district.
489. SKIPTON.	1. Kettlewell. 5. Skipton. 7. Grassington.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859-61.

Sub-district - 1. Kettlewell.

1859.			
Jan. 31	87	Cattle dealer -	Old age. Not certified.
May 23	32	Farmer -	Enteritis. Certified.
June 6	39	Innkeeper -	Consumption, 6 months. Not certified.
July 8	68	Farmer -	Dropsy, 1 month. Not certified.
„ 19	28	Stonemason -	Cephalitis, 4 days. Not certified.
„ 20	39	Schoolmaster -	Diseased kidneys, 6 months. Not certified.
Aug. 2	67	Lead miner -	Hypercarditis, 16 days. Certified.
„ 30	60	Labourer -	Sudden. Visitation of God. Inquest.
Oct. 8	73	Farmer -	Natural decay. Certified.
Nov. 3	68	Farmer -	Hepatitis, 9 days. Certified.
1860.			
Feb. 2	16	Farm servant	Accident. Discharge of a gun. Inquest.
„ 21	82	Labourer -	Visitation of God. Inquest.
Mar. 18	84	Lead miner -	Old age. Not certified.
Apr. 16	68	Innkeeper -	Dropsy, 3 months. Certified.
May 31	19	Son of farmer	Scrofula, 3 years. Certified.
July 8	77	Joiner - -	Hydrocele, 2 years. Certified.
Nov. 6	36	Joiner -	Consumption, 7 months. Certified.
„ 14	69	Draper - -	Natural decay, 12 months. Certified.
1861.			
Jan. 27	68	Joiner - -	Phthisis. Certified.
Feb. 9	25	Agric. labourer	Exposure to the weather. Inquest.
„ 9	55	Tailor - -	Exposure to the weather. Inquest.
May 4	61	Farmer -	Paralysis, 5 years. Certified.
„ 15	43	Cordwainer -	Erysipelas, 12 days. Certified.
July 5	47	Agric. labourer	Ascites, 1 year. Certified.
Aug 24	87	Farmer - -	Natural decay. No medical attendant.
Sept. 5	77	Agric. labourer	Natural decay. Not certified.
„ 19	74	Agric. labourer	Natural decay. Not certified.

Sub-district - 5. Skipton.

1859.			
Jan. 10	61	Wine merchant	Diseased heart, 12 months. Certified.
„ 11	60	Farmer -	Debility; bedsores. Certified.

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 29	73	Manager of waterworks.	Dropsy. Certified.
Feb. 10	63	Boatman -	Diseased heart. Certified.
Mar. 3	32	Clogger -	Phthisis, 2 years. Certified.
„ 7	62	Boat builder, master.	Chronic gastritis, 4 months. Certified.
„ 8	75	Innkeeper -	Gangrene senilis, 3 months. Certified.
„ 11	73	Labourer -	Bronchitis, 3 weeks. Certified.
„ 28	55	Farmer -	Ischuria, 3 weeks. Certified.
Apr. 2	61	Stonemason -	Bronchitis, 9 months. Certified.
„ 14	59	Joiner -	Icterus, 9 weeks. Certified.
„ 20	45	Bailiff assistant	Phthisis, 3 months. Certified.
„ 24	78	Grocer -	Jaundice. Certified.
„ 29	13	Son of carder	Phthisis, 6 months. Certified.
May 14	47	Shoemaker -	Nephria. Certified.
„ 14	76	Weaver -	Dropsy, 10 weeks. Certified.
„ 29	53	Surgeon -	Phthisis. Certified.
June 19	48	Spindle grinder	Bronchitis. Certified.
„ 21	65	Agric. labourer	Hernia. Certified.
„ 25	73	Agric. labourer	Mortification, 3 weeks. Certified.
„ 28	59	Post messenger	Diseased heart. Certified.
„ 24	59	Labourer -	Intemperance. Inquest.
July 1	67	Labourer -	Asthma. Certified.
June 30	42	Porter - -	Phthisis. Certified.
July 8	38	Innkeeper -	Diabetes some months. Certified.
„ 12	77	Hawker -	Diseased heart, asthma. Certified.
„ 28	18	Tinner -	Phthisis, 6 months. Certified.
„ 27	40	Shoemaker -	Suicide, cut his throat. Inquest.
Aug. 12	59	Shoemaker -	Phthisis. Certified.
„ 7	16	Son of printer	Congestion of brain from drinking spirituous liquors. Inquest.
„ 16	34	Shoemaker -	Phthisis pulmonalis. Certified.
„ 19	81	Labourer -	Apoplexy. Certified.
„ 21	74	Iron moulder -	General debility. Certified.
Sept. 6	55	Cabinet-maker	Diseased heart. Certified.
„ 11	53	Farmer -	Diseased heart. Certified.
„ 11	70	Shoemaker -	Typhoid fever, 4 weeks. Certified.
Oct. 12	42	Stone mason -	Phthisis, 2 years. Certified.
„ 8	21	Mechanic -	Phthisis, 2 years. Certified.
„ 29	37	Chimney sweep	Ileus. Certified.
„ 27	21	Labourer -	Phthisis pulmonalis. Certified.
Nov. 8	78	Woolcomber -	Old age. Not certified.
„ 19	86	Labourer -	Bronchitis. Certified.
Dec. 3	33	Delver -	Compound fracture and wound on the left leg. Inquest.
„ 6	32	Woolcomber -	Phthisis. Tracheatis. Certified.
„ 11	49	Labourer -	Bronchitis. Asthma, 2 years. Certified.
„ 13	62	Labourer -	Pneumonia, 6 days. Certified.
„ 15	61	Railway porter	Abscess, 3 years. Certified.
„ 14	60	Boatman -	Inguinal hernia. Certified.
1860.			
Jan. 2	23	Cotton weaver	Phthisis. Certified.
„ 4	72	Carrier -	Pneumonia, 6 weeks. Certified.
„ 4	57	Painter -	Diseased heart. Anasarca. Certified.
„ 12	41	Coach builder	Hernia. Acute bronchitis. Certified.
„ 17	80	Farmer -	Diseased heart. Palsy. Certified.
„ 21	67	Cordwainer -	Diseased heart and kidneys. Certified.
„ 21	76	Watchmaker -	Old age. Certified.
„ 27	24	Whitesmith -	Phthisis pulmonalis. Certified.
Feb. 4	76	Shoemaker -	Old age. Certified.
„ 4	44	Schoolmaster	Asthma. Bronchitis. Carditis. Certified.
„ 15	61	Agric. labourer	Bronchitis. Asthma. Certified.
„ 18	80	Carter - -	Paralysis. Certified.
„ 20	21	Joiner -	Hemiplegia Phthisis.
„ 27	54	Labourer -	Diseased liver. Dropsy. Certified.
Mar. 1	66	Blacksmith -	Bronchitis. Certified.
„ 23	14	Son of blacksmith.	Hernia and enteritis. Certified.
„ 27	39	Innkeeper -	Diseased kidneys and epileptic coma. Certified.
„ 31	69	Toll collector	Apoplexy, 3 days. Certified.
Apr. 2	64	Cotton twister	Found drowned. Inquest.
„ 6	75	Carter -	Asthma. Dropsy, 6 months. Certified.
„ 22	19	Agric. labourer	Phthisis pulmonalis, 6 months. Certified.
May 6	48	Post messenger	Phthisis pulmonalis, 6 months. Certified.
„ 12	21	Saddler -	Diseased heart. Certified.
„ 12	15	Son of iron moulder.	Diphtheria, 9 weeks. Certified.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
May 18	46	Carter - -	Pulmonary apoplexy. Certified.
„ 21	89	Yeoman -	Senectus. Certified.
„ 28	72	Lead roller -	Icterus, 3 months. Certified.
„ 29	59	Labourer -	Dementic debility. Certified.
June 1	61	Delver -	Pulmonary apoplexy.
„ 13	70	Drainer -	Suddenly. Certified.
„ 19	63	Stone mason -	Hydrothorax. Certified.
„ 23	55	Brewer's carter	Accident. Run over by a cart. Inquest.
„ 27	70	Blacksmith -	Dyspepsia. Bronchitis. Certified.
July 2	20	Carter - -	Phthisis pulmonalis. Certified.
„ 3	70	Wheelwright -	Hydrothorax, 3 months. Certified.
„ 21	59	Weaver -	Epilepsy. Certified.
„ 21	74	Blacksmith -	Debility. Not certified.
„ 23	42	Farm servant	Asthma. Bronchitis. Certified.
Aug. 9	48	Agric. labourer	Fracture of skull. Certified.
„ 12	51	Innkeeper -	Diseased liver. Certified.
Sep. 10	67	Gentleman -	Diseased heart. Certified.
„ 12	55	Stonemason -	Bronchitis. Certified.
„ 25	79	Gentleman -	Diseased liver. Certified.
Oct. 9	54	Power-loom weaver.	Dropsy. Certified.
„ 19	69	Gardener -	Diseased heart. Certified.
Nov. 2	50	Groom -	Bronchitis. Diarrhœa. Certified.
„ 11	19	Son of gardener	Phthisis pulmonalis, 3 years. Certified.
„ 16	18	Son of tailor -	Phthisis pulmonalis, 3 years. Certified.
Dec. 23	72	Agric. labourer	Bronchitis. Certified.
„ 21	82	Sawyer -	Bronchitis. Certified.
„ 26	73	Hatter -	Cirrhosis bronchitis. Certified.
Nov. 6	17	Stonemason -	Diseased liver. Inquest.
1861.			
Jan. 2	57	Draper -	Paralysis, 2 years. Certified.
„ 21	80	Delver -	Hernia, many years. Certified.
„ 29	82	Shoemaker -	Natural decay. Certified.
Feb. 5	73	Farmer -	Paralysis and dropsy, 2 years. Certified.
„ 15	84	Shoemaker -	Suddenly supposed to be a fit. Not certified.
„ 19	27	Cotton weaver	Phthisis pulmonia. Certified.
„ 18	12	Son of delver	Scrofula. Certified.
„ 20	84	Handloom weaver.	Pneumonia, 4 weeks. Certified.
„ 25	60	Joiner -	Cancer of the palate. Certified.
Mar. 11	65	Miller - -	Asthma. Bronchitis. Certified.
„ 7	83	Cabinet maker	Senectus. Certified.
„ 16	86	Farmer -	Old age. Certified.
„ 21	14	Son of printer	Phthisis, 1 month. Certified.
„ 23	64	Agric. labourer	Diseased heart. Certified.
Apr. 22	29	Cabinet maker	Phthisis pulmonalis, 4 months. Certified.
„ 30	12	Son of pointsman.	Phthisis pulmonalis, 4 months. Certified.
May 3	59	Engine tenter -	Gangrene of lung, 1 month. Certified.
„ 8	62	Farmer -	Cancer of stomach. Certified.
„ 13	24	Tailor -	Pneumonia, 1 week. Certified.
„ 15	10	Son of hawker	Diseased heart. Dropsy. Certified.
„ 24	74	Delver -	Diseased heart. Not certified.
„ 31	74	Butcher -	Dropsy. Not certified.
June 6	72	Boatman -	Bronchitis. Certified.
July 15	37	Hatter - -	Ulcered intestines. Certified.
Aug. 1	37	Woolcomber -	Apoplexy.
„ 1	40	Lead-miner -	Phthisis pulmonalis, 6 months. Certified.
„ 8	51	Sawyer -	Anasarca, 3 months. Certified.
„ 18	32	Agric. labourer	Continued fever, 14 days. Not certified.
„ 27	34	Handloom weaver.	Diseased heart. Anasarca, 14 days. Certified.
Sept. 1	67	Farmer -	Bronchitis. Diarrhœa. Certified.
Sept. 2	69	Farmer - -	Ileus, 4 weeks. Certified.
„ 8	62	Blacksmith -	Diarrhœa. Certified.
„ 16	67	Weaver -	Catarrhus vesicæ.
„ 21	53	Stonemason -	Phthisis pulmonalis, 10 months. Certified.
Oct. 2	46	Agric. labourer	Fever, 3 weeks. Certified.
„ 4	46	Overlooker in a cotton mill.	Stone. Certified.
„ 3	71	Land surveyor	Decay of nature. Certified.
„ 7	40	Delver - -	Diarrhœa, many months. Certified.
„ 14	67	Drover - -	Paralysis, 3 days. Certified.
„ 29	16	Spindle maker apprentice.	Pulmonary consumption. Certified.

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
Nov. 6	65	Stonemason -	Pleuro-pneumonia, 6 days. Certified.
„ 9	34	Cotton warper	Diseased spine and lungs. Certified.
„ 9	14	Son of labourer	Phthisis pulmonalis, 2 years. Certified.
„ 13	67	Scavenger -	Ileus, 72 hours. Certified.
„ 18	55	Labourer -	Chronic bronchitis. Certified.
„ 17	70	Toll collector	Apoplexy, 6 weeks. Old age. Certified.
Dec. 4	76	Farmer - -	Apoplexy. Certified.
„ 15	68	Schoolmaster -	Bronchitis. Certified.
„ 19	78	Labourer -	Anasarca, 3 months. Certified.
„ 19	37	Servant -	Enteritis, 14 days. Certified.
„ 21	78	Hawker -	Apoplexy, 72 hours. Certified.
„ 23	87	Labourer -	Bronchitis. Certified.
„ 27	50	Hawker -	Carbuncles. Certified.

Sub-district - 7. Grassington.

1859			
Jan. 13	59	Stonemason -	Asthma. Influenza. Certified.
Feb. 10	52	Lime burner -	Paralysis, 20 years. Not certified.
„ 9	58	Agric. labourer	Phthisis, 11 months. Certified.
„ 11	69	Cattle driver -	Laryngitis, 9 months. Certified.
„ 8	48	Lead miner -	Phthisis, 13 weeks. Certified.
Mar. 13	46	Labourer -	Asthma, 8 years. No medical attendant.
June 3	17	Son of lead miner	Consumption, 3 months. Not certified.
„ 11	51	Labourer -	Rheumatics and stone. Not certified.
July 20	25	Book keeper -	Consumption, 5 months. Certified.
Sept 28	63	Assayer -	Phthisis, 3 weeks. Certified.
Oct. 17	80	Proprietor of land.	Diseased kidneys, 3 weeks. Certified.
Dec. 3	83	Blacksmith -	Diarrhœa, 2 months. Certified.
„ 4	78	Joiner, master	Ulceration of the body. Certified.
„ 5	60	Farmer -	Ulcerated throat, 6 months. Certified.
„ 2	66	Surgeon -	Unknown. No medical attendant.
„ 29	77	Farmer - -	Pneumonia, 2 weeks. Certified.
1860			
Jan. 10	70	Stonemason -	Old age. Not certified.
„ 7	60	Farmer - -	Diarrhœa, 9 days. Certified.
1859			
Dec. 19	84	Cordwainer, master.	Old age. No medical attendant.
1860			
Jan. 26	28	Farmer - -	Pneumonia. Typhus, 2 weeks. Certified.
Feb. 4	51	Lead miner -	Miners' asthma, 2 years. Certified.
Mar. 17	34	Farmer - -	Consumption, 4 months. Certified,
„ 19	77	Lead miner -	Diseased heart. Certified.
Apr. 21	35	Lead ore smelter	Phthisis, 5 years. Certified.
June 14	47	Farmer - -	Phthisis, 5 years. Certified.
„ 10	73	Wool comber	Wound of the leg, 2 years. Certified.
„ 26	46	Excavator -	Atrophy, 3 weeks. Certified.
July 7	23	Repairer of rails	Typhus. Phthisis. Certified.
Aug 26	48	Labourer -	Consumption, 9 months. Certified.
Oct. 12	88	Landed proprietor.	Old age. No medical attendant.
Dec. 5	73	Landed proprietor.	Asthma, 6 years. Certified.
1861.			
Jan. 5	39	Coal miner -	Phthisis, 2 years. Certified.
Apr. 4	20	Draper, assistant.	Phthisis, 6 months. Certified.
„ 10	83	Proprietor of houses.	Senectus. Certified.
May 14	71	Clogger, master	Asthma. Not certified.
Apr. 22	16	Son of joiner, master.	Consumption, 3 months. Not certified.
„ 21	38	Tea dealer -	Hæmoptysis. No medical attendant.
June 6	25	Son of farmer	Consumption, 3 years. Not certified.
„ 13	20	Shoemaker -	Accident. Drowned. Inquest.
„ 9	70	Lead miner -	Asthma, 4 years. Certified.
1861.			
May 22	32	Joiner, master	Consumption, 7 months. Not certified.
June 27	15	Son of lead miner.	Psoas abscess, 1 year. Certified.
„ 29	11	Son of farmer	Gastric irritation and effusion on the brain. Certified.
July 2	43	Lead miner -	Consumption, 3 months. Certified.
„ 15	81	Farmer -	Senectus. Certified.
Aug 21	14	Son of lead ore smelter.	Diphtheria, 1 week. Certified.
Sept. 5	38	Lead miner -	Lumbar abscess, 2 years. Certified.
„ 13	54	Farmer -	Pneumonia, 6 days. Certified.
Dec. 2	15	Son of farmer	Diphtheria, 8 days. Certified.

Superintendent Registrar's District.	Registrar's Sub-District.
490. PATELEY BRIDGE.	1. Ramsgill. 2. Pateley Bridge.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859–61.

Sub-district - 1. Ramsgill.

1859.			
Feb. 14	80	Agric. labourer	Apoplexy. No medical attendant.
June 10	66	Farmer -	Stone, 12 days. Not certified.
„ 15	26	Stonemason -	Pneumonia, 13 days. Certified.
July 22	68	Agric. labourer	Dropsy, 2 months. Certified.
1860.			
Mar. 16	54	Farmer -	Scirrhus liver, 2 years. Certified.
„ 22	50	Stonemason -	Hydrocephalus, 7 days. Coma, 3 days. Certified.
Apr. 23	59	Farmer -	Paralysis, 3 years. Certified.
„ 28	56	Farmer -	Typhoid fever, 16 days. Certified.
May 12	63	Farmer -	Phthisis, 12 months. Not certified.
Nov. 15	74	Stonemason -	Bronchitis, 4 weeks. Not certified.
„ 25	70	Farmer - -	Diseased brain, 6 months. Certified.
Dec. 22	76	Farmer -	Synochus, 14 days. Bronchitis, 7 days. Certified.
1861.			
Jan. 24	12	Son of labourer	Suffocated by carbonic acid gas in a coal pit. Inquest.
Mar. 8	72	Farmer -	Pneumonia, 7 days. Not certified.
„ 23	71	Agric. labourer	Chronic rheumatism, some years. Certified.
May 12	75	Farmer -	Hepatitis. Jaundice, 6 weeks. Certified.
Aug 13	44	Cordwainer -	Consumption, 13 months. Certified.

Sub-District - 2. Pateley Bridge.

1859.			
Jan. 2	81	Blacksmith -	Paralysis. Certified.
„ 24	23	Agric. labourer	Phthisis. Certified.
Feb. 1	18	Son of farmer	Pneumonia. Not certified.
„ 15	50	Lead-miner -	Rheumatic fever. Not certified
Mar. 3	75	Farmer -	Fever, 3 weeks. Certified.
„ 18	52	Slater - -	Acute bronchitis. Certified.
„ 23	74	Gentleman -	Ileus, 14 days. Certified.
„ 30	50	Flax-dresser -	Phlegmon, 7 weeks. Certified.
Apr. 11	47	Lead miner -	Consumption. Not certified.
„ 19	61	Agric. labourer	Influenza. Not certified
May 8	78	Agric. labourer	Dysentery, 5 weeks. Certified.
„ 16	16	Mechanic -	Phthisis, 12 months. Certified.
June 1	24	Son of lead miner.	Pneumonia. Not certified.
„ 26	68	Farmer - -	Pneumonia. Not certified.
„ 28	56	Labourer -	Injuries. Fall under the wheels of a waggon. Inquest.

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
June 28	46	Labourer -	Injuries. Fall under the wheels of a waggon. Inquest.
July 28	42	Shoemaker -	Hepatitis, 16 years. Certified.
„ 29	27	- - -	Phthisis, 1 year. Certified.
Sept. 26	57	Labourer -	Dropsy. Not certified.
Oct. 3	70	Farmer -	Asthma. Not certified.
Nov. 25	20	Son of lead miner.	Consumption. Not certified.
Dec. 19	68	Lead miner -	Dropsy. Not certified.
1860.			
Jan. 8	30	Stonemason -	Consumption. Certified.
„ 16	71	Linen weaver	Cystitis, 3 months. Certified.
„ 21	82	Agric. labourer	Natural decay. Certified.
„ 28	68	Lead miner -	Ramolissement of brain, 3 years. Certified.
Feb. 7	74	Agric. labourer	Diseased heart. Not certified.
Mar. 27	59	Lead miner -	Diseased heart, dropsy. Certified.
May 12	15	Son of labourer	Smallpox. Not certified.
„ 26	23	Son of flax dresser.	Consumption. Not certified.
„ 27	23	Lead miner -	Typhus fever, 9 days. Certified.
June 8	73	Joiner - -	Diseased heart. Dropsy. Certified.
July 24	24	Bobbin turner	Enteritis, 10 days. Certified.
Aug. 21	62	Lead miner -	Hematuria. Certified.
„ 22	30	Son of farmer	Consumption. Certified.
Sept. 8	33	Farmer - -	Phthisis. Hæmoptysis. Certified.
„ 30	72	Farmer - -	Apoplexy. Not certified.
Oct. 3	74	Lead miner -	Paralysis. Certified.
Nov. 7	73	Yarn dyer -	Gastritis. Certified.
„ 28	18	- - -	Phthisis pulmonalis, 10 months. Certified.
1861.			
Jan. 10	58	Lead miner -	Diseased heart. Certified.
„ 15	59	Farmer -	Diseased spine. Certified.
„ 24	77	Lead miner -	Natural decay. Not certified.
„ 23	38	Cattle dealer -	Diseased lungs. Not certified.
Feb. 3	77	Farmer -	Apoplexy, 5 days. Certified.
„ 12	37	Lead miner -	Phthisis pulmonalis. Certified.
Mar. 19	33	Flax dresser -	Phthisis pulmonalis, 12 months. Certified.
„ 20	77	Gentleman -	Encephalitis. Certified.
Apr. 2	60	Farmer -	Diseased heart. Certified.
„ 18	13	Son of farmer	Scarlatina, 4 days. Certified.
May 10	85	Weaver	Dementia. Old age. Certified.
„ 8	32	Stonemason -	Consumption. Not certified.
„ 14	47	Lead miner -	Meningitis, 12 months. Certified.
„ 15	16	Son of lead miner	Phthisis, some years. Certified.
„ 12	73	Corn miller -	Bronchitis. Certified.
„ 16	84	Labourer -	Natural decay. Not certified.
„ 19	84	Farmer -	Senectus. Certified.
„ 26	20	Son of farmer	Pleuritis, 3 months. Certified.
„ 27	45	Quarryman -	Cancer of pylorus, 2 years. Certified.
June 5	63	Lead miner -	Diseased heart. Bronchitis. Certified.
„ 6	22	Joiner -	Consumption. Not certified.
„ 11	78	Hawker -	Softening of brain. Certified.
Aug. 2	55	Lead miner -	Bronchitis. Certified.
„ 3	38	Lead miner -	Phthisis pulmonalis. Certified.
Oct. 3	70	Farmer -	Diseased heart. Certified.
„ 5	87	Farmer -	Bronchitis. Certified.
Nov. 5	76	Linen weaver	Apoplexy. Certified.
Dec. 15	67	Lead miner -	Bronchitis, 4 months. Certified.
„ 23	66	Linen weaver	Diarrhœa, 56 hours. Certified.

COUNTY OF DURHAM.

Superintent Registrar's District.	Registrar's Sub-District.
543 TEESDALE.	3. Middleton.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859–61.

Sub-district - 3. Middleton.

1859.			
Jan. 2	22	Son of shoemaker.	Consumption. Certified.
„ 9	77	Grocer -	Apoplexy. Not certified.
„ 13	45	Farmer -	Pneumonia. Gastro-enteritis. Certified.
Feb. 3	22	Tailor -	Consumption. Certified.
„ 3	63	Grocer -	Diseased heart. No medical attendant.
„ 7	80	Gardener -	Ileus. Not certified.
„ 9	62	Shoemaker -	Diseased lungs. Certified.
Mar. 1	75	Farmer -	Natural decay. Not certified.
„ 30	40	Draper -	Diseased liver, 2 months. Certified.
„ 26	67	Farmer and lead miner.	Natural decay. Not certified.
Apr. 20	26	Lead miner -	Consumption. Certified.
„ 28	31	Son of farmer	Found dead. Cause unknown. Inquest.
„ 27	78	Farmer -	Natural decay. Certified.
May 14	55	Farmer -	Consumption. Not certified.
„ 21	36	Lead miner -	Consumption. Certified.
„ 22	12	Son of schoolmaster.	Enteritis. Not certified.
June 1	33	Groom	Consumption. Certified.
„ 17	58	Lead miner -	Diseased lungs, 6 months. Certified.
„ 6	57	Lead miner -	Diseased kidneys, 2 months. Certified.
„ 20	36	Farmer -	Erysipelas. Certified.
„ 17	53	Labourer -	Pneumonia. Certified.
Aug. 10	64	Yeoman -	Apoplexy. Certified.
„ 20	69	Overlooker, wood yard.	Bronchitis. Certified.
„ 10	54	Lead miner -	Bronchitis. Not certified.
„ 19	88	Farmer -	Natural decay. Certified.
1859.			
Sept. 13	19	Son of lead miner.	Apoplexy. Not certified.
Oct. 13	80	Farmer -	Natural decay. Certified.
„ 21	58	Yeoman -	Abscess in the thigh. Certified.
„ 12	48	Lead miner -	Consumption. Not certified.
Nov. 10	20	Lead ore smelter	Diseased lungs. Certified.
„ 11	61	Lead miner -	Consumption. Not certified.
Dec. 11	30	Solicitor -	Diphtheria. Certified.
„ 22	85	Tailor - -	Gangrene. Not certified.
„ 24	45	Lead miner -	Consumption. Certified.
„ 28	20	Son of lead miner.	Accident. Fall of stone in a lead mine. Inquest.
1860.			
Jan. 10	63	Carrier -	Diseased stomach, 3 days. Certified.
Feb. 10	76	Lead miner -	Bronchitis, 5 days. Certified.
„ 5	10	Son of farmer	Pneumonia. Certified.
„ 17	75	Agric. labourer	Diseased stomach. Certified.
„ 12	23	Son of lead ore smelter.	Consumption. Certified.
„ 27	71	Labourer -	Cancer of lip. Certified.
Mar. 12	69	Farmer -	Cancer of face. Certified.
„ 14	52	Lead miner -	Diseased lungs, 12 months. Certified.
Apr. 8	61	Lead miner -	Consumption. Certified.
„ 21	50	Lead miner -	Diseased lungs, 1 year. Certified.
„ 29	42	Lead miner -	Consumption. Certified.
May 12	72	Lead miner -	Pneumonia. Certified.
„ 5	23	Son of lead miner.	Diseased joints, 5 months. Certified.
„ 17	18	Son of farmer	Consumption. Certified.
„ 30	43	Lead miner -	Diseased lungs, 3 months. Certified.
June 13	60	Blacksmith -	Consumption. Certified.
„ 10	41	Stonemason -	Consumption. Certified.
July 5	57	Lead miner -	Dropsy. Certified.
„ 23	39	Lead miner -	Diseased lungs. Certified.
Aug. 15	73	Pensioner -	Paralysis. Certified.
„ 15	57	Lead miner -	Diseased heart, 10 years. Certified.
„ 20	39	Farmer -	Peritonitis. Certified.
„ 20	86	Farmer -	Natural decay. Certified.
„ 23	11	Labourer -	Severe shock to the general system. Inquest.
Sept. 1	63	Lead miner -	Diseased lungs. Certified.
„ 16	34	Joiner - -	Diseased brain, 2 years. Certified.

DISTRICTS IN NORTH OF ENGLAND.

Superintendent Registrar's District. — 544: WEARDALE.

Registrar's Sub-District. — 1. St. John. 2. Stanhope. 3. Wolsingham.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859–61.

Sub-district - 1. St. John.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 1	53	Lead miner -	Hæmoptysis, 48 hours. No medical attendant.
„ 2	71	Stone mason -	Debility from age. Certified.
„ 5	76	Farmer -	Influenza, 2 months. No medical attendant.
„ 14	49	Lead miner -	Influenza, 8 days. Certified.
„ 31	74	Lead miner -	Paralysis. Certified.
Feb. 16	13	Son of cartman	Pleuro-pneumonia. Certified.
„ 17	56	Lead miner -	Pneumonia. Certified.
„ 21	22	Iron miner -	Pneumonia typhoides. Certified.
„ 21	18	Lead miner -	Typhus. Certified.
„ 23	25	Lead miner -	Consumption. Certified.
Mar. 3	61	Ragman -	Cystirrhea. Certified.
„ 13	94	Gentleman -	Old age. Certified.
Feb. 22	34	Farmer and miller.	Suicide (cut throat). Inquest.
Mar. 21	41	Millwright -	Diseased heart. Certified.
„ 30	82	Shoemaker -	Old age. Cerlified.
Apr. 5	55	Lead miner -	Bronchitis. Certified.
„ 22	52	Registrar of births and deaths.	Consumption. Not certified.
„ 21	36	Lead miner -	Consumption, 4 months. Certified
„ 28	38	Lead miner -	Angina pectoris. Certified.
May 1	60	Lead miner -	Pleurisy, 4 days. Certified.
„ 6	15	Son of lead miner.	Diphtheria, 10 days. Certified.
„ 17	59	Lead miner -	Bronchitis, 6 days. Certified.
June 2	40	Lead miner -	Asthma. Certified.
„ 11	51	Lead miner -	Bronchitis. Certified.
„ 12	22	Lead miner -	Hepatitis. Certified.
„ 17	22	Lead miner -	Diseased heart. Certified.
„ 25	52	Lead miner -	Phthisis. Certified.
„ 26	57	Shoemaker, master.	Phthisis. Certified.
July 15	20	Lead miner -	Phthisis. Certified.
„ 29	48	Lead miner -	Phthisis. Certified.
„ 30	34	Lead miner -	Diseased liver. Certified.
Sep. 19	59	Iron miner -	Accident. Fall of stone in West Slit Mine. Inquest.
Oct. 2	64	Road labourer	Influenza. Certified.
„ 18	40	Farmer -	Dropsy. Certified.
„ 20	62	Lead miner -	Bronchitis. Certified.
Nov. 30	66	Toll collector	Pneumonia. Certified.
Dec. 11	35	Lead miner -	Phthisis. Certified.
„ 22	25	Iron miner -	Phthisis. Certified.
1860.			
Feb. 6	51	Lead miner -	Phthisis. Certified.
„ 11	29	Joiner, journeyman.	Phthisis. Certified.
„ 17	55	Lead miner -	Phthisis. Certified.
„ 20	28	Lead miner -	Cirrhosis of liver. Certified.
Jan. 29	22	Lead miner -	Cold and exaustion. Inquest.
Mar. 21	27	Stonemason, master.	Phthisis, 1 year. Certified.
„ 24	71	Lead miner -	Fever, 14 days. Certified.
Apr. 3	34	Lead miner -	Phthisis. Certified.
„ 9	22	Lead miner -	Pneumonia. Fever, 7 days. Certified.
„ 11	16	Son of lead miner.	Phthisis. Certified.
„ 9	14	Son of iron miner.	Fractures. Trismus. Inquest.
„ 16	23	Lead miner -	Typhus. Certified.
„ 16	23	Lead miner -	Acute peritonitis, 11 days. Certified.
„ 18	64	Gentleman -	Hypertrophy with hydrothorax. Certified.
„ 17	19	Lead miner -	Found dead at the bottom of shaft in Botts Burn Lead Mine. Inquest.
May 28	24	Lead miner -	Typhus. Certified.
June 21	59	Lead miner -	Otitis. Certified.
1860.			
Sept 22	49	Lead miner -	Phthisis. Certified.
Oct. 14	64	Lead miner -	Diseased heart. Certified.
„ 21	27	Schoolmaster	Consumption. Certified.
„ 29	71	Farmer -	Natural decay. Certified.
Nov. 4	85	Sawyer -	Natural decay. Certified.
„ 11	56	Lead miner -	Diseased lungs, 3 weeks. Certified.
„ 9	49	Lead miner -	Dropsy. Certified.
„ 21	50	Lead miner -	Diseased lungs, 2 years. Certified.
Dec. 1	61	Farmer -	Diseased heart. Certified.
Nov. 26	53	Farmer -	Diseased heart. Certified.
Dec. 12	59	Farmer -	Peritonitis. Certified.
„ 21	61	Lead miner -	Lumbar abscess. Certified.
„ 27	52	Lead miner -	Diseased lungs. Certified.
1861.			
Jan. 2	83	Farmer -	Pneumonia. Certified.
„ 5	50	Son of farmer	Hæmaturia. Certified.
Feb. 13	83	Blacksmith -	Natural decay. Certified.
„ 13	39	Innkeeper -	Myelitis. Certified.
Mar. 6	84	Landed proprietor.	Cystitis. Certified.
„ 5	25	Lead miner -	Diseased brain. Certified.
„ 16	25	Shoemaker -	Consumption. Certified.
Apr. 2	11	Son of farmer	Scarlatina. No certified.
„ 2	86	Tailor - -	Natural decay. Certified.
Mar. 29	19	Shoemaker, apprentice.	Consumption. Certified.
„ 29	65	Farmer -	Pneumonia. Not certified.
„ 31	17	Lead miner -	Scarlatina. Certified.
Apr. 4	83	Lead ore smelter.	Pneumonia. Certified.
„ 9	72	Farmer -	Natural decay. Certified.
„ 11	26	Joiner -	Hepatitis, 14 days. Certified.
„ 7	48	Blacksmith -	Pleurisy. Certified.
„ 23	33	Lead miner -	Consumption. certified.
„ 21	85	Farmer -	Influenza. Certified.
„ 22	29	Lead miner -	Diseased lungs. Certified.
„ 25	45	Overlooker of lead mines.	Diseased lungs, 6 months. Certified.
May 4	59	Lead miner -	Diseased lungs, 18 months. Certified.
„ 7	63	Lead miner -	Epilepsy, 3 weeks. Certified.
„ 24	66	Lead miner -	Bronchitis. Certified.
„ 15	86	Farmer -	Natural decay. Certified.
„ 26	11	Son of lead ore smelter.	Pneumonitis. Peritonitis. Certified.
„ 30	22	Lead miner -	Cephalitis. Certified.
June 4	19	Son of lead miner.	Consumption. Certified.
„ 9	83	Farmer -	Natural decay. Certified.
„ 22	76	Lead miner -	Natural decay. Certified.
„ 24	16	Son of tailor -	Pneumonia. Certified.
„ 29	24	Lead ore smelter.	Diseased lungs, 4 months. Certified.
July 4	18	Son of stonemason.	Diseased brain. Certified.
„ 18	62	Lead miner -	Diseased brain, 1 year. Certified.
June 30	68	Farmer -	Diseased heart. Certified.
July 24	72	Lead miner -	Diseased spine. Certified.
Aug 22	16	Son of servant	Disease of heart. Certified.
Sept 20	39	Lead miner -	Diseased lungs, 2 years. Certified.
Oct. 2	78	Farmer -	Natural decay. Certified.
„ 2	32	Lead miner -	Accident. Gun shot wound. Inquest.
„ 11	68	Stonemason -	Diseased heart. Certified.
„ 29	10	Son of washerwoman.	Scarlatina. Certified.
Nov. 21	82	Landed proprietor.	Natural decay. Certified.
„ 24	12	Son of lead miner.	Diseased brain, 3 days. Certified.
„ 29	68	Farmer -	Pneumonia. Not certified.
Dec. 4	24	Lead miner -	Consumption. Certified.
„ 17	34	Lead miner -	Consumption. Certified.

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
June25	43	Draper and grocer.	Phthisis pulmonalis, 1 month. Certified.
„ 29	21	Cartman -	Gastritis. Certified.
„ 30	71	Lead miner -	Cancer, 2 years. Certified.
July20	12	Son of lead miner.	Typhus. Certified.
„ 20	24	Joiner - -	Diabetes, 8 months. Certified.
Aug 11	49	Lead miner -	Cancer. Certified.
Sep. 6	19	Lead miner -	Pleuro-pneumonia, 9 days. Certified.
„ 6	28	Blacksmith, journeyman.	Ileus, 5 days. Certified.
„ 16	38	Lead miner -	Phthisis pulmonalis, 8 months. Certified.
Oct. 27	72	Lead miner -	Pneumonia, 3 days. Certified.
„ 23	22	Engine stoker	Accident. Run over by waggons. Inquest.
Nov.19	38	Lead miner -	Phthisis. Certified.
„ 22	66	Gentleman -	Consumption, 3 months. Certified.
„ 24	45	Lead miner -	Consumption, 4 months. Certified.
Dec.22	70	Lead miner -	Chronic bronchitis, 8 months. Certified.
„ 28	12	Son of lead miner.	Scarlatina maligna, 4 days. Certified.
„ 29	15	Son of lead miner.	Scarlatina maligna, 6 days. Certified.
„ 29	33	Lead miner -	Pneumonia. Certified.
„ 31	59	Lead miner -	Bronchitis senilis. Certified.
1861.			
Jan. 16	49	Lead miner -	Erysipelas. Mortification. Certified.
„ 18	52	Farm servant	Phthisis pulmonalis, 4 months. Certified.
„ 26	56	Schoolmaster -	Catarrh, 15 days. Certified.
„ 31	72	Lead miner -	Old age. Certified.
Feb. 8	34	Lead miner -	Phthisis. Certified.
„ 12	45	Iron miner -	Phthisis pulmonalis. Certified.
„ 13	42	Lead miner -	Bronchitis. No medical attendant.
„ 19	72	Gentleman -	Bronchitis senilis, 20 years. Certified.
„ 27	55	Lead miner -	Bronchitis senilis. Certified.
Mar. 8	22	Shoemaker, master.	Fever, 6 weeks. Certified.
„ 22	20	Son of lead miner.	Hæmoptysis. Certified.
„ 28	11	Son of lead miner.	Hydrocephalus, 8 days. Certified.
Apr. 1	19	Shoemaker, apprentice.	Epilepsy. Certified.
„ 5	50	Lead miner -	Influenza. No medical attendant.
„ 17	16	Lead miner -	Scarlatina. Pneumonia. Certified.
„ 21	63	Lead miner -	Fever, 3 weeks. Certified.
„ 30	62	Lead miner -	Bronchitis. Certified.
„ 30	70	Lead miner -	Influenza, 11 days. Certified.
„ 29	34	Engine smith	Phthisis, 3 months. Certified.
May 14	58	Lead miner -	Hepatitis, 4 months. Certified.
June23	43	Draper - -	Mitral disease of heart. Certified.
July 14	85	Schoolmaster -	Old age. No medical attendant.
Aug. 8	46	Lead miner -	Endocarditis. Certified.
„ 17	38	Lead miner -	Congestion of brain, 4 months. Certified.
Sep. 18	57	Lead miner -	Chronic hepatitis. Certified.
Oct. 14	47	Lead miner -	Intermittent fever, 12 months. Certified.
„ 19	24	Lead miner -	Disease of heart. Certified.
Nov.30	66	Landed proprietor.	Gangrene of lungs, 12 days. Certified.
Dec. 3	21	Lead miner -	Caries. Certified.
„ 7	46	Lead miner -	Phthisis pulmonalis. Certified.
„ 12	29	Lead miner -	Typhus, 5 days. Certified.
„ 23	45	Lead miner -	Pleuro-pneumonia, 15 days. Certified.

Sub-District - 2. Stanhope.

1859.			
Jan. 12	86	Shepherd -	Old age. Certified.
1858.			
Dec. 20	60	Farmer -	Nephria, 2 years. Certified.
1859.			
Jan. 23	70	Lead miner -	Bronchitis, 8 days. Certified.
„ 24	32	Lead miner -	Pneumonia, 2 weeks. Not certified.
„ 24	21	Iron miner -	Pneumonia. Typhoides. Certified.
Feb. 7	71	Iron mine agent	Broncho-pneumonia, 5 days. Certified.
„ 25	59	Lead miner -	Asthma. Dropsy, 6 months. Certified.
Mar. 13	48	Farmer -	Pneumonia, 5 days. Certified.
„ 23	16	Mason's apprentice.	Diphtheria, 3 weeks. Certified.
„ 24	12	Son of slate quarrier.	Diphtheria, 2 weeks. Certified.
Apr. 11	24	Railway engine Driver.	Phthisis, 1½ years. Certified.
Mar. 23	27	Lead miner -	Consumption. Not certified.
May 9	39	Lead miner -	Phthisis pulmonalis. Certified.
June 5	55	Lead miner -	Bronchitis. Certified.
„ 17	53	Innkeeper -	Consumption. Not certified.
„ 27	66	Agric. labourer	Bronchitis. Certified.
„ 29	41	Iron miner -	Diabetes, 1 year. Certified.
July 2	45	Ironstone quarrier.	Phthisis pulmonalis, 2 months. Certified.
„ 2	71	Mason and miller.	Bronchitis, 6 months. Certified.
„ 9	12	Son of station master.	Phthisis. Certified.
„ 9	22	Iron miner -	Psoas abscess, 6 months. Certified.
„ 20	66	Lead ore smelter.	Apoplexy. Not certified.
Aug 17	52	Butcher and farmer.	Meningitis. Certified.
„ 26	62	Mason, master	Phthisis. Certified.
Sept. 8	17	Shepherd -	Typhus, 14 days. Certified.
„ 18	44	Lead miner -	Phthisis pulmonalis. Certified.
„ 21	67	Lead miner -	Diseased heart, 1 week. Certified.
„ 18	20	Lead ore washer.	Epilepsy, 3 years. Not certified.
„ 24	46	Butter merchant.	Upset of cart. Inquest.
Oct. 2	77	Agric. labourer	Old age. Not certified.
„ 10	27	Railway labourer.	Acute peritonitis. Certified.
„ 8	22	Lead miner -	Lumbar abscess. Certified.
„ 26	32	Iron miner -	Pneumonia, 6 days. Certified.
Nov. 2	48	Lead miner -	Pleuro-pneumonia, 6 days. Certified.
Oct. 21	59	Agric. labourer	Pneumonia, 6 days. Certified.
Nov. 19	27	Mason, journeyman.	Phthisis. Certified.
„ 19	83	Farmer -	Old age. Not certified.
Dec. 6	36	Limestone quarrier.	Crushed between two railway waggons, 15 minutes. No medical attendant.
„ 13	38	Railway engine worker.	Enteritis, 2 months. Certified.
„ 14	64	Lead miner -	Typhoid pneumonia, 2 months. Certified.
„ 15	13	Son of lead ore smelter.	Bronchitis, 3 weeks. Certified.
„ 26	37	Iron miner -	Congestion of brain. Certified.
1860.			
Jan. 9	19	Coal carrier -	Unknown. No medical attendant.
„ 22	34	Agric. labourer	Phthisis, 3 months. Certified.
„ 28	64	Lead miner -	Cancer. Certified.
Feb. 7	17	Son of lead ore washer -	Debility. Certified.
Apr. 2	78	Farmer -	Old age. Not certified.
„ 14	52	Lead ore smelter.	Nephria. Apoplexy. Certified.
May 3	24	Limestone quarrier.	Compound fractures. Inquest.
„ 8	58	Iron miner -	Phthisis pulmonalis. Certified.
Apr. 30	31	Ironstone miner.	Accident. Fall of stone at Red Vein Mine. Inquest.
May 17	84	Cartwright, master.	Diseased heart. Certified.
„ 16	23	Police officer -	Cholera biliosa. Certified.
„ 8	42	Blacksmith, master.	Phthisis, 6 years. Certified.
June 1	14	Son of lead-mine agent.	Peritonitis, 4 days. Certified
„ 3	79	Toll collector -	Enteritis. Not certified.
„ 9	64	Servant -	Hepatitis. Certified.
„ 12	29	Farmer -	Consumption. Not certified.

DISTRICTS IN NORTH OF ENGLAND.

Sub-district - 2. Wolsingham.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
June 12	43	Lead miner -	Emphysema, 3 years. Certified.
„ 23	39	Railway plate layer.	Typhus fever, 4 weeks. Certified.
„ 29	72	Waggon man	Paralysis. Certified.
July 8	45	Iron miner -	Phthisis pulmonalis. Certified.
„ 11	41	Lead miner -	Bronchitis. Phthisis. 4 years. Certified.
Aug. 9	39	Iron miner -	Phthisis pulmonalis, 12 months. Certified.
„ 6	33	Lead ore washer	Diseased kidneys, 9 months. Certified.
Sept. 6	40	Limestone quarrier.	Fractures by blasting. Inquest.
„ 14	80	Labourer -	Old age. Not certified.
Aug 30	79	Farmer -	Old age. Not certified.
Sept. 8	36	Lead miner -	Phthisis pulmonalis. Certified.
„ 25	38	Lead miner -	Phthisis pulmonalis, 7 months. Certified.
Oct. 12	60	Landed proprietor.	Unknown. No medical attendant.
„ 5	50	Lead miner -	Phthisis, 1 year. Certified.
„ 29	72	Land agent -	Asthma. Certified.
„ 31	79	Agric. labourer	Influenza, 5 days. Certified.
Nov. 4	53	Farmer -	Enteritis. Not certified.
„ 23	44	Farmer -	Gastralgia, 6 days. Certified.
Dec. 2	44	Lead ore smelter.	Pleurisy. Not certified.
„ 11	49	Lead miner -	Consumption. Not certified.
„ 13	20	Lead miner -	Cerebritis. Certified.
1861.			
Jan. 9	47	Woodman -	Cardiac disease, 3 months. Certified.
„ 10	68	Lead ore smelter.	Fever. Apoplexy. Certified.
„ 28	24	Mason, journeyman.	Phthisis pulmonalis. Certified.
Feb. 4	14	Son of mason	Consumption. Not certified.
„ 5	11	Son of lead miner.	Asthma. Certified.
„ 24	13	Tramp -	Found dead. Exhaustion and cold. Inquest
„ 26	68	Joiner, journeyman.	Bronchitis. Certified.
Mar. 3	49	Farmer -	Pleuro-pneumonia, 21 days. Certified.
„ 14	28	Lead miner -	Consumption. Not certified.
„ 17	32	Lead miner -	Scirrhus of stomach. Certified.
Feb. 27	82	Farmer -	Old age. Certified.
„ 25	33	Lead miner -	Phthisis pulmonalis. Certified.
Mar. 17	80	Lead miner -	Old age. Certified.
Apr. 11	37	Tea dealer -	Stricture of œsophagus. Certified
„ 7	74	Lead miner -	Gangrene senilis. Certified.
„ 28	50	Lead miner -	General decay. Certified.
May 3	62	Farmer -	Bronchitis, 20 years. Certified.
„ 22	49	Iron miner -	Hepatitis. Certified.
June 9	55	Landed proprietor.	Apoplexy. Certified.
„ 8	72	Joiner, journeyman.	Pneumonia. Certified.
„ 10	55	Farmer and lead miner.	Hanged himself (suicide). Inquest.
„ 14	18	Lead miner -	Scarlatina maligna. Certified.
„ 6	19	Lead miner -	Scrofulous abscess. Certified.
July 8	34	Labourer -	Enteritis. Certified.
„ 13	77	Lead ore smelter.	Senile paralysis, 3 years. Certified.
„ 17	76	Proprietor of houses.	Diseased prostrate gland, 10 years. Certified.
Aug 15	28	Quarrier -	Phthisis pulmonalis. Certified.
„ 22	10	Son of grocer	Scarlatina. Not certified.
„ 26	63	Lead ore smelter.	Natural decay. Not certified.
Sept 11	21	Stoker -	Run over by a waggon. Inquest.
„ 21	61	Shepherd -	Diseased liver. Certified.
Oct. 6	21	Draper's assistant.	Intemperance. Inquest.
„ 31	43	Lead miner -	Diarrhœa. Certified.
Nov. 8	77	Farmer -	Diseased heart, 12 days. Certified.
„ 13	44	Blacksmith, journeyman.	Asthma. Phthisis. 4 weeks. Certified.
„ 18	66	Shepherd -	Scirrhus of stomach. Certified.
„ 22	59	Lead miner -	Asthma. Not certified.
„ 21	27	Mason, journeyman.	Concussion of brain. Not certified.
„ 29	38	Lead miner -	Hepatitis, 21 days. Certified.
Dec. 7	23	Labourer -	Pneumonia. Not certified.
„ 1	72	Mason, master	Catarrh, 3 days. Certified.
„ 1	76	Innkeeper -	Old age. Not certified.
„ 24	74	Innkeeper -	Paralysis, many years. Certified.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 15	46	Stone quarrior	Peritonitis, 2 days. Certified.
Feb. 2	45	Miller - -	Bronchitis, 6 months. Certified.
„ 5	44	Farmer -	Diphtheria. Certified.
„ 8	28	Miller, journeyman.	Pneumonia, 4 days. Certified.
Mar. 20	16	Son of coal miner.	Bronchitis, 8 days. Certified.
„ 30	58	Farmer -	Chronic bronchitis. Certified.
Apr. 12	79	Agric. labourer	Influenza. Certified.
May 3	18	Son of coal miner.	Insanity, 6 months. Phthisis. Certified.
„ 6	80	Joiner - -	Bronchitis, 7 days. Certified.
„ 12	11	Son of agric. labourer.	Atrophy, 3 months. Certified,
June 4	49	Iron furnace charger.	Accident. Burnt, 21 days. Certified.
„ 4	61	Colliery overman.	Apoplexy. Certified.
„ 16	71	Lead miner -	Phthisis. Certified.
„ 19	59	Furnaceman -	Compound fractures, 4 days. Inquest.
„ 17	14	Son of coal miner.	Pneumonia, 6 days. Certified.
„ 29	18	Son of farmer	Phthisis. Certified.
July 15	62	Agric. labourer	Peripneumonia. Notha. Certified.
„ 15	67	Ostler - -	Paralysis, 2 weeks. Certified.
„ 27	21	Furnaceman -	Phthisis. Certified.
Aug. 2	16	Son of agric. labourer.	Diseased lungs. Certified.
„ 24	50	Cutler - -	Diarrhœa, 2 days. Certified.
„ 5	20	Son of farmer	Typhus, 10 days. Trismus. Certified.
„ 29	69	Lead miner -	Asthma, 2 years. Certified.
„ 30	44	Agric. labourer	Phthisis. Certified.
Sep. 7	59	Farmer -	Cancer. Certified.
„ 22	49	Agric. labourer	Pneumonia, 7 days. Certified.
Oct. 24	67	Draper -	Peripneumonia, 4 days. Certified.
Nov. 3	40	Engineman -	Fracture by steam-engine. Inquest.
Oct. 29	27	Commercial traveller.	Typhus, 7 days. Certified.
Nov. 11	35	Farmer -	Pneumonia, 5 days. Certified.
„ 11	35	Farmer -	Pneumonia, 5 days. Certified.
„ 26	69	Miller - -	Synochus, 10 days. Certified.
Dec. 5	52	Farmer -	Synochus, 10 days. Peripneumonia. Certified.
„ 9	43	Iron furnace man.	Pleuro-pneumonia, 5 days. Certified.
„ 29	65	Agric. labourer	Necrosis. Certified.
1860.			
Jan. 19	12	Son of farmer	Diphtheria, 2 days. Certified.
Feb. 21	43	Coal miner -	Diseased liver. Certified.
„ 23	71	Plasterer -	Bronchitis. Certified.
Mar. 8	79	Miller - -	Bronchitis. Certified.
„ 26	55	Agric. labourer	Phthisis, 18 months. Certified.
„ 20	74	Agric. labourer	Hydrothorax, 2 weeks. Certified.
Apr. 30	19	Son of clerk -	Phthisis pulmonalis. Certified.
May 8	25	Coal miner -	Phthisis, 2 years. Certified.
June 1	58	Shepherd -	Hanged himself (suicide). Inquest.
„ 12	26	Farmer -	Phthisis, 2 years. Certified.
Aug 13	31	Blacksmith -	Anasarca. Diseased heart. Certified.
„ 19	64	Coal miner -	Phthisis. Certified.
Sept. 8	57	Coal miner -	Asthma. Certified.
„ 26	94	Agric. labourer	Old age. Certified.
„ 29	60	Labourer -	Abscess and diseased ankle joint. Certified.
Oct. 6	82	Miller - -	Senectus. Certified.
„ 12	52	Joiner -	Accident. Blow from a waggon at Headly Hope Colliery. Inquest.
Nov. 4	80	Agric. labourer	Bronchitis. Certified.
„ 10	58	Woodman -	Bronchitis. Certified.
Dec. 18	20	Coal miner -	Fall of stone in coal pit. Inquest.
„ 20	53	Mason, journeyman.	Injury to spine, 20 days. Inquest.
„ 20	68	Agric. labourer	Marasmus, 4 months. Certified.
1861.			
Jan. 16	18	Coal miner -	Typhoid fever, 3 weeks. Certified.
„ 9	30	Farmer -	Phthisis. Certified.
„ 22	61	Agric. labourer	Diseased liver. Bronchitis. Certified.
„ 31	35	Coal miner -	Pleuro-pneumonia. Phthisis. Certified.
Mar. 10	41	Labourer -	Apoplexy, 40 hours. Certified.
„ 28	24	Son of agricultural labourer.	Phthisis. Certified.

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
Apr. 9	56	Lead miner -	Suppression of urine. Certified.
„ 10	46	Joiner, journeyman.	Typhus, 30 days. Certified.
„ 30	45	Carter - -	Phthisis. Ascites. Certified.
May 16	73	Shoemaker, journeyman.	Diseased prostate gland. Certified.
„ 17	19	Son of farmer	Phthisis pulmonalis, 5 months. Certified.
„ 16	51	Shoemaker -	Anasarca, 7 months. Certified.
„ 22	78	Agric. labourer	Old age. No medical attendant.
June 10	17	Son of labourer	Epilepsy. Certified.
„ 21	52	Innkeeper -	Scirrhus of stomach. Certified.
„ 23	60	Farmer -	Diseased heart. Certified.
1861.			
June 26	18	Son of Farmer	Phthisis pulmonalis. Certified
„ 27	51	Farmer -	Diseased lungs. Certified.
„ 26	65	Farmer -	Hanged himself (suicide). Inquest.
Aug 17	90	Butcher -	Old age. Certified.
„ 21	48	Hurdle maker	Diseased heart. Certified.
Sept. 1	78	Blacksmith -	Climacteric decay. Certified.
„ 5	34	Railway platelayer.	Phthisis. Certified.
Oct. 8	74	Engine wright	Cardiac affection. Certified.
Nov. 5	66	Coal miner -	Chronic bronchitis. Certified
„ 8	28	Woollen draper	Phthisis pulmonalis, 7 months. Certified.
„ 14	14	Son of farmer	Phthisis. Certified.

COUNTY OF NORTHUMBERLAND.

Superintendent Registrar's District.	Registrar's Sub-District.
555. HEXHAM.	1. Bywell. 2. Hexham. 3. Allendale.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859–61.

Sub-District - 1. Bywell.

1859.			
Jan. 1	31	Schoolmaster	Hypertrophia cordis. Certified.
„ 8	34	Clerk - -	Diseased lungs and liver. Certified.
„ 27	74	Carrier - -	Dropsy, 7 weeks. Certified.
Feb. 7	85	Coal miner -	Old age. Not certified.
„ 8	67	Farmer - -	Cancer. Not certified.
„ 14	18	Lead ore miner	Diabetes, 1 year. Not certified.
Mar. 2	84	Farmer - -	Palsy, 14 days. Certified.
„ 10	74	Farmer - -	Unknown. Not certified.
„ 2	14	Driver - -	Wounded leg. Inquest.
„ 30	89	Agric. labourer	Old age. Certified.
Apr. 10	43	Agric. labourer	Inflammation. Not certified.
„ 20	53	Blacksmith, journeyman.	Encephalitis, 2 years. Certified.
„ 21	46	Cartman -	Hypertrophy of heart. Certified.
May 18	61	Gardener -	Diseased heart. Certified.
„ 22	13	Son of brakesman.	Typhus fever, 14 days. Certified.
June 2	53	Under viewer, colliery.	Cancer. Consumption. Certified.
„ 26	56	Shoemaker, journeyman.	Paralysis. Certified.
„ 27	23	Engine feeder	Phthisis, 8 months. Certified.
„ 30	78	Coal miner -	Diseased lungs, 8 weeks. Certified.
July 17	10	Son of cartman	Pleuritis. Certified.
„ 20	36	Cartman -	Phthisis pulmonalis. Certified.
July 12	96	Toll collector	Old age. Not certified.
„ 16	37	Agric. labourer	Pneumonitis. Certified.
„ 31	18	Coal miner -	Consumption, 12 months. Certified.
Aug. 4	83	Labourer -	Bronchitis. Certified.
„ 11	49	Surgeon -	Diseased liver. Not certified.
„ 16	82	Agric. labourer	Natural decay. Not certified.
„ 19	71	Agric. labourer	Peritonitis. Certified.
„ 27	63	Agric. labourer	Consumption. Not certified.
Sept 25	69	Agric. labourer	Fungus hæmatodes, 6 months. Certified.
Oct. 5	16	Linen draper's apprentice.	Diseased brain, 5 days. Certified.
Nov. 10	58	Coal miner -	Diseased heart. Certified.
„ 28	26	Railway labourer.	Fever, 3 months. Certified.
Dec. 2	15	Son of blacksmith, journeyman.	Consumption, 6 months. Certified.
„ 14	47	Coal miner -	Diseased heart, 6 months. Certified.
„ 9	68	Farmer -	Paralysis. Certified.
„ 7	43	Drainer -	Cancer. Certified.
„ 18	81	Farmer -	Diseased heart. Certified.
1860.			
Jan. 2	59	Son of farmer	Epilepsy. Certified.
„ 8	70	Agric. labourer	Apoplexy. Certified.
„ 26	70	Servant -	Diseased heart. Certified.
„ 18	74	Carrier -	Old age. Not certified.
„ 30	50	Coal miner -	Consumption. Certified.
„ 30	21	Labourer -	Consumption, 6 months. Certified.
Feb. 9	11	Driver -	Tubs going over him. Inquest.
„ 23	66	Labourer at colliery.	Hernia. Certified.
„ 25	83	Agric. labourer	Paralysis. Certified.
Mar. 3	26	Coal miner -	Typhus fever, 18 days. Certified.
„ 5	51	Drainer -	Peritonitis. Certified.
„ 6	30	Carrier -	Typhoid fever, 4 weeks. Certified.
Mar. 7	49	Coal miner -	Pneumonia, 2 years. Certified.
„ 9	42	Besom maker	Phthisis. Certified.
„ 12	31	Gentleman -	Pulmonary disease, 1 year. Not certified.
„ 9	37	Coal miner -	Accident. Run over by tubs. Inquest.
Apr 15	88	Coal miner -	Diseased prostate gland. Certified.
„ 16	51	Tailor - -	Smallpox, 8 days. Certified.
„ 9	60	Lead ore miner	Cancer, 10 months. Certified.
„ 25	59	Schoolmaster	Diseased heart. Not certified.
„ 28	79	Shoemaker, master.	Heart disease. Certified.
May 2	71	Farmer -	Pneumonia. Certified.
„ 7	74	Farmer -	Paraplexy. Certified.
„ 13	51	Labourer -	Heart disease. Hepatitis. Certified.
„ 14	38	Lead ore miner	Consumption, 6 months. Not certified.
„ 18	72	Letter carrier	Old age. Not certified.
„ 20	71	Stone quarrier	Diseased heart, 3 years. Certified.
„ 19	83	Nurseryman -	Old age. Not certified.
„ 22	60	Sub-postman -	Bronchitis. Certified.
„ 23	81	Woodman -	Paralysis, 4 days. Certified.
„ 22	16	Tailor, apprentice.	Apoplexy. Certified.
„ 26	72	Fisherman -	Bronchitis. Certified.
June 1	60	Agric. labourer	Heart disease. Certified.
„ 23	30	Coal miner -	Typhus, 6 days. Certified.
„ 25	39	Lead ore miner	Bronchitis. Influenza, 5 days. Certified.
July 8	28	Farm servant	Diseased stomach. Certified.
„ 10	49	Lead ore miner	Phthisis. Certified.
„ 11	40	Labourer -	Run over by waggon. Certified.
Aug. 9	37	Labourer -	Drowning. Inquest.
„ 18	50	Farmer -	Apoplexy. Inquest.
Sep. 3	53	Schoolmaster	Cephalitis. Certified.
„ 18	71	Hawker -	Old age. Not certified.
„ 24	88	Agric. labourer	Dropsy. No medical attendant.
„ 28	32	Coal miner -	Consumption, 3 years. Certified.
Oct. 9	84	Civil engineer	Apoplexy. Certified.
„ 9	90	Agric. labourer	Old age. Not certified.
„ 20	76	Coal miner -	Cancer. Not certified.
„ 20	60	Farmer -	Diseased heart. Anasarca. Certified.
„ 27	57	Shoemaker, master.	Diseased heart. Albuminuria. Certified.
„ 27	37	Coal miner -	Consumption, 6 months. Certified.

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Oct. 31	34	Surgeon -	Phthisis pulmonalis, 4 months. Certified.
Nov. 4	67	Cartwright, master.	Cancer, 9 months. Certified.
„ 12	23	Stonemason, journeyman.	Consumption, 6 months. Not certified.
„ 21	73	Farm servant	Dropsy. Certified.
„ 24	73	Farmer -	Heart affection, 6 months. Certified.
Dec. 4	54	Stonemason -	Pleurisy and peritonitis. Certified.
„ 7	61	Joiner, journeyman.	Synochus. Certified.
„ 9	92	Tailor, master	Natural decay. Certified.
„ 14	22	Coal miner -	Phthisis, 8 months. Certified.
„ 22	56	Coal miner -	Died suddenly. Inquest.
1861.			
Jan. 3	31	Game watcher	Typhoid fever, 3 days. Certified.
„ 3	71	Coal miner -	Pneumonia, 7 days. Certified.
„ 15	85	Blacksmith, journeyman.	Diarrhœa. Certified.
„ 16	59	Coal miner -	Pneumonia, 10 days. Certified.
„ 14	29	Pitman -	Fall of stone. Inquest.
„ 16	84	Agric. labourer	Old age. Certified.
Feb. 19	66	Gardener -	Bronchitis. Certified.
Mar. 3	61	Pitman - -	Fall down pit shaft. Inquest.
„ 19	64	Farm hind -	Pneumonia, 4 days. Certified.
„ 25	12	Son of farmer	Consumption, 6 months. Certified.
Apr. 8	14	Son of tailor -	Typhus. Certified.
„ 16	48	Coal miner -	Heart disease, 9 months. Certified.
„ 18	86	Farmer - -	Typhoid fever, 1 month. Certified.
„ 23	55	Stonemason -	Albuminuria. Certified.
May 11	79	Joiner, journeyman.	Cancer, 8 years. Certified.
„ 15	79	Farmer - -	Bronchitis. Certified.
„ 21	76	Farmer - -	Ramolissement. Certified.
„ 26	66	Gardener -	Diseased heart. Certified.
June 8	54	Labourer -	Accident. Fall of sheer legs. Inquest.
„ 30	71	Proprietor of houses.	Enteritis, 7 days. Certified.
July 2	90	Farmer - -	Natural decay. Certified.
„ 18	68	Farmer - -	Natural decay. Not certified.
Aug. 2	86	Farmer - -	Natural decay. Not certified.
„ 21	43	Grocer - -	Gastritis. Certified.
Sept 27	71	Woodman -	Paralysis. Certified.
Oct. 17	23	Joiner, journeyman.	Cephalitis, 11 days. Certified.
Nov 13	19	Labourer -	Phthisis, 2 years. Certified.
Dec. 13	36	Farmer - -	Diseased heart. Dropsy. Certified.
„ 22	39	Policeman -	Pleuro-pneumonia, 4 days. Certified.

Sub-District - 2. Hexham.

1859.			
Jan. 3	80	Shoemaker, journeyman.	Apoplexia. Certified.
„ 1	69	Watchmaker, master.	Disease of stomach, 7 months. Certified.
„ 1	58	Labourer -	Suffocated by a piece of beef in his throat. Inquest.
„ 17	84	Agric. labourer	Asthma. Certified.
Feb. 4	52	Stone mason, master.	Chronic bronchitis. Certified.
„ 10	37	Stone mason, journeyman.	Phthisis. Certified.
„ 12	60	Gentleman -	Fall into a quarry. Inquest.
„ 22	68	Drainer -	Natural decay. Certified.
„ 28	71	Currier, journeyman.	Natural decay. Certified.
Mar. 1	48	Cordwainer, master.	Marasmus. Certified.
„ 3	80	Chelsea pensioner.	Anasarca. Certified.
„ 24	66	Glover, journeyman.	Age. Certified.
„ 28	74	Farmer -	Paralysis. Certified.
Apr. 19	57	Agric. labourer	Pulmonary apoplexy. Certified.
„ 18	57	Gardener -	Paralysis. Certified.
„ 20	80	Agric. labourer	Natural decay. Certified.
„ 23	59	Cartman -	Hypertrophia cordis. Certified.
May 5	23	Cartman -	Phthisis. Certified.
1859.			
„ 4	73	Farmer -	Fall down stairs, 10 days. Inquest.
„ 17	28	Hawker -	Aneurism. Inquest.
„ 21	10	Son of farmer	Hydrocephalus. Certified.
„ 23	30	Labourer -	Compound fractures. Inquest.
„ 29	67	Gardener -	Cancer. Certified.
June 9	74	Farmer -	Diseased heart. Certified.
„ 12	42	Hawker -	Diseased brain. Pneumonia. Certified.
„ 14	36	Linen draper	Phthisis. Certified.
„ 11	78	Agric. labourer	Paralysis. Certified.
„ 20	65	Skinner, journeyman.	Bronchitis. Certified.
July 17	10	Son of cartman	Tuberculous pleuritis, 2 years, Certified.
„ 20	36	Cartman -	Phthisis. Certified.
July 27	34	Draper, master	Paralysis. Certified.
„ 31	28	Shoemaker -	Phthisis. Certified.
Aug. 7	49	Draper - -	Diseased brain. Certified.
„ 10	69	Accountant -	Old age. Certified.
„ 11	26	Mason's labourer.	Typhus. Certified.
„ 12	70	Stonemason, journeyman.	Emphysema of lungs. Certified.
„ 16	71	Lead ore roaster	Cancer. Melæna. Certified.
„ 23	27	Son of farmer	Tabes mesenterica. Certified.
Sept 21	18	Draper's apprentice.	Phthisis. Bronchitis. Certified.
„ 23	62	Gardener -	Bronchitis. Diseased heart. Certified.
„ 27	76	Waller - -	Hypertrophia cordis. Certified.
Oct. 10	13	Son of labourer	Albuminuria. Certified.
„ 19	76	Wood keeper	Decay of nature. Certified.
„ 22	61	Agric. labourer	Diseased liver. Certified.
„ 28	63	Quarrier -	Cardiac dropsy. Certified.
„ 25	74	Clergyman -	Bronchitis. Certified.
Nov. 5	45	Drover -	Exhaustion and exposure to cold and wet. Inquest.
„ 19	14	Farm servant	Fever. Not certified.
„ 25	53	Cartman - -	Cardiac dropsy. Certified.
„ 25	103	Chelsea pensioner.	Fracture of femur. Certified.
„ 24	34	Spirit merchant	Dysentery. Certified.
„ 27	65	Hawker -	Natural decay. Certified.
„ 29	55	Shoe repairer	Diseased stomach and liver. Certified.
„ 29	54	Linendraper -	Cardiac dropsy. Certified.
„ 29	68	Chelsea pensioner.	Hæmoptysis, 14 days. Certified.
„ 30	50	Lodging-house keeper.	Cerebral disease. Certified.
Dec. 8	74	Agric. labourer	Natural decay. Certified.
„ 10	37	Agric. labourer	Phthisis, 2 years. Certified.
„ 23	93	Lead ore smelter.	Natural decay. No medical attendant.
„ 27	18	Draper's clerk	Phthisis. Not certified.
„ 29	86	Blacksmith -	Diarrhœa. Certified.
1860.			
Jan. 3	75	A capitalist -	Paraplexy. Certified.
„ 14	83	Gardener -	Decay of nature. Certified.
„ 29	10	Son of joiner -	Necrosis. Certified.
Feb. 12	82	Slippermaker-	Natural decay. Certified.
„ 11	76	Shoemaker, master.	Hypertrophia cordis. Certified.
„ 12	19	Grocer -	Phthisis. Certified.
„ 15	84	Gardner -	Natural decay. No medical attendant.
„ 15	48	Farm hind -	Hæmoptysis. Certified.
„ 18	46	Agric, labourer	Suffocated by hanging. Inquest.
„ 20	59	Inn keeper -	Bronchitis. Certified.
Mar. 8	75	Cattle drover -	Natural decay. No medical attendant.
„ 8	21	Painter, journeyman.	Phthisis. Certified.
„ 9	63	Lead ore miner	Suicide by strangling. Inquest.
„ 25	54	Cartman -	Phthisis. Certified.
„ 25	63	Blacksmith -	Natural decay. Certified.
„ 30	67	Moneyed proprietor.	Natural decay. Certified.
Apr. 1	79	Farmer -	Scirrhus of rectum. Certified.
„ 19	14	Son of farm hind.	Hypertrophia cordis. Certified.
„ 12	42	Millstone dresser.	Found dead (sudden). Inquest.
„ 23	26	Stone mason -	Phthisis. Certified.
„ 24	19	Joiner, apprentice.	Phthisis pulmonalis. Certified.
„ 24	73	Drainer -	Cancer of mouth and tongue. Certified.

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Apr. 26	68	Tinsmith -	Cardiac dropsy. Certified.
„ 30	45	Agric. labourer	Enlarged glands. Debility. Certified.
May 4	28	Agric. labourer	Bronchitis. Certified.
„ 4	70	Farmer -	Paralysis, 24 hours. Certified.
„ 8	72	Agric. labourer	Found dead (sudden). Inquest.
„ 22	57	Dealer in earthenware.	Valvular disease of heart. Certified.
„ 23	37	Blacksmith, master.	Phthisis. Certified.
„ 30	79	Monied proprietor.	Hypertrophia cordis. Certified.
„ 27	76	Hawker -	Cold and intoxication. Inquest.
June 5	77	Labourer -	Bronchitis. Certified.
„ 6	61	Farmer -	Necrosis. Phthisis. Certified.
„ 13	85	Draper, master	Natural decay. Certified.
„ 13	18	Son of farmer	Consumption. Certified.
„ 15	44	Farmer -	General organic disease. Certified.
„ 29	84	Servant -	Diarrhœa. Certified.
July 3	51	Butcher, journeyman.	Diseased heart. Certified.
„ 12	74	Innkeeper -	Bronchitis. Certified.
„ 19	19	Labourer -	Meningitis. Certified.
Aug. 4	55	Glover, journeyman.	Ulcered intestine. Certified.
„ 13	82	Hawker -	Old age. Certified.
„ 16	51	Paper maker, journeyman.	Cancer. Certified.
„ 18	74	Labourer -	Natural decay Certified.
„ 19	18	Chemist -	Phthisis. Certified.
„ 25	34	Banksman at a pit.	Hypertrophia cordis. Certified.
„ 24	78	Soldier -	Heart disease. Certified.
„ 27	70	Glover, journeyman.	Diseased heart. Certified.
„ 18	54	Methodist minister.	Dilatation of heart. Certified.
Sept. 8	69	Nut, cress, and mushroom gatherer.	Phthisis. Certified.
„ 10	70	Quack doctor	Bronchitis. Certified.
„ 7	10	Not stated -	Crushed by a mill water wheel. Inquest.
„ 15	45	Hawker -	Pulmonary disease. Certified.
Oct. 1	55	Labourer -	Hemiplegia. Certified.
„ 10	76	House proprietor.	Diseased liver. Certified.
„ 15	66	Agric. labourer	Phthisis pulmonalis. Certified.
„ 16	20	Chemist -	Phthisis pulmonalis. Certified.
Nov. 17	74	Agric. labourer	Bronchitis. Certified.
„ 22	31	Hatter, journeyman.	Caries. Certified.
„ 25	33	Lead-ore smelter.	Bronchitis. Certified.
„ 26	70	Chelsea pensioner.	Hemiplegia. Coma. Certified.
Dec. 1	24	Son of labourer	Diseased heart. Dropsy. Certified.
„ 8	71	Farm labourer	Consumption. Not certified.
„ 10	77	Labourer -	Paraplexy. Certified.
„ 9	19	Labourer -	Heart disease. Dropsy. Certified.
„ 18	67	Proprietor of land.	Apoplexia. Certified.
„ 26	64	Farmer -	Diseased heart. Dropsy. Certified.
„ 28	79	Millwright -	Hepatitis. Certified.
„ 28	74	Agric. labourer	Old age. Certified.
1861.			
Jan. 4	80	Agric. labourer	Bronchitis. Certified.
„ 8	65	Shoemaker, master.	Febris typhoides. Certified.
„ 10	81	Toll-bar keeper	Apoplexy. Certified.
„ 21	78	House proprietor.	Dropsy. Certified.
„ 22	66	Monied proprietor.	Chronic bronchitis. Certified.
Feb. 13	63	Tanner, master	Diseased heart, Paralysis. Certified.
„ 16	67	Agric. labourer	Paralysis, 40 hours. Certified.
„ 20	45	Collier -	Phthisis pulmonalis. Certified.
„ 21	77	Cartwright -	Natural decay. Certified.
Mar. 4	19	Lead ore miner	Phthisis pulmonalis. Certified.
„ 16	73	Agric. labourer	Stricture of urethra. Certified.
„ 24	49	Son of labourer	Epilepsy. Certified.
„ 26	69	Saddler -	Natural causes. Inquest.
„ 27	65	Farmer -	Phthisis. Certified.
„ 28	27	Lead ore miner	Phthisis, 3 years. Not certified.
„ 29	42	Plumber -	Paralysis. Certified.
1861.			
Mar. 30	70	Gardene -	Remolissement of brain. Certified.
April 2	51	Idiotic -	Gastro-enteritis. Certified.
„ 5	40	Railroad labourer.	Pneumonia. Certified.
„ 5	82	Glazier, master	Hypertrophia Cordis. Certified.
„ 9	57	Hawker -	Asthma. Phthisis. Certified.
May 3	48	Hawker -	Fever. Bronchitis. Certified.
„ 4	28	Labourer -	Phthisis. Certified.
„ 18	52	Coal carman -	Apoplexia. Certified.
„ 26	16	Son of blacksmith.	Lumbar abscess, 3 years. Certified.
„ 21	69	Agric. labourer	Natural decay. Not certified.
June 3	55	Shoemaker, journeyman.	Paralysis. Certified.
„ 5	77	Farmer -	Natural decay. Certified.
„ 6	40	Land agent -	Apoplexy. Certified.
„ 8	73	Farm manager	Cancer, 14 months. Certified.
„ 13	11	Son of sawyer	Cerebral congestion. Certified.
„ 19	73	Tea dealer -	Cancer in stomach. Certified.
July 2	72	Painter -	Apoplexia. Certified.
„ 13	69	Lead ore miner	Cardiac. Dropsy. Certified.
„ 23	16	Farm servant	Synochus. Meningitis. Certified.
„ 23	70	Agric. labourer	Heart disease and dropsy. Certified.
„ 28	49	Gardener -	Disease of heart. No medical attendant.
Aug. 5	27	Railway guard	Typhus fever. Certified.
„ 5	50	Labourer -	Phthisis pulmonalis. Certified.
„ 7	59	Tailor, master	Diseased heart. Dropsy. Certified.
„ 10	70	Collier -	Natural decay. Certified.
„ 12	87	Ostler -	Paralysis. Certified.
„ 24	65	Blacksmith, journeyman.	Diseased heart. Anasarca. Certified.
Sept. 5	29	A cordial manufacturer.	Phthisis. Certified.
„ 6	36	Labourer -	Pneumonia. Certified.
„ 17	37	Iron founder -	Injury. Bronchitis, 5 days. Certified.
„ 19	52	Labourer -	Hepatic disease. Certified.
„ 20	82	Hawker -	Diseased heart. Certified.
„ 26	56	Stonemason -	Diabetes. Certified.
Oct. 18	64	Farm labourer	Apoplexy. Certified.
Nov. 2	40	Cattle drover	Accident. Fall. Inquest.
„ 5	78	Roper -	Paralysis, 11 hours. Certified.
„ 7	43	Hawker -	Diseased heart. Dropsy. Certified.
„ 6	63	Farmer -	Compression of brain from a fall. Inquest.
„ 7	40	Surgeon -	Hypertrophia cordis. Certified.
„ 21	80	Baker -	Natural decay. Certified.
„ 23	33	Butcher -	Phthisis pulmonalis. Certified.
„ 30	60	Wood keeper	Phthisis. Certified.
Dec. 8	95	Agric. labourer	Old age. No medical attendant.
„ 12	12	Son of farmer	Typhus, 25 days. Certified.
„ 14	75	Not known -	Natural decay. Certified.
„ 17	73	Slater - -	Pleuro-pneumonia. Certified.
„ 19	78	Agric. labourer	Natural decay. Certified.
„ 27	31	Tobacconist -	Phthisis. Certified.

Sub-District - 3. Allendale.

1859.			
Jan. 2	82	Farmer -	Natural decay. Certified.
„ 5	72	Lead ore smelter	Bronchitis, 2 weeks. Certified.
„ 9	27	Lead ore miner	Phthisis, 10 months. Certified.
„ 2	70	Farmer -	Enteritis. Not certified.
„ 12	69	Lead ore smelter	Diseased liver. Anasarca. Certified.
„ 16	76	Coal miner -	Apoplexy. Not certified.
„ 19	80	Butcher, master	Old age. Not certified.
„ 30	22	Butcher, journeyman.	Pneumonia. Not certified.
Feb. 6	65	Lead miner -	Phthisis pulmonalis. Certified.
„ 6	27	Lead miner -	Phthisis, 7 days. Pneumonia. Certified.
„ 5	82	Proprietor of money, formerly a lead miner.	Bronchitis, 6 months. Certified.
„ 12	32	Lead miner -	Rheumatic fever, 5 days. Certified.
Mar. 10	26	Lead miner -	Pleuritis, 6 days. Certified.
„ 14	18	Lead miner -	Typhus, 16 days. Certified.
Apr. 4	19	Son of a farmer	Consumption. Not certified.

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Mar.12	23	Shoemaker -	Typhus, 14 days. Certified.
„ 26	20	Servant -	Phthisis, 18 weeks. Certified.
Apr. 9	27	Woodman -	Accident. Fall of a tree. Inquest.
„ 13	52	Lead ore smelter	Phthisis pulmonalis, 1 year. Certified.
May 4	35	Lead miner -	Consumption, 2½ years. Not certified.
„ 15	31	Agric. labourer	Hepatitis. Certified.
„ 15	22	Waggon driver	Caries. Phthisis. Certified.
„ 21	28	Lead miner -	Tubercular peritonitis, 3 years. Certified.
„ 17	27	Farmer -	Phthisis, 9 months. Certified.
„ 22	83	Smelting agent	Bronchitis, 6 days. Certified.
„ 29	55	Lead weigher	Fever, 13 weeks. Certified.
June 2	67	Lead ore smelter	Pleuritis. Phthisis. Certified.
„ 12	24	Labourer -	Drowning. Inquest.
„ 14	16	Labourer, lead mine.	Continued fever, 16 days. Certified.
„ 19	14	Mason's labourer.	Scarlatina, 2 days. Certified.
„ 25	51	Lead miner -	Bronchitis, 7 days. Certified.
„ 21	35	Draper, grocer	Diseased liver, 8 weeks. Certified.
„ 22	72	Labourer -	Natural decay. Certified.
July 5	85	Labourer -	Paralysis. Certified.
June28	62	Shoemaker, maker.	Diseased heart. Certified.
„ 20	17	Lead miner -	Fever. Enteritis, 3 months. Certified.
July11	46	Lead miner -	Pulmonary phthisis, 2 years. Certified.
„ 14	29	Lead miner -	Phthisis, 7 months. Certified.
„ 29	86	Lead miner -	Old age. No medical attendant.
„ 25	38	Lead miner -	Spinal disease, 3 years. Certified.
Aug. 1	70	Agric. labourer	Natural decay. Certified.
„ 17	42	Labourer -	Lupus exedens of face, 1 year. Certified.
„ 17	63	Tailor -	Accident fall from a wall. Inquest.
Sept.15	15	Son of blacksmith.	Meningitis, 6 months. Certified.
„ 27	70	Lead ore smelter.	General debility. No medical attendant.
Oct. 4	39	Draper and grocer.	Phthisis. Certified.
„ 3	33	Grocer, lead miner.	Consumption. Certified.
Sept.30	84	Blacksmith, master.	Old age. No medical attendant.
Oct. 28	62	Lead miner -	Bronchitis. Diseased heart, 6 months. Certified.
Nov. 6	30	Lead miner -	Abscess in hip joint, 8 months. Certified.
„ 18	52	Lead miner -	Pleuritis. Certified.
„ 22	63	Stonemason, master.	Dropsy, 1 year. Certified.
„ 16	70	Blacksmith, master.	Gastritis. Not certified.
„ 25	79	Farmer -	Natural causes. Inquest.
„ 30	65	Landed proprietor.	Cancer. Certified.
Dec. 16	62	Shepherd, formerly a miner.	Dropsy, several years. Not certified.
„ 24	82	Farmer -	Bronchitis. Certified.
„ 16	25	Lead miner -	Typhoid fever, 1 month. Certified.
„ 21	21	Lead miner -	Phthisis, 2 years. Certified.
1860.			
Jan. 10	32	Lead miner -	Phthisis, 3 years. Certified.
„ 16	40	Medical practitioner.	Phthisis, 3 years. Certified.
„ 21	64	Gardener -	Disease of liver. Certified.
„ 26	53	Lead miner -	Bronchitis, 3 months. Certified.
„ 18	29	Lead miner -	Phthisis, 3 months. Certified.
Feb. 4	64	Landed proprietor.	Nervous debility, 1 year. Not certified.
„ 11	62	Farmer -	Diseased liver. Dropsy. Certified.
„ 11	60	Grocer -	Influenza. Not certified.
„ 15	48	Lead miner -	Bronchitis, 12 months. Certified.
„ 22	70	Farmer -	Heart disease. Certified.
„ 19	62	Lead miner -	Bronchitis, 3 months. Not certified.
„ 6	45	Lead ore smelter.	Consumption, 3 months. Certified.
„ 22	45	Lead miner -	Consumption, 1 year. Certified.
Mar.15	72	Lead miner -	Phthisis, 5 months. Certified.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Mar.17	79	Joiner, master	Constipation. Certified.
Apr. 2	55	Ordnance surveyor.	Diseased liver. Certified.
„ 2	83	Farmer -	Diseased heart. Certified.
Mar.30	64	Formerly lead miner.	Chronic bronchitis, 2 years. Certified.
Apr. 1	47	Lead miner -	Phthisis, 12 months. Certified.
„ 19	36	Lead miner -	Phthisis, 13 months. Certified.
„ 21	57	Lead miner -	Consumption, 6 months. Certified.
„ 17	21	Lead miner -	Consumption, 2 years. Certified.
„ 16	72	Formerly lead miner.	Old age. No medical attendant.
„ 23	22	Policeman -	Consumption. Not certified.
May 5	53	Lead ore smelter.	Nephria. Certified.
„ 14	61	Lead ore smelter.	Nephria, 12 months. Certified.
„ 15	52	Landed proprietor.	Apoplexy, 29 hours. Certified.
„ 8	63	Platelayer in lead mines.	Typhoid fever, 7 days. Certified.
June 3	55	Lead miner -	Phthisis pulmonalis, 6 months. Certified.
„ 10	55	Blacksmith -	Diarrhœa, 7 days. Certified.
„ 10	50	Agric. labourer	Consumption, some months. Certified.
„ 13	45	Lead ore washer.	Pneumonia and pleuritis. Certified.
„ 25	68	Innkeeper -	Paralysis, 1 week. Certified.
„ 21	49	Lead miner -	Pneumonia, 7 months. Certified.
„ 13	52	Lead miner -	Anasarca. Certified.
July12	39	Farmer -	Diseased stomach. Certified.
„ 11	70	Lead ore smelter.	Heart disease. Certified.
„ 26	61	Lead miner -	Asthma. Certified.
Aug20	19	Shoemaker, apprentice.	Phthisis. Certified.
„ 25	77	Lime burner -	Enlarged prostate gland. Certified.
Sept10	82	Blacksmith -	Ileus. Certified.
„ 4	16	Lead ore washer.	Bronchitis, 2 weeks. Certified.
Aug12	28	Platelayer in lead mine.	Congestion of liver, 5 weeks. Certified.
Sept18	36	Grocer - -	Muco-enteritis. Certified.
„ 18	63	Lead miner -	Bronchitis. Certified.
Oct. 5	89	Farmer -	Paralysis. Certified.
„ 15	34	Shoemaker, master.	Phthisis pulmonalis, 6 months. Certified.
„ 19	60	Landed proprietor.	Heart disease. Certified.
„ 27	22	Lead miner -	Phthisis, 12 months. Certified.
Dec. 6	13	Son of farm hind.	Continued fever, 10 days. Certified.
„ 12	46	Lead miner -	Continued fever, 10 days. Certified.
„ 22	56	Stonemason, master.	Pneumonia. Certified.
„ 20	16	Lead ore washer.	Tyhus fever. Not certified.
1861.			
Jan. 2	84	Joiner - -	Paralysis, 10 days. Not certified.
„ 22	66	Farm hind -	Cancer. Not certified.
Feb. 4	39	Lead ore smelter.	Phthisis, 6 months. Certified.
Jan.30	65	Lead miner -	Enteritis, 2 days. Certified.
Feb.23	61	Blacksmith, master.	Scirrhus of rectum. Certified.
„ 18	38	Farmer -	Liver complaint. Dropsy. Certified.
Feb.16	75	Farmer - -	Fall from a cart. Inquest.
Mar. 1	67	Railway labourer.	Enteritis. Not certified.
Feb.25	49	Lead miner -	Bronchitis, 7 days. Certified.
Mar. 7	28	Agric. labourer	Diseased heart. Certified.
„ 13	54	Shopkeeper -	Fall from a cart. Inquest.
„ 19	62	Lead miner -	Bronchitis, 8 days. Certified.
„ 24	32	Lead miner -	Hepatitis, 2 years. Certified.
„ 27	36	Cooper, master	Bronchitis. Certified.
„ 28	57	Farmer - -	Apoplexia, 3 hours. Certified.
„ 27	52	Tailor - -	Phthisis pulmonalis. Certified.
Apr.17	65	Coal miner -	Disease of heart, 6 weeks. Certified.
„ 15	90	Farmer - -	Hemiplegia, 3 weeks. Certified.
„ 18	57	Agric. labourer	Bronchitis, 18 months. Certified.
„ 23	65	Farmer - -	Hemiplegia. Certified.
May 2	62	Butcher -	Hemiplegia, 6 days. Certified.
„ 4	72	Farmer - -	Bronchitis, 11 weeks. Certified.
„ 12	57	Lead miner -	Bronchitis. Certified.
„ 13	18	Pattern maker	Consumption, 7 months. Certified.
„ 24	68	Labourer -	Pneumonia. Certified.

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
May 27	67	Farmer - -	Gangrene senilis, 26 days. Certified.
June 10	12	Son of coal miner	Diphtheria. Certified.
„ 8	66	Lead miner -	Chronic bronchitis, 12 months. Certified.
„ 9	36	Lead miner -	Diphtheria. Certified.
„ 18	11	Son of coal miner	Diphtheria. Certified.
„ 24	66	Lead miner -	Apoplexy. No medical attendant.
„ 24	52	Besom maker	Apoplexy, 1 hour. Certified.
„ 21	40	Farmer - -	Accident. Fall of a stone. Inquest.
„ 30	73	Lead ore smelter	Phthisis, 6 months. Certified.
July 2	66	Lead miner -	Influenza. Not certified.
June 25	49	Lead miner -	Consumption. Certified.
July 7	36	Lead miner -	Phthisis. Certified.
„ 29	82	Farmer - -	Old age. Not certified.
Aug 12	33	Blacksmith, journeyman.	Consumption, 12 months. Not certified.
„ 8	45	Railway labourer.	Diseased heart. Certified.
Sept 2	33	Lead miner -	Tabes mesenterica, 2 years. Certified.
„ 5	72	Proprietor of land and a lead ore washer.	Muco-enteritis, 12 months. Certified.
1861.			
Sept. 7	59	Farmer - -	Diarrhœa, 16 days. Certified.
„ 8	22	Farmer - -	Consumption, 3 years. Certified.
„ 23	57	Lead miner -	Cancer, 6 months. Certified.
„ 28	34	Lead miner -	Natural causes. Inquest.
Oct. 2.	78	Lead ore smelter	Diseased heart. Certified.
Nov. 14	55	Lead miner -	Typhus, 2 weeks. Diarrhœa. Certified.
„ 14	78	Agric. labourer	Old age. Not certified.
„ 19	61	Lead miner -	Softening of brain, 8 months. Certified.
Dec. 1	18	Son of lead ore smelter.	Diseased heart. Dropsy. Certified.
Nov. 29	68	Farmer - -	Hepatitis. Phthisis. Certified.
„ 28	41	Coal miner -	Consumption, 12 months. Not certified.
Dec 13	28	Esquire -	Meningitis. Certified.
„ 22	57	Lead miner -	Bronchitis, 4 months. Certified.
„ 26	67	Farmer - -	Bronchitis, 3 weeks. Apoplexy, 3 hours. Certified.

COUNTY OF CUMBERLAND.

Superintendent Registrar's District.	Registrar's Sub-District.
564. ALSTON.	1. Alston.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859–61.

Sub-District - 1. Alston.

1859.			
Jan. 15	51	Lead miner -	Miners' asthma. No medical attendant.
14	71	Farmer -	Bronchitis. Not certified.
4	23	Lead ore miner	Accident. Fall of stone in Cabel Cleugh Mine. Inquest.
„ 19	61	Lead miner -	Miners' asthma, 5 years. Certified.
„ 23	21	Lead ore smelter	Encephalitis. Certified.
Feb. 4	50	Lead miner -	Bronchitis. Certified.
„ 4	58	Cordwainer, master.	Diseased heart. Certified.
„ 6	39	Lead miner -	Consumption. Not certified.
„ 12	42	Lead miner -	Catarrh, 3 days. Certified.
Mar. 2	24	Lead miner -	Tabes mesenterica, 4 weeks. Certified.
„ 15	64	Stonemason -	Bronchitis, 2 years. Certified.
„ 17	36	Lead miner -	Meningitis. Bronchitis. Certified.
„ 19	57	Lead miner -	Bronchitis. Certified.
„ 20	64	Clogger -	Bronchitis, 2 months. Certified.
Apr. 29	24	Lead miner -	Pneumonia, 3 months. Certified,
„ 27	69	Lead miner -	Bronchitis, 14 days. Certified.
„ 30	69	Blacksmith, journeyman.	Cirrhosis of liver. Certified.
May 1	58	Farmer -	Bronchitis. Certified.
„ 11	72	Yeoman -	Bronchitis. Not certified.
„ 15	23	Lead miner -	Phthisis, 6 months. Certified.
„ 19	64	Lead miner -	Bronchitis, 6 months. Certified.
„ 27	59	Lead miner -	Bronchitis, 6 months. Certified.
June 8	28	Tailor, journeyman.	Epilepsy, 6 months. Certified.
„ 9	54	Lead mine agent.	Rheumatic pericarditis, 1 year. Certified.
„ 10	21	Lead miner -	Ascites. Certified.
„ 25	56	Lead miner -	Dyspepsia. Dropsy. Certified.
July 5	67	Butcher -	Diseased kidneys. Certified.
„ 16	56	Lead miner -	Miners' asthma. No medical attendant.
Aug. 4	74	Carrier - -	Anasarca, 9 months. Certified.
„ 2	38	Quarryman -	Accident. Fall of stone. Inquest.
Sept. 8	18	Son of lead-miner.	Phthisis. Certified.
1859.			
Oct. 11	27	Smelter of lead ore.	Cerebritis, 5 days. Certified.
„ 31	64	Agric. labourer	Angina pectoris. Certified.
Nov. 2	29	Stonemason -	Consumption, 18 months. No medical attendant.
„ 7	22	Lead miner -	Pneumonia. Certified.
„ 12	19	Lead miner -	Nephritis, 14 days. Certified.
„ 13	30	Carrier - -	Cynanche maligna. Certified.
„ 28	57	Smelter, lead ore.	Diseased heart. Certified.
Dec. 1	58	Tallow chandler, journeyman.	Intussusceptio, 24 hours. Certified.
„ 16	10	Son of farmer	Consumption, 3 months. Not certified.
„ 20	58	Lead miner -	Melanosis of lungs. Certified.
„ 20	70	Lead miner -	Diseased heart. Dropsy. Certified.
„ 23	34	Lead miner -	Phthisis pulmonalis. Certified.
1860.			
Jan. 2	22	Son of lead miner.	Scrofulous abscess. No medical attendant.
„ 14	64	Smelter of lead ore.	Tetanus from lead. Certified.
Feb. 7	70	Farmer - -	Paralysis, 6 years. Certified.
„ 9	55	Lead miner -	Miners' consumption. Certified.
„ 12	60	Lead mine agent.	Bronchitis. Certified.
„ 16	54	Draper - -	Scirrhus of liver. Certified.
„ 24	16	Son of farmer	Cephalitis, 2 weeks. Certified.
Mar. 6	30	Carter - -	Tabes mesenterica, 4 months. Certified.
„ 10	17	Lead miner -	Bronchitis, 5 years. No medical attendant.
„ 14	20	Son of dissenting minister.	Cephalitis. Certified.
Apr. 3	50	Lead miner -	Miners' asthma. Certified.
„ 4	80	Lead miner -	Apoplexy, 3 weeks. Certified.
„ 4	49	Lead miner -	Bronchitis. Consumption. Certified.
„ 13	63	Lead miner -	Bronchitis. Certified.
„ 9	62	Stonemason -	Bronchitis. Certified.
„ 14	48	Lead miner -	Miners' bronchitis, 12 months. Certified.
„ 15	23	Lead miner -	Consumption, 6 months. Certified.
„ 16	40	Police officer -	Miners' bronchitis, 2 years. Certified.
„ 14	41	Architect -	Excessive drinking of ardent spirits and laudanum. Inquest.
„ 24	39	Lead miner -	Bronchitis. Certified.

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
May 8	30	Lead miner -	Enlarged liver. Certified.
June17	50	Lead miner -	Cancer. Certified.
„ 18	33	Miner - -	Accident. Fall of stone from roof of lead mine. Inquest.
„ 29	14	Son of lead miner.	Consumption. No medical attendant.
July 2	61	Lead miner -	Paraplexy. Certified.
„ 3	63	Grocer -	Bronchitis, 3 weeks. Certified.
„ 8	18	Lead miner -	Phthisis pulmonalis. Certified.
„ 8	65	Woollen weaver	Dropsy, 2 years. Certified.
„ 11	42	Farmer -	Heart disease. No medical attendant.
„ 16	34	Lead miner -	Nephria. Certified.
Aug. 1	77	Flax dresser -	Apoplexy, 12 hours. Certified.
„ 8	59	Innkeeper -	Enlarged liver. Not certified.
„ 8	66	Lead miner -	Miners' consumption. Certified.
„ 23	67	Lead miner -	Cirrhosis. Certified.
„ 27	23	Lead miner -	Phthisis pulmonalis, 6 months. Certified.
Sept.10	58	Lead miner -	Phthisis, 2 months. Certified.
„ 13	17	Son of lead miner.	Nephria. Dropsy. Coma. Certified.
„ 15	37	Stone mason -	Ileus, 24 hours. Certified.
„ 17	32	Draper -	Ileus, 10 days. Certified.
Oct. 4	15	Son of lead miner.	Chorea. Certified.
„ 20	71	Lead miner -	Senile debility. No medical attendant.
Nov. 1	33	Lead miner -	Phthisis. Certified.
„ 6	43	Innkeeper -	Phthisis pulmonalis, 4 months. Certified.
„ 17	37	Lead miner -	Phthisis pulmonalis, 2 months. Certified.
Dec. 2	23	Lead miner -	Partial dislocation of spine, 30 weeks. Certified.
„ 22	66	Workhouse master.	Chronic Bronchitis, 1 year. Certified.
1861.			
Jan. 2	41	Lead miner -	Pulmonary abscess, 1 year. Certified.
1860.			
Dec. 31	46	Lead miner -	Cirrhosis. Certified.
1861.			
Jan. 5	76	Yeoman -	Pneumonia. Certified.
„ 11	49	Lead miner -	Bronchitis. Dropsy. Certified.
„ 18	61	Lead miner -	Miners' asthma. Certified.
„ 24	53	Farmer -	Pleuro-pneumonia. Certified.
„ 26	53	Tailor, master	Phthisis pulmonalis, 2 years. Certified.
„ 30	11	Son of tailor -	Scarlatina, 2 weeks. Certified.
Feb. 7	18	Son of farmer	Scrofula. No medical attendant.
„ 7	42	Lead miner -	Scrofula. Diarrhœa. Certified.
„ 16	53	Lead miner -	Miner's phthisis. Certified.
„ 20	56	Lead miner -	Asthma. Diarrhœa. Certified.
Mar. 4	63	Lead miner -	Chronic bronchiiis, 4 years. Certified.
„ 6	43	Lead miner -	Miners consumption. Certified.
„ 16	12	Lead miner -	Miner's diarrhœa. Certified.
„ 24	52	Lead miner -	Chronic bronchitis. Certified.
„ 26	58	Farmer -	Emphysema, 4 years. Certified.
Apr. 4	71	Lead miner -	Emphysema. Certified.
„ 7	70	Lead miner -	Scirrhus.
„ 16	38	Lead miner -	Phthisis. Certified.
„ 19	66	Coal miner -	Pneumonia, 2 weeks. Certified.
„ 21	52	Plate layer -	Hemiplegia. Certified.
„ 23	23	Lead miner -	Enlargement of liver. Certified.
„ 27	62	Lead miner -	Miners' asthma. Certified.
„ 30	22	Lead miner -	Scarlatina. Certified.
May 5	25	Lead miner -	Diseased liver, 2 years. Certified.
„ 13	26	Lead miner -	Influenza, 1 month. Certified.
„ 13	60	Lead miner -	Senile debility. Certified.
„ 15	52	Lead miner -	Miners' asthma. Certified.
June23	77	Farmer -	Senile debility. No medical attendant.
„ 21	40	Lead miner -	Cynanche maligna. Certified.
„ 13	20	Waggon driver	Accident. Drowned. Inquest.
„ 29	20	Lead miner -	Gastric fever. Certified.
July 9	21	Clogger, journeyman.	Scrofula. Certified.
„ 11	28	Schoolmaster	Phthisis. Diarrhœa. Certified.
„ 10	29	Miner - -	Accident by the falling in of an arch. Inquest.
„ 20	27	Lead miner -	Phthisis pulmonalis. Certified.
Aug. 1	19	Blacksmith, apprentice	Parotitis, 10 days. Certified.
„ 31	61	Lead miner -	Cirrhosis. Certified.
„ 31	67	Lead miner -	Senile debility. Certified.
Sep. 4	60	Lead miner -	Diseased heart, 2 months. Anasarca. Certified.
1861.			
Sep. 6	31	Lead miner -	Bronchitis. Certified.
„ 24	19	Lead miner -	Phthisis, 1 year. Certified.
Oct. 27	12	Son of lead miner.	Phthisis pulmonalis, 6 months. Certified
Nov.30	45	Lead miner -	Insanitas, 2 years. Certified.
Dec.13	55	Lead miner -	Bronchitis. Certified.
„ 26	64	Lead miner -	Bronchitis. Certified.

Superintendent Registrar's District. — Registrar's Sub-district.

570. COCKERMOUTH. — 1. Keswick.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859–61.

Sub-district - 1. Keswick.

1859.			
Jan. 9	83	Woollen weaver	Decay of nature. Certified.
„ 10	66	Woollen weaver	Stricture of œsophagus. Certified.
„ 10	45	Attorney -	Diseased heart. Dropsy, 2 months. Certified.
„ 20	88	Butcher -	Decay of nature, 8 weeks. No medical attendant.
„ 23	26	Farm servant	Phthisis, 6 weeks. Certified.
Feb. 11	36	Agric. labourer	Diseased liver, 3 months. Not certified.
„ 11	73	Lead miner -	Asthma, 15 months. No medical attendant.
„ 16	38	Lead miner -	Typhus, 3 weeks. Certified.
Mar. 7	74	Shoemaker -	Sudden death. Inquest.
„ 14	30	Lead miner -	Phthisis pulmonalis, 9 months. Certified.
„ 15	63	Woollen spinner	Nephria, 2 years. Certified.
„ 20	44	Farmer -	Diseased stomach, 2 years Certified.
Apr. 4	31	Miller, master	Phthisis pulmonalis, 18 month Certified
„ 28	52	Lead miner -	Cirrhosis of liver. Certified.
May 1	25	Mining agent	Phthisis, 6 weeks. Certified.
„ 7	18	Chemist's apprentice.	Enteritis, 1 week. Certified.
„ 17	23	Waller -	Phthisis, 3 months. Certified.
„ 18	62	Lead miner -	Bronchitis, 3 years. Certified.
„ 24	49	Farmer -	Diseased liver, 3 years. Certified.
June 3	16	Tailor's apprentice.	Phthisis pulmonalis, 6 months. Certified.
„ 7	21	Son of farmer	Consumption, 3 years. No medical attendant.
„ 8	79	Land steward	Decay of nature. Certified.
„ 11	77	Farmer -	Dropsy, 1 month. Not certified.
„ 22	79	Servant -	Diseased heart, 3 weeks. Certified.
„ 11	45	Butler -	Suicide by hanging. Inquest.
July31	54	Gentleman -	Rheumatic fever. Pericarditis. Certified.
„ 31	59	Gentleman -	Diabetes, 2 years. Certified.
„ 25	34	Stonemason -	Fracture of spine, 4 days. Certified.
Aug. 7	56	Agric. labourer	Fever, 3 weeks. Certified.
„ 26	66	Woollen weaver	Dysentery, 1 week. Certified.
Sept. 6	73	Woollen weaver	Dropsy, 6 weeks. Certified.
„ 28	58	Skinner -	Nephria. Certified.
Oct. 8	84	Farm servant	Decay of nature, 6 months. Certified.
„ 18	65	Labourer -	Found drowned. Inquest.
„ 31	57	Farmer -	Peritonitis and enteritis. Certified.
Nov. 3	76	Agric. labourer	Decay of nature, 12 months. Not certified.
„ 16	82	Joiner, journeyman.	Decay of nature, 2 years. Not certified.
„ 18	56	Lead miner -	Bronchitis, 18 months. Certified.
Dec. 1	32	Farmer -	Scarlatina, 3 days. Certified.
„ 15	34	Lead miner -	Typhus fever, 14 days. Certified.
„ 16	67	Cowkeeper -	Apoplexy. Cerrified.
„ 18	77	Yeoman -	Hydrothorax, 3 weeks. Certified.
1860.			
Jan. 13	80	Woollen manufacture.	Decay of nature, 4 years.
„ 18	75	Lead miner -	Nephria, 12 months. Certified.
„ 21	77	Waller, journeyman.	Influenza, 5 weeks. Bronchitis. 14 days. Certified.

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Jan. 27	62	Joiner, journeyman.	Unknown. No medical attendant.
„ 28	75	Shoemaker, journeyman.	Cirrhosis of liver. Certified.
„ 30	67	Agric. labourer	Decay of nature, 4 years. Certified.
Feb. 8	77	Slate quarrier	Decay of nature, 1 year. Certified.
„ 5	67	Retired revenue officer.	Angina pectoris. Certified.
„ 2	15	Son of miner	Accident. Drowned. Inquest.
„ 10	75	Silversmith -	Bronchitis. Certified.
„ 28	22	Son of agric. labourer.	Consumption, 6 months. Certified.
„ 27	61	Son of agric. labourer.	Pneumonia, 10 days. Certified.
Mar. 13	64	Land proprietor.	Diseased heart, 2 months. Certified.
„ 17	56	Hotel keeper -	Apoplexy, 3 weeks. Certified.
„ 14	73	Farmer -	Decay of nature. No medical attendant.
„ 26	60	Farmer -	Pulmonary apoplexy, 5 days. Certified.
„ 25	20	Printer's apprentice.	Pleuritis, 12 months. Certified.
Apr. 17	67	Yeoman -	Diseased heart. Certified.
„ 19	56	Schoolmaster	Apoplexy. Certified.
May 4	42	Skinner, journeyman.	Phthisis pulmonalis. Certified.
„ 30	50	Lead miner -	Pelvic abcess, 2 years. Certified.
June 4	53	Agric. labourer	Consumption. No medical attendant.
„ 2	53	Blacklead pencil maker.	Apoplexy, 6 hours. Certified.
„ 4	68	Ostler - -	Cardiac disease, 2 years. Certified.
„ 6	52	Innkeeper -	Hepatic abscess, 16 weeks. Certified.
„ 9	67	Agric. labourer	Stricture of intestines. Certified.
„ 5	23	Farm servant	Accident. Drowned. Inquest.
„ 16	19	Tin-plate worker, journeyman.	Phthisis pulmonalis, 12 months. Certified.
„ 19	33	Lead miner -	Nephria, 3 years. Certified.
„ 24	50	Grocer - -	Emphysema, 4 years. Certified.
„ 15	64	Yeoman -	Diseased heart. Certified.
July 7	77	Woolsorter -	Cardiac disease, 2 months, Certified.
„ 23	72	Woollen weaver	Diseased heart. Dropsy. Certified.
„ 16	73	Farmer -	Bronchitis, 2 years. Certified.
„ 24	78	Farmer -	Chronic bronchitis, 9 months. Certified.
„ 26	77	Yeoman -	Cardiac disease, 2 years. Certified.
„ 28	73	Woollen manufacture.	Diseased heart, 3 months. Certified.
„ 29	56	Earthenware dealer.	Cirrhosis of liver. Certified.
Aug. 13	60	Yeoman -	Pneumonia, 4 days. Certified.
„ 16	56	Landed proprietor.	Epileptic fits, 4 years. Certified.
„ 28	35	Landed proprietor.	Epilepsy, 2 years. Certified.
Sept. 19	79	Proprietor of houses.	Senile bronchitis, 12 months. Certified.
Oct. 17	16	Son of bobbin turner.	Laryngitis, 5 weeks. Certified.
„ 24	80	Agric. labourer	Decay of nature, 3 months. Certified.
„ 27	43	Miner - -	Hanged himself. Temporary insane. Inquest.
„ 31	54	Agric. labourer	Nephritis. Certified.
Nov. 4	75	Carpenter, master.	Pneumonia, 8 months. Certified.
„ 7	44	Lead miner -	Cancer, 4 months. Certified.
„ 29	73	Blacksmith, journeyman.	Apoplexy. Certified.
„ 30	59	Dyer, master -	Cancer, 4 years. Certified.
Dec. 18	53	Landed proprietor.	Diseased heart, 18 months. Certified.
„ 29	73	Woollen weaver	Decay of nature, 3 months. Certified.
1861.			
Jan. 13	84	Formerly a butler.	Bronchitis, 8 days. Certified.
„ 9	72	Agric. labourer	Stricture of urethra, 6 years. No medical attendant.
Feb. 12	30	Linendraper -	Apoplexy, 3 days. Certified.
1861.			
Feb. 5	42	Drayman -	Found drowned. Inquest.
„ 12	30	Warehouseman	Phthisis pulmonalis, 4 years. Certified.
„ 24	77	Agric. labourer	Diseased bladder, 2 years. Certified.
Mar. 13	72	Woollen weaver	Pulmonary œdema. Certified.
„ 20	67	Agric. labourer	Diseased liver, 3 months. Certified.
Apr. 23	67	Shoemaker, master.	Dropsy, 3 months. No medical attendant.
„ 26	51	Farmer -	Psoas abscess, 3 years. Certified.
May 8	87	Shoemaker -	Decay of nature, 3 years. No medical attendant.
„ 15	76	Labourer -	Paralysis of bladder. Certified.
June 12	78	Farmer -	Decay of nature, 6 months. Certified.
„ 23	79	Agric. labourer	Decay of nature. Certified.
„ 28	78	Farmer -	Asthma, 3 years. Certified.
July 10	64	Miller, master	Consumption, 6 weeks. Certified.
„ 5	64	Farmer -	Diseased heart. Dropsy, 4 months. Certified.
„ 16	73	Labourer -	Paralysis, 4 days. Certified.
Sept. 1	44	Farmer and innkeeper.	Intemperance. Certified.
„ 4	76	Woollen spinner	Bronchitis. Heart disease, 15 weeks. Certified.
„ 25	29	Tailor, journeyman.	Consumption, 9 months. Certified.
Oct. 1	25	Lead miner -	Pneumonia, 3 weeks. Certified.
„ 6	76	Sorter of black lead pencils.	Decay of nature, 3 months. Certified.
„ 21	46	Woollen manufacture.	Typhoid fever, 3 weeks. Certified.
„ 21	69	Clogg maker -	Diarrhœa, 3 months. Certified.
Nov. 5	42	Agric. labourer	Pneumonia. Hepatized lung, 3 weeks. Certified.
„ 5	12	Driver in lead-mine.	Fall over a wall at Greenside Lead Mines. Inquest.
„ 15	46	Stationer -	Bronchitis, 1 week. Certified.
„ 19	76	Woollen spinner	Apoplexy, 6 days. Certified.
„ 26	50	Engraver -	Abscess on lungs, 3 months. Certified.
„ 30	31	Blacksmith -	Convulsive fits, 3 days. Certified.
Dec. 15	84	Bacon curer -	Decay of nature, 1 month. Certified.

Superintendent Registrar's District.	Registrar's Sub-District.
571. WHITEHAVEN.	2. Whitehaven.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859–61.

Sub-District - 2. Whitehaven.

1859.			
Jan. 8	74	Plasterer -	Diarrhœa, 8 days. Certified.
„ 13	17	Son of mariner	Paraplegia, 13 weeks. Certified.
„ 16	61	Mariner -	Paralysis. Certified.
„ 18	49	Miller - -	Found drowned. Inquest.
„ 19	45	Master mariner	Cardiac and pleuritic effusion. Certified.
„ 26	61	Progrietor of houses.	Chronic bronchitis. Certified.
Feb. 9	76	Mariner -	Natural decay. Certified.
„ 11	35	Stonemason -	Phthisis. Certified.
„ 10	47	Solicitor -	Diseased heart. Hepatitis. Certified.
„ 14	55	Clogger, master	Phthisis. Certified.
„ 17	69	Mariner -	Diseased heart, some years. Certified.
„ 20	50	Cordwainer -	Exhaustion. Certified.
„ 24	14	Son of cordwainer.	Typhoid fever, 19 days. Certified.
Mar. 4	19	Son of master mariner.	Phthisis. Certified.
„ 18	32	Nail maker -	Phthisis, 4 years. Certified.
„ 26	47	Mariner -	Pleuro-pneumonia, 19 days. Certified.
„ 30	70	Accountant -	Asthma. Certified.
Apr. 7	61	Labourer -	Exhaustion. Certified.
„ 5	68	Labourer -	Apoplexy, 65 hours. Certified.
„ 9	25	Stonemason -	Phthisis, 2 years. Certified.
„ 11	51	Mariner -	Morbus cordis, 10 weeks. Certified.

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Apr. 16	79	Coal trimmer	Bronchitis. Certified.
„ 24	79	Farmer -	Old age. Certified.
„ 25	12	Son of mariner	Scrofula, 3 years. Certified.
„ 25	79	Innkeeper -	Gastric fever, 14 days. Certified.
„ 24	25	Son of ship-joiner.	Phthisis. Certified.
„ 24	44	Blacksmith -	Morbus cordis, 10 days. Certified.
„ 26	47	Carter -	Accident. Fall from a flight of steps. Inquest.
May 16	42	Mariner -	Diseased heart. Certified.
„ 8	37	Labourer -	Convulsions. Certified.
„ 11	71	Tailor, master	Old age. Certified.
„ 17	65	Stonemason -	Pneumonia, 7 days. Certified.
„ 22	60	Accountant -	Accident. Fall. Inquest.
„ 27	55	Rope maker -	Bronchitis. Dropsy. Certified.
„ 26	62	Stone mason -	Angina pectoris. Certified.
June 2	79	Cotton weaver	Rheumatism. Certified.
„ 10	46	Labourer -	Nephritis. Certified.
„ 12	74	General labourer.	Cystitis. Certified.
„ 23	72	Mariner -	General debility. Not certified.
„ 26	49	Iron miner -	Phthisis, 3 months. Certified.
„ 25	69	Nail maker -	Phthisis, 4 years. Certified.
July 2	86	Labourer -	Intussusceptio. Certified.
„ 3	64	Agric. labourer	Pneumonia, 6 days. Certified.
„ 11	72	Mariner -	Diarrhœa, 3 days. Certified.
„ 16	84	Chelsea pensioner.	General debility. Not certified.
„ 17	66	Nail maker -	Bronchitis. Certified.
„ 19	79	Millwright -	Old age. Certified.
„ 21	69	Mariner, master	Mollities cerebri. Certified.
„ 21	18	Son of labourer	Phthisis, 12 months. Certified.
„ 25	36	Proprietor of land.	Delirium tremens. Certified.
„ 26	67	Tailor, journeyman.	Phthisis, 3 months. Certified.
„ 29	59	Mariner -	Diseased heart. Certified.
Aug. 3	82	Tailor, master	Diarrhœa, 4 days. Certified.
„ 8	72	Labourer -	General debility. Certified.
„ 13	53	Groom and innkeeper.	Stricture of intestines. Certified.
„ 17	49	Labourer.	Diseased heart. Certified.
„ 20	62	Labourer.	Pneumonia, 8 days. Certified.
Sept. 3	70	Labourer, coal pit.	Morbus cordis, 4 months. Certified.
„ 14	41	Wood turner -	Phthisis. Certified.
„ 21	16	Son of weaver	Phthisis, 4 months. Certified.
„ 24	66	Tobacconist -	Gastritis. Certified.
Oct. 3	27	Labourer -	Cephalitis. 1 month. Certified.
„ 3	62	General dealer	General debility. Not certified.
„ 4	43	Joiner, journeyman.	Rheumatic affection of heart. Certified.
„ 10	71	Shipwright -	Apoplexy, 2 days. Certified.
„ 10	45	Painter -	Accident. Fall from ladder. Inquest.
„ 28	40	Labourer -	Synovitis. Fever. Certified.
„ 29	10	Son of labourer	Scarlatina, 1 month. Certified.
„ 29	39	Mariner -	Accident. Drowned. Inquest.
„ 30	61	Timber merchant.	Paralysis, 2½ years. Certified.
Nov. 1	12	Son of coachman	Scarlatina, 3 days. Certified.
„ 8	77	Accountant -	General debility. No medical attendant.
„ 8	88	Proprietor of houses.	Apoplexia, 3 days. Certified.
„ 14	15	Son of blacksmith.	Accident. Thrown from a horse. Inquest.
„ 16	74	Shipwright -	Apoplexy. Certified.
„ 17	55	Plasterer -	Phthisis, 3 months. Not certified.
„ 24	80	Hammerman -	Old age. Certified.
Dec. 5	18	Tailor's apprentice.	Diseased heart, 7 weeks. Certified.
„ 7	21	House painter	Lumbar abscess, 5 months. Certified.
„ 17	31	Engine man -	Natural causes. Inquest.
„ 21	69	Coal miner -	Bronchitis, 3 months. Certified.
„ 23	52	Labourer -	Natural causes. Inquest.
„ 25	61	Labourer -	Scirrhus. Certified.
„ 25	69	Labourer -	Accident. Fall down stairs. Inquest.
„ 28	75	Cabinet-maker, master.	Bronchitis, 10 weeks. Certified.
„ 29	74	Cotton weaver	General debility. Not certified.
1860.			
Jan. 11	75	Shipwright -	Bronchitis, 5 weeks. Certified.
„ 15	55	House proprietor.	Hepatitis, 12 months. Certified.
„ 17	10	Son of potter -	Croup, 4 days. Certified.
„ 20	64	Mariner -	Diseased heart. Certified.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Jan. 20	64	Master mariner	Apoplexy and paralysis. Certified.
„ 27	11	Son of hairdresser.	Phthisis, 8 months. Certified.
„ 30	11	Son of earthenware maker.	Scarlatina, 1 month. Certified.
Feb. 2	11	Son of blacksmith.	Tabes mesenterica, 2 years. Certified.
„ 2	51	Mariner -	Diseased heart. Certified.
„ 3	51	Agric. labourer	Diseased heart. Certified.
„ 6	30	Banker, coal pit.	Phthisis pulmonalis. Certified.
„ 8	42	Farmer -	Hepatitis, 4 months. Certified.
„ 9	48	Stonemason -	Bronchitis. Certified.
„ 12	40	Coal miner -	Dropsy. Certified.
„ 12	77	Tailor - -	General debility, 1 year. Certified.
„ 19	46	Joiner - -	Chronic anemia. Certified.
„ 19	77	Flax dresser -	Burn, 3 weeks. Certified.
„ 23	73	Baker - -	Bronchitis. Certified.
„ 25	22	Son of cabinet-maker.	Phthisis, 12 months. Certified.
Mar. 9	71	Pavior - -	Senile gangrene. Certified.
„ 9	34	Sawyer - -	Bronchitis, 1 month. Certified.
„ 10	64	Bookseller -	Suicide (cut throat). Inquest.
„ 12	10	Son of stoker -	Atrophy. Certified.
„ 22	28	Mariner -	Diarrhœa. Certified.
Apr. 2	59	Blacksmith -	Cancer. Certified.
„ 4	87	Labourer -	Bronchitis, 5 months. Certified.
„ 6	46	Mariner -	Asthma. Not certified.
„ 6	14	Son of provision dealer	Phthisis. Certified.
„ 7	62	Mariner -	Diarrhœa, 6 weeks. Certified.
„ 7	18	Son of nail-maker.	Phthisis, 3 months. Certified.
„ 13	38	Coal miner -	Bronchitis, 10 days. Certified.
„ 14	60	Mariner -	Apoplexy. Certified.
„ 13	70	Builder, master	Natural decay. Not certified.
„ 17	46	Soldier -	Tympanites, 1 week. Certified.
„ 20	75	Labourer -	Bronchitis. Certified.
May 5	58	Cellarman -	Phthisis, 6 months. Certified.
„ 11	75	Mariner, master	Diseased heart. Bronchitis. Certified.
„ 12	79	Mariner, master	Gastralgia, 3 months. Certified.
„ 18	22	Engine fitter	Phthisis, 10 weeks. Certified.
„ 18	26	Cordwainer -	Phthisis, 10 weeks. Certified.
„ 27	59	Mariner	Bronchitis, 3 weeks. Certified.
June 7	59	Shoemaker, journeyman.	Asthma, Certified.
„ 9	69	Butcher -	Exhaustion. Certified.
„ 11	73	Coal miner -	Intussusception. Certified.
„ 20	62	Butcher, master	Bronchitis, 3 years. Certified.
July 6	30	Boot and shoemaker.	Phthisis, 6 months. Certified.
„ 7	41	Tea dealer -	Phthisis pulmonalis, 2 years. Certified.
„ 6	84	Farmer -	Natural decay. Certified.
„ 8	66	Carman, master	Diseased heart — years. Certified.
„ 16	46	Engine feeder	Diseased heart. Dropsy. Certified.
Aug. 6	11	Son of seaman	Tabes mesenterica, 2 months. Certified.
„ 5	65	Shipwright -	Morbus cordis, 6 months. Certified.
„ 9	19	Bootmaker, apprentice.	Phthisis. Certified.
„ 14	80	Coal miner -	Bronchitis, 2 months. Certified.
„ 18	21	Son of stonemason.	Phthisis. Certified.
„ 24	57	Bailiff -	Apoplexy, 36 hours. Certified.
Sept. 1	54	Blacksmith -	Fever, 3 weeks. Certified.
„ 5	63	Accountant -	Apoplexy. Certified.
„ 20	13	Son of clerk -	Scarlatina, 4 weeks. Certified.
„ 20	33	Wine merchant	Fever with delirium. Certified.
„ 20	unk.	Mariner -	Accident. Fall from rigging. Inquest.
„ 23	52	Dentist -	Dropsy, 2 years. Certified.
Oct. 8	49	Mariner -	Phthisis. Diarrhœa. Certified.
„ 16	30	Watch maker	Pneumonia, 8 days. Certified.
„ 17	30	Labourer -	Phthisis. Certified.
„ 19	18	Seaman -	Phthisis, 2 months. Certified.
„ 20	68	Seaman -	General debility. Not certified.
„ 27	55	Assistant overseer.	Typhus fever, 12 days. Certified.
Nov. 3	54	Rope maker, journeyman.	Phthisis. Certified.
Oct. 5	30	Shipwright -	Dysentery. Certified.
Nov. 12	75	Corn miller -	Bronchitis. Certified.
„ 14	75	Labourer -	Morbus cordis. Certified.

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age	Occupation.	Cause of Death.
1860.			
Nov. 17	21	Seaman -	Accident. Fall from ladder. Inquest.
„ 20	44	Wine merchant	Apoplexy. Certified.
„ 28	59	Coal miner -	Diseased heart. Dropsy, 4 months. Certified.
Dec. 7	50	Painter -	Cancer. Certified.
„ 5	75	Cab driver -	Asthma. Certified.
„ 12	26	Mariner -	Phthisis pulmonalis. Certified.
„ 13	67	Butcher, journeyman.	Icterus. Certified.
14	unk.	Mariner -	Fell down on the quay and died instantly. Inquest.
„ 17	81	Shipwright -	Old age. Certified.
„ 22	74	Grocer -	Natural decay. Certified.
„ 22	29	Labourer -	Bronchitis, 14 days. Certified.
Dec. 30	16	Labourer -	Accident by machinery. Inquest.
1861.			
Jan. 5	61	Cordwainer -	Bronchitis. Certified.
„ 12	28	Labourer -	Bronchitis, 3 weeks. Certified.
„ 14	83	Labourer -	Old age. Not certified.
„ 21	57	Coal miner -	Apoplexy. Certified.
„ 23	65	Mariner -	Bronchitis, 6 days. Certified.
„ 26	55	Coal trimmer	Necrosis. Certified.
„ 26	49	Cartwright -	Accident. Fall of timber. Inquest.
„ 28	20	Iron ore miner	Fall of stone from No. 3 pit in Parkside Mine. Inquest.
„ 31	51	Pensioner -	Phthisis pulmonalis, 5 weeks. Certified.
Feb. 2	47	Mariner, master	Phthisis. Certified.
„ 3	52	Mariner, master	Cancer, 13 months. Certified.
„ 12	33	Mariner, master	Consumption, 3 months. Certified.
„ 17	22	Painter, journeyman.	Phthisis. Certified.
„ 18	62	Linendraper -	Morbus cordis, 12 months. Certified.
„ 23	58	Bootmaker -	Cirrhosis, 14 months. Certified.
Mar. 8	74	Banker - -	Bronchitis, 3 weeks. Certified.
„ 13	32	Labourer -	Accident. Drowned. Inquest.
„ 15	12	Son of brickmaker.	Mesenteric disease. Certified.
„ 29	39	Corn merchant	Apoplexy, 44 hours Certified.
Apr. 3	79	Quarryman -	Bronchitis, 7 days. Certified.
„ 10	76	Chelsea pensioner.	Apoplexy. Certified.
„ 15	47	Shoemaker, journeyman.	Phthisis. Certified.
„ 15	52	Corn merchant	Paralysis. Certified.
„ 17	78	Hatter - -	Bronchitis. Certified.
„ 19	34	Mariner -	Cut his throat (suicide). Inquest.
May 4	19	Son of fish curer.	Phthisis. Certified.
„ 8	42	Labourer -	Accident in a bone-mill. Inquest.
„ 27	34	Coal miner -	Diseased heart. Dropsy. Certified.
1861.			
May 27	63	Stoker - -	Bronchitis. Certified.
June 1	17	Tailor - -	Accident by machinery in a mine. Inquest.
„ 14	13	Driver - -	Accident. Kick of a horse. Inquest.
„ 20	50	Shoemaker -	Natural causes. Sudden. Inquest.
„ 24	25	Brazier, journeyman.	Phthisis, 6 months. Certified.
„ 29	82	Coal miner -	General debility. Certified.
„ 30	34	Stoker, coal-pit	Phthisis. Certified.
July 3	59	House joiner -	Dropsy. Certified.
„ 10	17	Son of labourer	Phthisis, 3 years. Certified.
„ 15	83	Nail-maker -	Icterus. Certified.
Aug. 8	71	Mariner -	Apoplexy, 12 hours. Certified.
„ 14	63	Shoemaker, journeyman.	Enlarged prostate gland. Certified.
„ 16	40	Labourer -	Phthisis. Certified.
„ 26	62	Sawyer -	Bronchitis. Certified.
Sept. 7	25	Coach proprietor.	Icterus, 2 week. Certified.
„ 6	35	Landed proprietor.	Unknown. No medical attendant.
„ 14	27	Joiner, journeyman.	Lumbar abscess, 8 months. Certified.
„ 18	100	Stonemason -	Old age. Certified.
—	unk.	Labourer -	Found drowned. Inquest.
„ 29	43	Innkeeper -	Hepatitis. Anasarca. Certified.
Oct. 11	67	Joiner, master	Bronchitis, 1 year. Certified.
„ 14	76	Master mariner	Natural decay, 1 year. Certified.
„ 16	78	Agric. labourer	Old age. Certified.
Oct. 19	43	Coal miner -	Ascites. Certified.
Nov. 1	46	Innkeeper -	Accident. Drowned. Inquest.
„ 2	13	Son of plumber, master.	Spinal disease. Certified.
„ 3	49	Butcher, master	Bronchitis, 3 months. Certified.
„ 7	69	Mariner -	General debility. Not certified.
„ 10	45	Labourer -	Bronchitis. Certified.
„ 10	32	Mariner -	Phthisis, 10 months. Certified.
„ 17	61	Coach maker, journeyman.	Dysentery. Certified.
„ 77	35	Cabinet maker, journeyman.	Phthisis, 6 months. Certified.
„ 20	18	Son of shipwright.	Convulsions. Certified.
Nov. 22	71	Labourer -	Natural decay. Not certified.
„ 25	52	Mariner, master.	Diseased heart. Dropsy. 4 months. Certified.
„ 29	41	Pawnbroker -	Cirrhosis, 4 months. Certified.
Dec. 1	29	Policeman -	Remittent fever, 9 days. Certified.
„ 2	26	Sawyer -	Phthisis, 1 year. Certified.
„ 4	56	Joiner, journeyman.	Bronchitis. Certified.
„ 10	10	Son of sawyer	Accident Drowned. Inquest.
„ 12	64	Shipwright -	Bronchitis, 2 years. Certified.
„ 16	11	Son of servant	Anasarca. Certified.
„ 22	45	Brazier -	Diseased heart. Anasarca. Certified.

COUNTY OF WESTMORELAND.

Superintendent Registrar's District.	Registrar's Sub-District.
574 West Ward.	2 Lowther.

Deaths of Males aged 10 Years and upwards in each of the Years 1859–61.

Sub-District - 2 Lowther.

1858.			
Dec. 22	46	Corn miller -	Fall from a loft. Inquest.
1859.			
Feb. 5	24	Lead miner -	Consumption. Certified.
Mar. 22	66	Railway labourer.	Typhus fever. Not certified.
Apr. 14	86	Mole catcher	Natural decay. Certified.
„ 23	29	Road repairer	Phthisis, 1 year. Certified.
May 4	91	Farmer -	Natural decay. Not certified.
Apr. 28	65	Road repairer	Erysipelas. Not certified.
1859.			
May 10	72	Mole catcher	Natural decay. Not certified.
„ 13	36	Labourer -	Fever. Certified.
„ 13	81	Agric. labourer	Dropsy and diseased heart. Certified.
„ 23	27	Miner - -	Accident. Explosion from blasting in mine. Inquest.
June 2	70	Gentleman -	Apoplexy, 9 hours. Certified.
May 22	54	Saddler -	Found drowned. Inquest.
June 14	67	Farmer - -	Hernia. Not certified.
July 10	66	Groom - -	Cancer. Certified.
June 18	67	Innkeeper -	Natural decay. Not certified.
July 18	52	Clog maker -	Decline. Not certified.
„ 31	57	Lead miner -	Consumption. Not certified.
Aug 13	74	Farmer - -	Natural decay. Not certified.
„ 20	35	Stonemason -	Enteritis. Not certified.
Sept 24	56	Railway labourer.	Sudden death. Inquest.
Oct. 16	36	Agric. labourer	Dropsy, 6 months. Certified.
„ 18	39	Farmer - -	Consumption. Certified.
„ 24	40	Lead miner -	Consumption. Not certified.
„ 19	40	Mole catcher -	Suffocation. Lime kiln. Inquest.
Nov. 18	13	Son of agric. labourer.	Scarlatina. Certified.

DISTRICTS IN NORTH OF ENGLAND.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Nov. 23	30	Butcher -	Phthisis. Certified.
„ 21	59	Labourer -	Found drowned. Inquest.
Dec. 12	28	Carpenter -	Decline. Not certified.
„ 21	25	Copper miner	Consumption. Not certified.
„ 22	52	Farmer -	Dropsy. Not certified.
„ 1	41	Gentleman -	Cephalitis. Not certified.
1860.			
Feb. 4	12	Son of gentleman.	Hydrocephalus. Not certified.
„ 18	39	Farmer -	Phrenitis, 7 days. Certified.
„ 28	74	Groom -	Dropsy. Inquest.
Mar. 5	70	Agric. labourer	Natural decay. Certified.
„ 7	74	Carrier -	Natural decay. Certified.
„ 27	48	Agric. labourer	Insanity. Not certified.
Apr. 1	82	Blacksmith -	Natural decay. Not certified.
Mar. 31	78	Farmer -	Natural decay. Not certified.
Apr. 5	20	Son of farmer	Consumption. Not certified.
„ 7	54	Parish clerk -	Diseased heart. Not certified.
„ 19	54	Innkeeper -	Pneumonia. Certified.
May 16	83	Farmer -	Natural decay. Certified.
„ 15	10	Son of farmer	Diphtheria. Not certified.
„ 17	84	Groom -	Found dead in a stable. Inquest.
June 4	48	Doorkeeper -	Apoplexy. Not certified.
„ 11	61	Land proprietor.	Pneumonia. Not certified.
July 9	88	Land proprietor.	Old age. Not certified.
„ 16	79	Gentleman -	Old age. Not certified.
„ 16	61	Agric. labourer	Cut his throat (insane). Inquest.
Aug. 3	54	Farmer -	Diseased lungs. Certified.
„ 15	80	Farmer -	Natural decay. Not certified.
„ 15	34	Innkeeper -	Consumption. Not certified.
„ 29	29	Joiner -	Consumption. Not certified.
Oct. 15	76	Plasterer -	Hernia. Certified.
„ 19	87	Farmer -	Natural decay. Certified.
Nov. 7	85	Farmer -	Dropsy. Not certified.
„ 12	77	Weaver -	Natural decay. Certified.
„ 21	78	Agric. labourer	Natural decay. Not certified.
„ 5	60	Labourer -	Found drowned. Inquest.
1860.			
Nov. 26	79	Gentleman -	Natural decay. Certified.
1861.			
Jan. 20	60	Farmer -	Typhus. Bronchitis. Certified.
„ 21	13	Son of ostler	Not stated.
1860.			
Dec. 17	33	Gentleman -	Consumption. Not certified.
1861.			
Jan. 28	88	Farmer -	Natural decay. Certified.
Feb. 3	73	Mason - -	Natural decay. Not certified.
Jan. 28	69	Book dealer -	Diseased heart. Certified.
„ 31	55	Vagrant -	Natural causes. Inquest.
Mar. 11	41	Farm servant	Ileus. Certified.
„ 27	66	Farm servant	Pneumonia. Not certified.
Apr. 10	59	Gentleman -	Cirrhosis of liver, 3 months. Certified.
„ 15	59	Farmer - -	Dropsy. Not certified.
May 1	63	Carpenter -	Compression of brain. Certified.
Apr. 20	31	Schoolmaster -	Found drowned. Inquest.
June 7	84	Clergyman -	Natural decay. Not certified.
„ 1	78	Gentleman -	Natural decay. Not certified.
„ 24	33	Carpenter -	Consumption. Certified.
July 18	10	Son of agric. labourer.	Water in the head. Not certified.
Aug. 16	82	Blacksmith -	Natural decay. Not certified.
Sep. 16	73	Farmer -	Apoplexy. Certified.
Oct. 2	55	Farmer -	Dropsy. Certified.
„ 6	49	Husbandman	Hanged himself (suicide). Inquest.
Nov. 2	68	Vicar of Bampton.	Diseased heart, 2 years. Inquest.
„ 25	39	Earthenware maker.	Accidentaliy drowned. Inquest.
Dec. 7	46	Drayman -	Accident. Run over by horse and cart. Inquest.
„ 16	19	Lead ore washer.	Consumption. Not certified.

DISTRICTS IN NORTH WALES.—COUNTY OF FLINT.

Superintendent Registrar's District.

610. HOLYWELL.

Registrar's Sub-District.

1. Whitford.
2. Holywell.
3. Flint.
4. Mold.

DEATHS OF MALES AGED 10 YEARS AND UPWARDS IN EACH OF THE YEARS 1859–61.

Sub-District. 1. Whitford.

1859.			
Jan. 5	10	Son of house joiner.	Scarlet fever. Not certified.
„ 15	65	Lead smelter	Palsy. Confined to bed 8 years. Not certified.
„ 22	89	Road labourer	Decay of nature. Not certified.
Feb. 2	47	General labourer	Consumption, 3 months. Certified.
„ 10	61	General labourer	Consumption, 3 months. Certified.
„ 19	15	Son of carpenter	Consumption, 12 months. Certified.
Mar. 20	39	Fireman -	Consumption, 6 months. Not certified.
„ 20	17	Farm servant	Supposed to have fallen from the back of a young colt. Inquest.
1859.			
Mar. 22	27	Collier - -	Inflammation of lungs. Not certified.
„ 28	72	Errand man -	Palsy, second attack. Not certified.
Apr. 3	55	Farmer -	Dropsy. Certified.
„ 4	57	Collier - -	Consumption. Not certified.
„ 14	90	Labourer -	Decay of nature. Not certified.
„ 18	59	Lead miner -	Dropsy, 2 months. Not certified.
„ 22	63	Labourer -	Asthma, 12 months. Certified.
„ 25	24	Collier - -	Consumption, 6 months. Certified
May 4	73	Collier - -	Decay of nature. Not certified.
„ 7	70	Farmer - -	Apoplexy. Not certified.
„ 12	70	General labourer	Decay of nature. Certified.
„ 15	24	Journeyman baker.	Consumption, 6 months. Certified.
„ 12	77	Lead miner -	Decay of nature. Not certified.
June 3	82	Farmer -	Decay of nature. Not certified.
„ 1	72	Agricultural labourer.	Decay of nature. Certified.
„ 9	51	Agric. labourer	Not known. Not certified.
„ 10	59	Farmer -	Consumption. Not certified.
„ 22	82	Slater - -	Decay of nature. Not certified.
„ 22	52	Mason - -	Consumption, 14 months. Certified.
„ 28	67	Collier - -	Not known. No medical attendant.
July 3	74	Lead miner -	Decay of nature. Not certified.
„ 10	85	General labourer	Decay of nature. Not certified.
„ 11	20	Husbandman -	Fever, 7 days. Not certified.
Aug. 2	40	General labourer	Typhus fever, 7 days. Certified.
„ 5	10	Son of sailor -	Slow fever, 3 weeks. Not certified.
„ 4	46	Farmer -	Consumption, 6 months. Certified.

DISTRICTS IN NORTH WALES.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Aug. 5	65	Farmer -	Cancer on the face, 4 years, Not certified.
„ 19	59	Labourer -	Asthma. Not certified.
Sept. 1	50	General labourer	Consumption, 6 months. Certified.
Aug. 21	16	Son of farmer	Typhus fever, 4 weeks. Certified.
Sept. 19	29	Collier - -	Consumption, 6 months. Certified.
„ 17	42	Clerk - -	Jaundice, 2 years. Not certified.
„ 24	49	Publican -	Consumption. Not certified.
„ 28	30	Mason - -	Consumption. Not certified.
Oct. 20	65	General labourer	Convulsions. Not certified.
Nov. 9	42	Warehouseman	Consumption, 6 months. Not certified.
„ 22	25	Coal miner -	Consumption, 4 months. Not certified.
„ 29	59	Coal miner -	Asthma, 12 months. Certified.
Dec. 20	19	Lead miner -	Scarlet fever, 3 weeks. Certified.
„ 24	60	Carpenter -	Injury to spine. Not certified.
1860.			
Jan. 7	54	Grocer - -	Asthma, 5 years. Not certified.
„ 15	31	Collier - -	Died suddenly by the visitation of God in a natural way. Inquest.
„ 21	82	General labourer	Decay of nature. Not certified.
Feb. 2	86	Labourer -	Decay of nature. Certified.
„ 9	70	Lead miner -	Asthma. Not certified.
„ 12	47	Wheelwright	Brain fever, 3 days. Not certified.
„ 17	19	Collier - -	Consumption, 9 months. Certified.
„ 16	18	Sailor - -	Drowned in the River Dee.
„ 20	68	Lead miner -	Asthma. Not certified.
„ 25	55	Horse dealer -	Died suddenly by the visitation of God in a natural way. Inquest.
Mar. 2	17	Son of lead miner.	Scarlet fever, 14 days. Not certified.
„ 7	85	Farmer -	Decay of nature. Not certified.
„ 8	67	Lead miner -	Dropsy. Not certified.
„ 13	31	Lead ore miner	Accidentally killed by falling down to the bottom of a lead ore mine shaft. Inquest.
„ 18	70	Wheelwright	Water on the chest. Not certified.
„ 18	52	Gentleman -	Palsy, second attack. Not certified.
„ 27	58	Lead miner -	Consumption. Not certified.
„ 31	57	Farmer -	Asthma. Not certified.
Apr. 2	57	Lead miner -	Asthma, 2 years. Not certified.
„ 10	73	Labourer -	Died suddenly by the visitation of God in a natural way. Inquest.
“ 9	40	Mason - -	Consumption, 9 months. Certified.
„ 15	78	Wool spinner	Decay of nature. Not certified.
May 1	87	Butcher -	Decay of nature. Not certified.
„ 8	62	Mine agent -	Palsy. Not certified.
„ 9	44	Collier - -	Not known. No medical attendant.
„ 9	50	Labourer -	Consumption, 3 months. Certified.
„ 11	39	Engineer -	Consumption, 11 months. Not certified.
„ 15	70	Husbandman -	Decay of nature. Not certified.
June 12	36	Farmer -	Consumption, 10 months. Not certified.
„ 23	84	Collier - -	Decay of nature. Not certified.
„ 24	78	Shoemaker -	Do.
July 4	75	Farmer -	Do.
„ 7	76	Farmer -	Do.
„ 12	80	Farmer -	Do.
„ 8	25	Footman -	Consumption, 12 months. Certified.
„ 21	78	Collier - -	Decay of nature. Not certified.
„ 19	54	Lead miner -	Consumption. Not certified.
„ 25	61	Innkeeper -	Consumption, 6 months. Certified.
„ 28	40	Collier - -	Disease of the heart. Certified.
Aug. 10	63	General labourer	Consumption. Not certified.
„ 12	33	Husbandman -	Fever, 14 days. Not certified.
„ 13	42	Lead miner -	Consumption, 12 months. Certified.
„ 13	55	Carpenter -	Fistula. Not certified.
„ 25	70	Sawyer -	Decay of nature. Not certified.
Sept. 10	56	Farmer -	Being subject to fits, was drowned accidentally in a ditch. Inquest.
„ 13	48	Shoemaker -	Consumption. Not certified.
Oct. 8	20	Coal miner -	Consumption. Certified.
„ 31	11	Son of blacksmith	Fever, 9 days. Not certified.
Nov. 3	23	Schoolmaster	Consumption. Certified.
„ 13	34	Coal miner -	Consumption. Not certified.
„ 15	74	Coal miner -	Decay of nature. Not certified.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Nov. 30	34	Farmer -	Consumption, 12 months. Not certified.
“ 25	22	Butter merchant.	Consumption, 6 months. Not certified.
Dec. 14	54	Coal miner -	Inflammation of lungs. Certified.
„ 15	62	Coal miner -	Asthma, 12 months. Certified.
„ 16	12	Son of lead miner.	No medical attendant. Not certified.
„ 21	94	Coal miner.	Decay of nature. Not certified.
„ 27	64	General labourer	Dropsy. Certified.
1861.			
Jan. 6	67	Coal miner -	Not known. No medical attendant.
„ 14	78	Mug dealer -	Decay of nature. Not certified.
„ 16	58	General labourer	Consumption. Not certified.
„ 16	84	Shoemaker -	Decay of nature. Certified.
Feb. 9	38	Labourer -	Consumption, 12 months. Certified.
„ 12	14	Labourer -	Decay of nature. Not certified.
„ 9	72	Farmer -	Slow fever. Not certified.
„ 12	80	Farmer -	Decay of nature. Not certified.
„ 26	74	Blacksmith -	Decay of nature. Not certified.
„ 27	39	Journeyman printer.	Consumption. Not certified.
Mar. 14	53	Lead miner -	Miners' asthma. Certified.
„ 17	68	Farmer -	Decay of nature. Not certified.
„ 24	16	Son of lead miner.	Not known. Not certified.
Apr. 6	17	Son of coal miner.	Consumption, 6 months. Certified.
„ 13	70	Lead miner -	Decay of nature. Not certified.
„ 20	11	Son of farmer	Diphtheria. Certified.
„ 23	50	Lead miner -	Consumption, 12 months. Certified.
May 14	61	Lead miner -	Asthma. Not certified.
„ 11	68	Gentleman -	Malignant disease of stomach. Certified.
„ 18	76	Farmer -	Dropsy. Not certified.
„ 20	63	Coal miner -	Consumption. Not certified.
„ 11	36	Coal miner -	Consumption. Certified.
„ 10	55	Farmer -	Consumption. Certified.
„ 26	71	Shopkeeper -	Obstruction of the bowels. Certified.
„ 18	56	Lead miner -	Miner's asthma. Not certified.
„ 10	72	General labourer	Decay of nature. Not certified.
„ 21	62	Farmer -	Decay of nature. Not certified.
July 3	52	Mason - -	Rheumatism, 6 months. Certified.
„ 6	55	Farmer -	Consumption, 8 months. Certified.
Aug. 1	31	Miner - -	Accidentally killed by falling down a shaft. Inquest.
Mar. 28	32	Collier -	Accidentally killed by a large lump of coal falling on his head. Inquest.
Aug. 4	71	Butcher -	Decay of nature. Not certified.
„ 13	64	Farmer -	Consumption. Certified.
Sept. 11	52	Lead miner -	Cancer on the face. Certified.
„ 10	66	Farmer -	Accidentally killed by falling down stairs. Inquest.
Oct. 1	19	Coal miner -	Consumption, Not certified.
„ 1	37	Husbandman	Consumption, 6 months. Not certified.
„ 4	67	Tailor -	Dropsy. Certified.
„ 4	14	Son of platelayer.	Consumption, 6 months. Certified.
„ 10	67	Farmer -	Decay of nature. Certified.
„ 11	70	Farmer -	Verdict, died suddenly by the visitation of God in a natural way. Inquest.
„ 10	77	Shepherd -	Decay of nature. Not certified.
„ 13	53	Wheelwright	Verdict, died suddenly by the visitation of God in a natural way. Inquest.
„ 27	69	Agric. labourer	Decay of nature. Not certified.
„ 30	22	General labourer	Not known. No medical attendant.
„ 26	23	Collier -	Accidentally suffocated and smothered. Inquest.
„	45	Do. -	Do.
„	24	Do. -	Do.
„	36	Do. -	Do.
„	32	Do. -	Do.
„	38	Do. -	Do.
„	39	Do. -	Do.
„	35	Do. -	Do.
„	49	Do. -	Do.
„	24	Do. -	Do.

DISTRICTS IN NORTH WALES.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
Nov. 15	41	Mason - -	Consumption, 12 months. Certified.
„ 17	35	Sailor - - -	Drowned in the river Dee. Inquest.
„ 22	86	Labourer -	Decay of nature. Not certified.
„ 19	15	Carter -	Accidentally killed by a chaff-cutting engine. Inquest.
„ 21	66	Fishmonger -	Palsy. Not certified.
Dec. 2	63	Lead miner -	Miner's asthma.
„ 7	19	Farm labourer	Fever, 9 days. Not certified.
„ 19	20	Journeyman draper.	Consumption. Certified.
„ 26	18	Son of lead miner.	Consumption. Not certified.

Sub-District. 2. Holywell.

1859.			
Jan. 1	58	Labourer -	Verdict, died suddenly by the visitation of God in a natural way. Inquest.
„ 14	72	Farmer -	Chronic disease of stomach. Certified.
„ 9	77	Miner -	Asthma. Certified.
„ 19	80	Shopkeeper -	Asthma. Certified.
„ 19	65	Miner -	Asthma and dropsy. Certified.
„ 28	17	Sailor -	Consumption. Certified.
„ 28	65	Collier -	Consumption. Certified.
Feb. 5	15	Farm servant	Typhus fever. Certified.
„ 6	37	Bricklayer -	Dropsy.
„ 12	86	Farmer - -	Decline of age. Not certified.
„ 16	76	Miller and publican.	Decline of age. Not certified.
„ 20	66	Lead smelter	Chronic disease of stomach. Certified.
„ 26	58	Miner - -	Consumption. Certified.
„ 27	23	Miner - - -	Disease of hip. Certified.
Mar. 2	70	Stone mason and farmer.	Dropsy. Certified.
„ 4	53	Miner - -	Fever. Certified.
„ 14	83	Lead ore washer	Palsy. Certified.
„ 17	55	Mine agent -	Dropsy. Certified.
„ 21	52	Farmer and publican.	Asthma. Certified.
„ 23	35	Son of collier, idiot.	Ulceration of the bowels. Certified.
Apr. 13	64	Forgeman in copper works.	Softening of the brain. Certified.
„ 17	49	Gardener -	Consumption. Certified.
„ 22	54	Miner - -	Asthma. Certified.
„ 22	42	Farmer -	Consumption. Certified.
„ 21	60	Pauper -	Ulcerated legs. Certified.
„ 1	17	Son of collier	Had his fingers accidentally entangled in machinery, which produced lockjaw and death. Inquest.
Apr. 1	11	Son of printer	Accidentally killed by the wild beasts' carriages of Mrs. Ann Wombwell falling upon him during a very heavy wind. Inquest.
„ 1	32	Keeper at Mrs. Wombwell's.	Do.
„ 1	14	Son of blacksmith.	Do.
„ 1	13	Printer - -	Do.
„ 2	49	Lead ore miner	Accidentally killed by part of the roof of the Lead Ore Mine falling upon him. Inquest.
„ 16	14	Collier - -	Accidentally burned to death by the fire damp in Coleshill Colliery. Inquest.
„ 29	24	Joiner -	Consumption. Certified.
May 7	79	Labourer -	Palsy. Certified.
„ 10	70	Labourer -	Chronic bronchitis. Certified.
„ 12	22	Copper worker	Consumption. Certified.
„ 14	78	Smelter -	Decline of age. Not certified.
„ 20	61	Engineer -	Diseased heart and asthma. Certified.
„ 20	10	——	Hydrocephalus. Certified.
„ 22	24	Ship broker's clerk.	Consumption. Certified.
„ 24	65	Coal miner -	Asthma. Certified.
„ 26	45	Farmer and road surveyor.	Enteritis. Certified.
1861.			
May 17	68	Gardener -	Not being of sound mind, memory, and understanding, did hang himself with a rope to the roof of a bedroom in his own house until he was dead. Inquest.
„ 19	65	Surgeon -	Diseased kidneys and dropsy. Certified.
June 3	44	Mine agent -	Typhoid fever. Certified.
„ 2	72	Farmer -	Bronchitis. Certified.
„ 2	56	Paper maker -	Dropsy. Certified.
„ 30	53	Baptist minister	Struck by a flash of lightning, and from the effect of such did instantly die. Inquest.
„ 7	31	Collier - -	Consumption. Certified.
„ 7	60	Miner - -	Consumption. Certified.
„ 17	60	Labourer -	Cancer. Certified.
„ 30	77	Smelter -	Dropsy. Certified.
July 17	73	Labourer -	Rheumatism. Not certified.
Aug. 6	51	Miner - -	Asthma. Certified.
„ 10	41	Collier - -	Epilepsy. Certified.
„ 16	32	Labourer -	Asthma. Certified.
„ 19	79	Formerly copper shearer.	Decline of age. Not certified.
„ 28	58	Miner - -	Chronic disease of stomach. Certified.
Sept. 3	19	Copper roller	Consumption. Certified.
„ 13	10	Son of farmer	Died suddenly by the visitation of God while in a fit. Inquest.
„ 16	24	Lead worker -	Consumption. Certified.
„ 21	32	Labourer -	Died suddenly by the visitation of God in a natural way. Inquest.
„ 26	72	Miner - -	Palsy. Certified.
Oct. 3	20	Farm servant	Consumption. Certified.
„ 7	57	Rope drawer -	Died suddenly by the visitation of God in a natural way. Inquest.
„ 11	55	Miner - -	Consumption. Certified.
„ 14	75	Miner - -	Asthma. Certified.
„ 19	66	Labourer -	Ileus. Certified.
„ 22	50	Shoemaker -	Phthisis. Certified.
„ 24	55	Labourer -	Scrofula. Certified.
„ 21	58	Farmer - -	Found dead in the bottom of a mine shaft in Holywell Mountain on the 23rd of October 1859. Inquest.
„ 27	11	Son of labourer	Accidentally killed by falling from the back of a donkey which he was riding. Inquest.
„ 26	47	Ostler - -	Consumption. Certified.
Nov. 3	59	Smelter -	Died suddenly by the visitation of God in a natural way. Inquest.
„ 10	81	Farmer -	Pneumonia. Certified.
„ 11	29	Railway labourer	Consumption. Certified.
„ 12	72	Smith - -	Bronchitis. Certified.
„ 13	75	Carpenter -	Decline of age. Certified.
„ 18	72	Labourer -	Dropsy. Certified.
„ 3	59	Smelter - -	Died suddenly by the visitation of God in a natural way. Inquest.
„ 24	29	Labourer -	Consumption. Certified.
„ 21	75	Schoolmaster	Gout and diseased liver. Certified.
„ 26	51	Labourer -	Cancer. Certified.
„ 29	71	Joiner - -	Chronic diseased bladder. Certified.
Dec. 4	51	Collier - -	Bronchitis. Certified.
„ 5	65	Farmer -	Palsy. Certified.
„ 5	55	Miner - -	Consumption. Certified.
„ 13	36	Carpenter -	Died suddenly by the visitation of God in a natural way. Inquest.
„ 28	56	Miner - -	Chronic bronchitis. Certified.
„ 23	65	Labourer -	Died suddenly by the visitation of God from the effect of the bursting of a varicose vein of the leg. Inquest.
1860.			
Jan. 2	55	Miner and shoemaker.	Pneumonia. Certified.
„ 5	30	Shoemaker -	Consumption. Certified.
„ 19	49	Joiner and publican.	Diseased liver. Certified.
„ 23	68	Clerk and overlooker.	Asthma. Certified.
„ 25	62	Miner - -	Strangulated hernia. Certified.
„ 25	70	Miner - -	Asthma. Certified.
„ 27	60	Foreman in wine vaults.	Chronic bronchitis. Certified.
Feb. 4	37	Miner - -	Disease of the heart. Certified.
„ 6	55	Collier - -	Palsy. Certified.

DISTRICTS IN NORTH WALES.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Feb. 8	77	Paper lighter	Died suddenly by the visitation of God in a natural way. Inquest.
„ 15	85	Husbandman	Decline of age. Certified.
„ 15	72	Stonemason	Dropsy. Certified.
„ 19	66	Carter	Consumption. Certified.
„ 28	39	Miner	Pneumonia. Certified.
Mar. 7	59	Lead roller	Fistula.
„ 7	38	Stonemason	Inflammation of lungs. Certified.
„ 6	80	Formerly manager in lead works.	Decline of age. Not certified.
„ 10	31	Miner	Consumption. Certified.
„ 15	83	Farmer	Decline of age. Certified.
„ 18	11	-	Scarlet fever. Certified.
„ 23	65	Labourer	Consumption. Certified.
Apr. 3	60	Miner	Fever. Certified.
„ 1	73	Miner	Died suddenly by the visitation of God in a natural decay. Inquest.
„ 5	35	Clerk to Holywell Union.	Bronchitis. Certified.
„ 6	77	Formerly gardener.	Decline of age. Certified.
„ 9	62	Farmer	Asthma and dropsy. Certified.
„ 14	72	Smelter	Died suddenly by the visitation of God in a natural way. Inquest.
„ 16	66	Formerly clerk and relieving officer.	Palsy. Decline.
May 2	76	Thatcher	Decline of age. Certified.
Apr. 30	44	Labourer	Died suddenly by the visitation of God in a natural way. Inquest.
May 3	71	Watchmaker	Fever. Certified.
„ 13	30	Publican	Pneumonia. Certified.
„ 16	42	Farm labourer	Bronchitis. Certified.
„ 16	26	Collier	Consumption. Certified.
„ 26	22	Draper	Consumption. Certified.
„ 30	15	-	Dropsy. Certified.
June 8	68	Formerly cotton spinner.	Asthma and dropsy. Certified.
„ 5	11	Son of miner	Consumption. Certified.
„ 9	64	Labourer	Killed by a tree falling upon him. Inquest.
„ 14	72	Smelter and publican.	Palsy. Certified.
„ 16	80	Joiner	Died suddenly by the visitation of God in a natural way. Inquest.
„ 18	51	Labourer	Consumption. Certified.
„ 19	60	Stonemason	Pneumonia. Certified.
„ 29	79	Farmer	Decline of age. Certified.
„ 30	32	Collier	Effects of a burn. Certified.
„ 30	32	Collier	Accidentally burned to death by an explosion of fire damp. Inquest.
July 7	54	Publican	Died suddenly from the effects of excessive drinking. Inquest.
„ 19	60	Slater	Chronic dirrahœa. Certified.
„ 21	31	Attorney's clerk	Consumption. Certified.
Aug. 3	42	Labourer	Fever. Certified.
„ 4	63	Labourer	Chronic disease of stomach. Certified.
„ 1	72	Collier	Dropsy. Certified.
„ 7	50	Collier	Asthma. Certified.
„ 9	28	Attorney's clerk	Consumption. Certified.
„ 25	32	Tailor	Enteritis. Certified.
„ 28	60	Hawker	Paralysis. Certified.
„ 31	72	Baker	Dropsy. Certified.
Sept. 1	14	Son of lead miner.	Diphtheria. Certified.
„ 16	30	Discharged soldier.	Serous apoplexy. Certified.
„ 19	66	Collier	Dropsy. Certified.
„ 19	23	Butcher	Consumption. Not certified.
„ 23	48	Labourer	Scirrhus of the throat. Certified.
Oct. 1	73	Copper roller	Decline of age. Certified.
„ 15	86	Farmer	Do.
„ 19	71	Smelter	Disease of the heart. Certified.
„ 22	23	Smelter	Consumption. Certified.
„ 28	83	Smelter	Strangulated hernia. Certified.
„ 31	56	Smelter	Disease of the heart and dropsy. Certified.
„ 31	50	Smelter	Paralysis. Certified.
Nov. 4	86	Formerly joiner	Apoplexy. Certified.
„ 24	54	Weaver & toll-gate keeper.	Disease of liver and kidneys. Certified.

When Died.	Age	Occupation.	Cause of Death.
1860.			
Nov. 24	68	Mine agent	Chronic bronchitis. Certified.
Dec. 7	67	Farm bailiff	Apoplexy. Certified.
„ 10	20	In service	Abscess of the brain. Certified.
„ 25	54	Farmer	Diseased liver and dropsy. Certified.
1861.			
Jan. 5	43	Miner	Asthma and dropsy. Certified.
„ 5	24	Son of husbandman.	Scrofula. Certified.
„ 7	24	Butcher	Decline of age. Certified.
„ 8	43	Brewer's traveller.	Disease of the heart and dropsy. Certified.
„ 1	24	Collier	Accidentally burned to death from the effects of an explosion at the Englefield colliery on the 18th Dec. 1860. Inquest.
„ 14	88	Copper shearer	Strangulated hernia. Certified.
„ 14	66	Farmer	Bronchitis. Not certified.
„ 19	72	Farmer	Dropsy. Certified.
„ 19	57	Miner	Consumption. Certified.
„ 17	72	Labourer	Accidentally killed by falling against an iron bedstead. Inquest.
„ 20	25	Hair dresser	Bronchitis. Certified.
„ 29	26	Son of shoemaker.	Consumption. Certified.
1860.			
Dec. 6	78	Lime burner	Asthma. Certified.
1861.			
Jan. 27	40	Tailor	Not being of sound mind, memory, and understanding, but lunatic and distracted, did kill himself by drinking 2 ounces of laudanum. Inquest.
„ 26	49	Collier	Accidentally killed by a stone from the side of the level falling upon him at Coleshill coa pit. Inquest.
Feb. 1	13	Carter	Accidentally crushed to death by a railway waggon. Inquest.
„ 9	32	Miner	Bronchitis. Certified.
„ 15	81	Miner	Decline of age. Certified.
„ 14	70	Draper and brewer.	Disease of liver and dropsy. Certified.
„ 22	68	Coal carrier	Dropsy. Certified.
„ 25	43	Labourer	Chronic disease of the stomach Certified.
„ 27	62	Smelter	Asthma and dropsy. Certified.
„ 27	18	Fuller	Cardiac disease and dropsy. Certified.
„ 28	54	Nurseryman & gardener.	Pneumonia. Certified.
„ 28	10	Son of timber merchant.	Diphtheria. Certified.
Mar. 4	74	Earthenware hawker.	Decline of age. Certified.
„ 15	68	Collier	Asthma and dropsy. Certified
„ 18	75	Stonemason	Convulsions. Not certified.
„ 24	77	Farmer	Asthma. Certified.
„ 28	51	Labourer	Asthma. Certified.
„ 29	21	Son of miner	Consumption. Certified.
„ 30	42	Brass smelter	Consumption. Certified.
„ 30	46	Smelter	Pneumonia. Certified.
April 5	47	Labourer	Consumption. Certified.
„ 5	63	Smelter	Disease of stomach and bowels. Certified.
„ 7	78	Labourer	Asthma. Certified.
„ 10	83	Farmer	Decline of age. Certified.
„ 30	63	Labourer	Congestion of the lungs. Certified.
„ 18	89	Miner	Decline of age. Certified.
„ 20	60	Farmer	Dropsy. Certified.
„ 22	82	Hawker	Decline of age. Certified.
„ 24	10	Son of joiner	Accidentally burned to death. Inquest.
May 1	54	Groom and coachman.	Pneumonia. Certified.
„ 3	27	Agric. labourer	Consumption. Certified.
„ 9	53	Miner	Asthma. Certified.
„	33	Farmer and corn dealer's agent.	Pneumonia. Certified.
„ 8	47	Grocer	Consumption. Certified.
„ 17	68	Labourer	Dropsy. Certified.
„ 20	69	Collier	Paralysis. Certified.

DISTRICTS IN NORTH WALES.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
May 22	80	Nailor	Verdict. Murder against Sarah Edwards, who feloniously and maliciously cut her husband's throat with a razor. Inquest.
„ 28	55	Collier	Consumption. Certified.
„ 30	65	Collier	Fever. Certified.
June 1	27	Shoemaker	Pneumonia. Certified.
„ 3	46	Miner	Cancer of the stomach. Certified.
„ 14	82	Retired copper works agent	Decline of age. Certified.
„ 15	58	Formerly stone mason.	Chronic disease of stomach. Certified.
„ 15	56	Clothier	Consumption. Certified.
„ 20	54	Pitman in a colliery.	Consumption. Certified.
„ 27	14	Grocer's apprentice.	Fever. Certified.
„ 30	71	Farmer	Paralysis. Certified.
July 5	29	Joiner	Consumption. Certified.
„ 2	32	Fish hawker	Consumption. Certified.
„ 8	25	Miner	Phrenitis. Certified.
„ 11	22	Labourer	Typhus fever. Certified.
„ 7	56	Farmer	Consumption. Certified.
„ 18	20	Blacksmith	Consumption. Certified.
„ 21	63	Joiner	Consumption. Not certified.
„ 22	12	Son of labourer	Died suddenly by the visitation of God in a natural way. Inquest.
„ 30	28	Coal carrier	Disease of the lungs and dropsy. Certified.
„ 29	68	Miner	Asthma and Dropsy. Certified.
Aug. 4	69	Overlooker in lead smelting works.	Dropsy. Certified.
„ 13	76	Shoemaker	Disease of the kidneys. Certified.
„ 13	52	Miner	Disease of the liver. Certified.
„ 17	70	Journeyman tanner.	Asthma and Dropsy. Certified.
„ 20	72	Collier	Paralysis. Certified.
„ 31	50	Shoemaker	Acute anasarca. Certified.
Sept. 3	63	Collier	Cancer of the stomach. Certified.
„ 7	74	Miner	Asthma and dropsy. Certified.
„ 6	18	Carter	Accidentally killed by two wheels of a tramroad waggon going over his leg. Inquest.
„ 9	54	Labourer	Bronchitis and dropsy. Certified.
„ 11	79	Artist	Palsy and decline of age. Certified.
„ 10	57	Miner	Asthma and dropsy. Certified.
„ 11	78	Farmer	Apoplexy. Certified.
„ 17	73	Formerly farmer	Enteritis. Certified.
„ 18	54	Joiner and publican.	Consumption. Certified.
„ 3	44	Butcher and publican.	Bronchitis. Certified.
Oct. 10	57	Labourer in lead smelting works.	Diseased liver. Certified.
„ 16	24	Assayer in lead works.	Diseased heart. Certified.
„ 16	36	Miner	Consumption and pulmonary hæmorrhage. Certified.
„ 17	11	Miner	Consumption. Certified.
„ 18	11	Collier	Asthma. Certified.
„ 28	59	Farmer	Bronchitis. Not certified.
„ 19	55	Collier	Asthma. Not certified.
Nov. 7	50	Independent minister.	Died suddenly by the visitation of God in a natural way. Inquest.
„ 6	68	Farmer	Cancerous tumour in the neck. Certified.
„ 28	27	Collier	Accidentally killed by falling down a coal pit while in the act of coming up from his work. Inquest.
„ 25	65	Saddler	Debility. Certified.
Dec. 10	70	Formerly farmer	Asthma. Certified.
„ 21	28	Tailor	Consumption. Certified.

Sub-District. 3. Flint.

1859.			
Jan. 13	14	Son of lead miner	Scarlet fever. Not certified.
„ 14	85	Wood sawyer	Debility from age. Not certified.
1859.			
Jan. 12	69	Formerly a publican.	Paralysis. Not certified.
„ 27	32	Lead miner	Verdict, accidentally killed by the roof of clay in the bottom of a lead ore mine shaft falling upon him. Inquest.
Feb. 6	83	Gamekeeper	Debility from age. Certified.
„ 12	62	Fisherman	Hæmaturia. Certified.
Mar. 1	35	Fisherman	Inflammation of bowels. Certified.
„ 4	71	Tallow chandler	Gastritis. Certified.
„ 6	37	Lead miner	Consumption, Not certified.
„ 12	59	Lead miner	Apoplexy. Certified.
„ 16	91	Farmer	Debility from age. Not certified.
Apr. 10	72	Landed proprietor.	Diseased heart. Not certified.
„ 26	14	Son of lead miner	Consumption. Certified.
„ 24	51	Fisherman	Pneumonia. Certified.
May 3	16	Son of coal miner	Consumption. Certified.
„ 3	63	Lead miner	Disease of stomach. Certified.
„ 15	36	Lead miner	Consumption. Not certified.
June 20	50	Lead miner	Consumption. Not certified.
„ 23	32	Seaman, merchant service.	Consumption. Certified.
„ 15	15	Lead ore miner	Verdict, accidentally killed by falling down to the bottom of a lead ore mine shaft. Inquest.
July 12	81	Farmer	Debility from age. Not certified.
„ 14	34	Lead miner	Consumption. Not certified.
„ 24	80	Lead miner	Debility from age. Not certified.
Aug. 6	63	Lead miner	Cancer of stomach. Not certified.
„ 12	54	Lead miner	Consumption. Not certified.
„ 12	40	Blacksmith	Apoplexy. Not certified.
Sept.	60	Coal miner	Debility from age. Not certified.
Sept. 8	13	Sailor	Verdict, accidentally drowned in the river Dee. Inquest.
„ 22	55	Farmer	Consumption. Not certified.
„ 29	22	Joiner	Inflammation of brain. Certified,
Oct. 1	14	Lead miner	Disease of heart. Certified.
„ 2	25	Lead miner	Disease of stomach. Certified.
„ 4	49	Lead miner	Cancer in the lip. Not certified.
„ 15	45	Seaman, merchant service	Consumption. Certified.
„ 15	11	Son of a lime burner.	Inflammation of brain. Certified.
„ 27	72	Cordwainer	Consumption. Certified.
„ 28	45	Lead miner	Consumption. Certified.
„ 31	42	Carter	Consumption. Not certified.
Nov. 5	72	Agric. labourer	Cancer of the lip. Not certified.
„ 3	85	Basket maker	Paralysis. Certified.
„ 28	54	Timber merchant.	Disease of heart. Not certified.
Dec. 21	25	Lead miner	Typhus fever. Certified.
„ 20	70	Agric. labourer	Palsy. Certified.
„ 28	34	Lead miner	Consumption. Not certified.
„ 24	28	Grocer	Consumption. Not certified.
„ 26	58	Solicitor	Disease of the heart. Not certified.
„ 25	45	Farmer	Debility from age. Not certified.
„ 28	85	Assistant surgeon.	Verdict, accidentally killed by a goods train going over him at the Flint Railway Station. Inquest.
1860.			
Jan. 15	22	Son of joiner	Consumption, 11 months. Not certified.
„ 16	55	Coal carrier	Shaking palsy. Not certified. quest.
„ 18	27	Ship's carpenter	Died suddenly by the visitation of God in a natural way. Inquest.
„ 26	72	Coal miner	Dropsy. Not certified.
„ 24	56	Lead miner	Consumption. Not certified.
Feb. 7	56	Farmer	Consumption, 3 months. Not certified.
„ 22	75	Agric. labourer	Debility from age. Not certified.
Mar. 1	20	Linen handloom weaver	Debility from age. Not certified.
„ 12	81	Farmer	Debility from age. Not certified.
Apr. 9	39	Chemical labourer.	Consumption, 3 months. Certified.
„ 14	72	Exciseman	Inflammation of chest. Certified.
„ 20	32	Farmer	Consumption and cramp in legs. Certified.
„ 22	38	Blacksmith	Verdict, accidentally killed by the handle of a turntree striking him on the head. Inquest.
„ 25	55	Chemical labourer.	Asthma, 2 years. Pneumonia, 6 days. Certified.

DISTRICTS IN NORTH WALES.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
Apr. 27	56	Agric. labourer	Consumption. Not certified.
May 1	79	Farmer	Debility from age. Not certified.
„ 4	56	Engine driver at lead mines.	Disease of brain. Not certified.
„ 9	73	Agric. labourer	Debility from age. Not certified.
„ 14	32	Joiner	Disease of stomach. Not certified.
„ 14	90	Slater and plasterer.	Debility from age. Not certified.
„ 26	40	Labourer	Died suddenly by the visitation of God in a natural way. Inquest.
June 4	54	Lead miner	Asthma, 18 months. Not certified.
„ 10	11	Sailor	Verdict, accidentally drowned in the river Dee. Inquest.
„ 17	66	Agric. labourer	Inflammation of stomach, 4 weeks. Ulceration of stomach, 3 weeks. Certified.
„ 16	38	Engine driver at coal mine.	Enlargement of liver, 5 months. Ulceration of liver, 3 months. Certified.
„ 19	20	Labourer	Verdict, died from the effect of drinking one eighth part of a pint of gas water, called ammonia water, thinking it was a good medicine for his ailment, and contrary to expectation, he as soon as he drank it, fell down, and did then and there instantly die. Inquest.
„ 21	17	Agric. labourer	Rupture, aneurism burst. Not certified.
„ 22	70	Agric. labourer	Debility from age. Not certified.
„ 22	48	Farmer	Consumption, 3 months. Not certified.
„ 24	44	Wheelwright	Died suddenly by the visitation of God in a natural way. Inquest.
July 1	60	Coal miner	Disease of stomach. Not certified.
„ 11	37	Lead miner	Disease of brain. Certified.
„ 14	24	Agric. labourer	Inflammation of brain. Not certified.
„ 17	70	Farmer	Debility from age. No medical attendant.
„ 29	55	Blacksmith	Dropsy. Not certified.
„ 28	69	Agent in lead mines.	Disease of heart and dropsy. Not certified.
Aug. 4	71	Lead miner	Asthma, 6 years. No medical attendant.
„ 21	38	Pilot, river Dee	Consumption, 6 months. Not certified.
Sept. 3	20	Son of lead miner.	Consumption, 8 months. Not certified.
„ 16	32	Lead miner	Consumption, 8 months. Not certified.
„ 27	71	Agric. labourer	Disease of the stomach and debility from age. Certified.
Oct. 6	78	Lead miner	Debility from age. Not certified.
„ 11	67	Perpetual curate of St. Mark's, Connah's Quay	Anœmia and chronic mentagra, some months acute mentagra, followed by extreme debility, 11 days. Certified.
„ 13	56	Lead miner	Miner's asthma, 3 years. No medical attendant.
Nov. 5	12	Son of coal miner	Inflammation of the lungs, 3 days. Not certified.
14	30	Lead miner	Congestion of the lungs. Certified.
24	66	Publican and coal mine agent	Bronchitis, 16 days. Certified.
Dec. 7	54	Lead miner	Consumption. Certified.
„ 17	14	Son of seaman, merchant service.	Quinsy. Not certified.
„ 17	22	Son of stone mason.	Scarlet fever, 17 days. Certified.
„ 23	90	Journeyman carpenter.	Debility from old age. No medical attendant.
1861.			
Jan. 4	86	Labourer in a brick work.	Debility from age. No medical attendant.
„ 7	73	Coal miner	Debility and old age. Certified.
„ 10	84	Cordwainer	Cancer on the lip to the throat, 3 years. Not certified.
„ 11	83	Agric. labourer	Debility from age. Not certified.
„ 27	80	Plasterer and slater.	Paralysis, 3 months. Not certified.
Feb. 3	63	Policeman	Chronic bronchitis, 13 years; active bronchitis, 1 month. Certified.
1861.			
Feb. 7	65	Journeyman tanner.	Asthma, 12 years. Certified.
„ 12	58	Wholesale butter dealer.	Verdict, died suddenly by the visitation of God in a natural way. Inquest.
„ 25	92	Farmer	Debility from age. Certified.
„ 25	35	Agric. servant	Verdict, died suddenly by the visitation of God in a natural way. Inquest.
Mar. 1	51	Lead miner	Phthisis, 3 months. Not certified.
„ 4	38	Seaman, merchant service	Bronchitis, 9 months; consumption, 3 months. Certified.
„ 7	77	Blacksmith	Debility from age. Dropsy (acute), 9 days. No medical attendant.
„ 4	73	Tanner	Disease of heart. Congestion of lungs, 5 days. Certified.
„ 14	34	Cordwainer	Disease of the brain. Certified.
„ 19	51	Lead miner	Consumption, 8 months. No medical attendant.
„ 24	75	Coal miner	Inflammation of the lungs. Not certified.
Apr. 21	55	Lead miner	Miner's asthma. Certified.
„ 19	73	Miller	Verdict, died suddenly by the visitation of God in a natural way. Inquest.
„ 30	22	Son of lead miner	Brain fever. Certified.
May 2	44	Gentleman	Consumption, 10 weeks. Not certified.
„ 7	59	Lead miner	Lead miner's asthma, 2 months. No medical attendant.
„ 17	76	Agric. labourer	Asthma, 12 months. No medical attendant.
„ 21	56	Cattle dealer	Asthma, 15 months. Dropsy (acute). Not certified.
June 1	89	Lead miner	Debility from age. No medical attendant.
„ 10	52	Agric. labourer	Valvular disease of the heart. Certified.
„ 14	13	Turner	Verdict, accidentally drowned. while bathing in the River Dee. Inquest.
„ 23	45	Lead and coal miner.	Consumption, 9 months. Certified.
„ 26	81	Agric. labourer	Debility from age. No medical attendant.
July 28	20	Son of a labourer in a wood-turning mill	Phthisis pulmonalis, 6 months. Certified.
„ 30	57	Cordwainer	Disease of the liver. Certified.
Aug. 28	72	Lead miner	Lead miner's asthma, 3 years. No medical attendant.
Sept. 3	72	Bricklayer	Verdict, accidentally killed by falling against the ground. Inquest.
„ 12	22	Agric. labourer	Consumption, 7 months. Certified.
„ 20	23	Son of a labourer under River Dee Company.	Tabes mesenterica. Certified.
„ 29	13	Son of a blacksmith.	Consumption, 12 months. Not certified.
Oct. 10	62	Lead miner	Consumption, 18 months. Not certified.
„ 8	27	Wood sawyer	Consumption. Certified.
„ 12	60	Farmer	Cancer on the cheek. Not certified.
„ 16	67	Coal miner	Asthma, 6 months. Not certified.
Nov. 19	51	Miner	Verdict, died suddenly by the visitation of God in a natural way. Inquest.
„ 24	38	Railway fireman.	Verdict, accidentally killed by a railway train going over him. Inquest.
„ 21	53	Agric. labourer	Disease of the brain. Not certified.
„ 26	60	Chemical labourer.	Fatty degeneration of the heart, 4 years. Certified.
Dec. 4	20	Son of agricultural labourer	Phthisis, 4 months. Certified.
„ 8	38	Tanner	Chronic disease of the stomach, 7 months. Certified.
„ 25	50	Agric. labourer	Chronic bronchitis. Certified.

DISTRICTS IN NORTH WALES.

Sub-District. 4. Mold.

When Died.	Age.	Occupation.	Cause of Death.
1859.			
Jan. 5	21	Agric. labourer	Consumption, 6 months. Not certified.
„ 16	56	Lead miner -	Consumption, 18 months. No medical attendant.
„ 28	54	Coal miner -	Chronic bronchitis, 3 years. Certified.
Feb. 3	64	Innkeeper -	Disease of arteries. Gangrene of foot, 2 weeks. Certified.
„ 3	23	Farmer -	Unknown. No medical attendant.
„ 1	74	General labourer.	Chronic asthma, 10 years. Not certified.
„ 17	32	Brickmaker -	Consumption, 6 months. Certified.
„ 22	11	Son of grocer	Pleurisy, 5 weeks. Certified.
Mar. 3	28	General labourer.	Heart disease. Certified.
„ 4	76	Lead miner -	Old age. Not certified.
„ 2	78	Joiner - -	Paralysis, 14 days. Certified.
„ 4	56	General labourer.	Consumption. Certified.
„ 11	62	Coal miner -	Bronchitis, 6 days. Not certified.
„ 14	59	Journeyman tailor.	Consumption, 18 months. Not certified.
„ 16	42	Painter - -	Capillary. Bronchitis. Certified.
„ 18	71	Lead miner -	Chronic bronchitis, 3 years. Not certified.
„ 20	57	Lead miner -	Chronic bronchitis, 3 years. Not certified.
„ 18	32	Journeyman draper.	Consumption, 2 years. No medical attendant.
„ 21	58	Labourer -	Bronchitis, 6 days. No medical attendant.
„ 22	51	Serjeant in Flintshire Militia.	Heart disease, 9 weeks. Not certified.
„ 22	51	Lead miner -	Unknown. Not certified.
„ 26	68	Lead miner -	Chronic bronchitis, 5 years. No medical attendant.
„ 27	57	Lead miner -	Bronchitis. Not certified.
Apr. 2	56	Labourer -	Died suddenly by the visitation of God, without any marks of violence. Inquest.
„ 23	56	General labourer.	Chronic bronchitis. Not certified.
May 3	75	Lead miner -	Unknown. No medical attendant.
„ 6	24	General labourer.	Unknown. Not certified.
„ 6	53	General labourer.	Asthma. Certified.
„ 10	61	Pauper - -	Died suddenly by the visitation of God in a natural way. Inquest.
„ 15	73	Lead miner -	Chronic bronchitis. No medical attendant.
„ 20	10	Son of coal miner.	Fever, 6 weeks. Certified.
„ 25	54	Mine agent -	Valvular disease of heart. Certified.
„ 26	31	Lead miner -	Meningitis, 7 days. Certified.
„ 31	69	Coal miner -	Chronic bronchitis. Not certified.
June 14	75	Colliery agent	Died suddenly by the visitation of God in a natural way. Inquest.
„ 27	25	General labourer.	Typhus fever. Certified.
„ 28	18	General labourer.	Fever, with heart disease. Certified.
„ 29	47	Lead miner -	Pleurisy. Fever. Certified.
„ 21	16	Agric. servant	Typhus fever.
July 4	79	Stonemason.	Old age. No medical attendant.
„ 7	58	Lead ore miner.	Chronic asthma, 10 years. Not certified.
„ 17	57	Agric. labourer	Unknown. No medical attendant.
Aug. 10	33	Coal miner.	Consumption, 18 months. No medical attendant.
„ 9	26	Farmer.	Consumption. Not certified.
Sept. 2	82	Agric. labourer	Old age. No medical attendant.
„ 5	76	Farmer.	Bronchitis. No medical attendant.
„ 7	65	Hatter.	Died suddenly by the visitation of God in a natural way. Inquest.
Sep. 17	57	Coal miner.	Chronic asthma. Not certified.
„ 17	75	Mine agent.	Chronic bronchitis, 6 months. Certified.
„ 28	65	Genl. labourer	Unknown. Not certified.
Oct. 18	47	Farmer.	Dropsy, 3 months. Certified.
„ 18	63	Farmer.	Paralysis, 2 years. Not certified.
„ 22	79	Tailor.	Bronchitis, 2 weeks. Certified.
Nov. 1	59	Physician and general practitioner.	Fatty degeneration of kidneys. Bright's disease. Certified.
„ 7	28	Gardener -	Typhoid fever, 14 days. Pneumonia, 7 days. Certified.
„ 13	19	Porter at a warehouse.	Unknown. Not certified.
„ 14	66	Coal miner -	Chronic asthma, 3 years. Not certified.
„ 16	60	Coal miner -	Chronic bronchitis. No medical attendant.
„ 16	35	Hostler -	Consumption. Certified.
Dec. 4	69	Common carrier.	Sloughing of foot, 4 months. Certified.
„ 10	52	Farmer and landsurveyor.	Cancerous disease of liver. Certified.
„ 11	71	Agric. labourer	Paralysis, 24 hours. Certified.
„ 4	65	Formerly overlooker at foundry.	Diabetes. Certified.
„ 21	60	General labourer	Unknown. Not certified.
„ 27	56	General labourer	Unknown. Not certified.
„ 31	73	General labourer	Chronic asthma. Certified.
1860.			
Jan. 7	27	Coal miner -	Lumbar abscess, 2 years. Certified.
„ 16	70	Farmer -	Unknown. No medical attendant.
„ 21	78	Formerly blacksmith.	Cancer of mouth, 18 months. No medical attendant.
Feb. 6	27	Cashier in draper's shop.	Phthisis, 2 years. Certified.
„ 10	74	Agric. labourer	Unknown. Not certified.
„ 12	14	Son of lead miner.	Typhus fever, 14 days. Certified.
„ 15	83	Formerly private 1st Roy. Artillery.	Asthma. Certified.
„ 15	50	Labourer -	Accidentally killed by a tree falling on him. Inquest.
„ 17	80	Broker -	Died suddenly by the visitation of God in a natural way. Inquest.
„ 29	59	Miller.	Chronic bronchitis. Certified.
Mar. 4	61	Quarryman -	Palsy. Not certified.
„ 6	56	Coal miner	Bronchitis, 8 days. Certified.
„ 9	68	Journeyman miller.	Chronic asthma. No medical attendant.
„ 11	66	Agric. labourer	Chronic asthma. No medical attendant.
„ 12	17	Son of tailor.	Unknown. Not certified.
„ 16	70	Journeyman joiner.	Anasarca, 3 months. Certified.
„ 15	12	Son of carter	Consumption. Not certified.
„ 24	54	Journeyman shoemaker.	Chronic asthma, 5 years. Not certified.
Apr. 4	45	Farmer -	Hanged himself to the top of a hayloft. Inquest.
„ 17	61	Farmer - -	Died suddenly on a footpath on the mountain by the visitation of God in a natural way. Inquest.
„ 19	48	Wine and spirit merchant.	Died suddenly by the visitation of God in a natural way. Inquest.
„ 24	16	Son of coal miner.	Consumption, 18 months. Certified.
„ 24	21	Lead miner -	Consumption, 6 months. Certified.
May 2	72	Brickmaker -	Unknown. Not certified.
Apr. 30	20	Engine driver at colliery.	Fever. Certified.
May 7	68	Farmer -	Unknown. Not certified.
„ 16	70	General merchant.	Purpura. Heart disease, 6 weeks.
June 3	23	Carter - -	Consumption, 6 months. Certified.
„ 15	80	General labourer	Old age. Not certified.
„ 18	60	Musician -	Chronic bronchitis. Certified.
„ 14	63	Journeyman mason.	Chronic bronchitis, 9 months. Not certified.
„ 27	77	General labourer	Chronic bronchitis. Not certified.

DISTRICTS IN NORTH WALES.

When Died.	Age.	Occupation.	Cause of Death.
1860.			
June 26	72	Attorney -	Died suddenly by the visitation of God in a natural way. Inquest.
„ 27	61	Farmer - -	Died suddenly by the visitation of God in a natural way. Inquest.
„ 30	68	Butcher -	Accidentally drowned in a ditch. Inquest.
July 6	80	Agric. labourer	Old age. Not certified.
„ 6	70	Coal miner -	Unknown. Not certified.
„ 9	84	General labourer	Chronic bronchitis. Certified.
„ 8	21	Coal miner -	Consumption, 7 months. Certified.
„ 11	85	Engine driver, lead mine.	Old age. Not certified.
„ 26	55	Publican -	Fatty degeneration of the heart. Certified.
„ 29	32	Painter - -	Died suddenly by the visitation of God in a natural way. Inquest.
Aug. 18	73	Formerly schoolmaster.	Unknown. Not certified.
„ 24	20	Coal miner -	Disease of the stomach. Not certified.
Sept. 3	65	Coal miner -	Chronic bronchitis. Certified.
„ 5	65	Retired innkeeper.	Chronic bronchitis. Certified.
„ 9	77	Formerly journeyman shoemaker.	Congestion of the brain. Certified.
„ 22	21	Journeyman blacksmith.	Diphtheria, 5 days. Certified.
Oct. 30	38	Lead miner -	Chronic bronchitis. Not certified.
Nov. 5	75	Formerly coal proprietor.	Old age. Not certified.
„ 10	73	Retired farmer	Cancer of throat. Not certified.
„ 16	56	General labourer	Bronchitis, 14 days. Not certified.
„ 26	60	Lead ore miner	Died suddenly by the visitation of God in a natural way by the bursting of a blood vessel in his chest. Inquest.
„ 30	57	Wheelwright -	Disease of the heart. Not certified.
Dec. 4	69	Late surgeon to the Royal Merioneth militia.	Old age. Certified.
„ 8	80	Formerly journeyman wheelwright.	Old age. Not certified.
„ 8	75	Lead ore miner	Heart disease, 9 months. Certified.
„ 17	67	Formerly a saddler.	Paralysis, 6 months. Certified.
„ 23	28	General labourer	Consumption, 2 years. Certified.
1861.			
Jan. 1	16	Son of coal miner.	Consumption, 2 years. Not certified.
„ 8	52	General labourer	Inflammation of lungs, 14 days. Certified.
„ 10	69	Journeyman shoemaker.	Chronic asthma. Not certified.
„ 9	76	Public baker -	Chronic bronchitis. No medical attendant.
„ 12	82	Farmer -	Old age. Not certified.
„ 17	83	Journeyman shoemaker.	Old age. Certified.
„ 26	32	Journeyman bricklayer.	Inflammation of the brain. Not certified.
„ 23	53	Farmer -	Bronchitis, 3 weeks. Certified.
„ 25	64	Manager at a colliery.	Disease of the heart. Certified.
Feb. 12	67	General labourer	Heart disease. Not certified.
„ 10	78	Farmer -	Old age. No medical attendant.
„ 12	46	Farmer -	Consumption, 12 months. Certified.
„ 13	71	Farmer -	Unknown. Not certified.
„ 18	72	General labourer	Old age. Certified.
„ 18	68	General labourer	Unknown. Not certified.
„ 20	65	General labourer	Bronchitis, 8 days. Certified.
„ 10	22	Lead ore miner	Accidentally fell to within 20 yards of the bottom of a lead ore mine shaft, and instantly killed.
„ 20	80	Lead ore miner	Old age. Certified.
„ 21	62	Proprietor of coal works.	Pneumonia, 6 months. Certified.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
Feb. 22	68	Lead miner.	Bronchitis, 2 months. Certified
„ 24	26	General labourer	Typhus fever, 14 days. Certified.
„ 19	45	Tailor & draper	Consumption, 12 months. Certified.
Mar. 5	11	Son of lead miner.	Consumption, 12 months. Certified.
„ 12	23	General labourer	Unknown. Not certified.
„ 16	70	Agric. labourer	Old age. Not certified.
„ 18	18	Coal miner	Typhus fever. Certified.
„ 19	20	Brickmaker	Diphtheria, 10 days. Not certified.
„ 23	34	General labourer	Fever. Not certified.
„ 22	70	General labourer	Bronchitis. Not certified.
„ 24	13	Son of warehouseman.	Consumption, 3 months. Not certified.
„ 29	17	General labourer	Consumption, 12 months. Certified.
„ 26	23	Clerk, Post Office.	Consumption. Not certified.
Apr. 1	14	Son of iron fitter	Low fever, 14 days. Not certified.
„ 5	41	Tanner	Disease of the heart. Certified.
„ 9	16	Son of general labourer.	Typhus fever, 14 days. Certified.
„ 13	21	General labourer	Typhoid fever. Certified.
„ 15	79	General labourer	Old age. Not certified.
„ 20	48	Lead Miner	Chronic liver disease. Certified.
„ 16	60	Coal miner	Chronic asthma, 5 years. Not certified.
„ 23	50	Farmer	Unknown. Not certified.
„ 16	14	Collier	Verdict. Manslaughter against Thomas Jones. Inquest.
„ 24	80	Sawyer	Old age. Not certified.
„ 29	17	Brickmaker	Consumption, 12 months. Not certified.
May 1	17	Son of farmer	Fever, 3 weeks.
„ 8	45	Currier	Dropsy, 6 weeks. Not certified.
„ 16	60	Farmer	Abscess of side. Exhaustion. Certified.
„ 31	21	Lead miner	Consumption, 3 months. Not certified.
June 17	19	Bricklayer	Brain fever, 9 days. Certified.
„ 18	18	Clerk at a colliery	Phthisis, 12 months. Certified.
July 6	43	Engine driver at a colliery.	Fever, 3 weeks. Certified.
„ 12	81	Agric. labourer	Old age. Certified.
„ 14	49	Lead miner	Inflammation of lungs. Not certified.
„ 15	58	Mine agent	Unknown. Not certified.
„ 19	73	Small farmer	Unknown. No medical attendant.
„ 18	15	Collier.	Accidentally killed by falling down to the bottom of a coal pit at Spon-Green colliery, while in the act of going down to his work. Inquest.
„ 25	40	Bricklayer's labourer.	Phthisis, 8 months. Certified.
Aug. 1	10	Son of general labourer.	Consumption. No medical attendant.
„ 3	25	Discharged soldier.	Consumption, 18 months. Not certified.
„ 22	21	General labourer	Bronchitis. Certified.
„ 26	83	Small farmer	Old age. Certified.
Sept. 13	35	Lead miner	Consumption. Not certified.
„ 15	15	Son of driver at an inn.	Hepatitis, 14 days. Certified.
„ 18	35	Waggoner	Verdict. Manslaughter against Joseph Evans. Inquest.
„ 17	66	Engineer	Verdict. Not being of sound mind, memory, and understanding, but lunatic and distracted, did kill himself by throwing himself down a coal pit. Inquest.
„ 23	16	Son of labourer	Consumption, 2 years. Certified.
„ 20	83	Surgeon (retired.)	Old age Certified.
„ 24	23	Engine fitter at a foundry.	Consumption, 18 months. Certified.
„ 25	55	Agric. labourer	Chronic asthma. Certified.
„ 29	36	Iron moulder	Consumption, 6 months. Certified.
Oct. 7	76	Shoemaker, journeyman.	Old age. Certified.
„ 7	80	Wheelwright	Old age. Certified.
„ 11	91	Miner	Verdict. Accidentally fell down to the bottom of a quarry on the 10th instant and died on the following morning from the effects of the injury. Inquest.

DISTRICTS IN NORTH WALES.

When Died.	Age.	Occupation.	Cause of Death.
1861.			
Oct. 24	81	Formerly a farmer.	Old age. certified.
Nov. 4	35	Brickmaker	Consumption, 2 years. Not certified.
„ 14	72	Parish clerk	Bronchitis, 3 weeks. Certified.
„ 18	69	Formerly a cotton spinner.	Paralysis, 6 months. Certified.
Dec. 12	25	Agric. labourer	Typhoid fever, 14 days. Certified.
„ 25	44	General labourer	Disease of the heart. Certified.
„ 25	89	Labourer	Died suddenly by the visitation of God in a natural way. Inquest.
„ 31	60	Tinman.	Chronic bronchitis. Certified.

Deaths of Males aged 10 Years and upwards in each of the Years 1859–61 in the Chapelry of Tryddyn, being that Part of the Parish of Mold which is situated in the Hope Sub-District of Wrexham.

1859.			
Jan. 12	82	Agric. labourer	Palsy, 4 days. Certified.
„ 30	24	Coal miner	Phthisis. Certified.
Mar. 4	11	Son of coal miner.	Injury to his spine 4 years. Diarrhœa. Certified.
„ 19	66	Wheelwright	Inflammation of lungs. Not certified.
Apr. 23	53	Coal mine	Consumption. Not certified.
„ 28	14	Son of lead miner	Typhus fever. Certified.
May 17	60	Coal mine labourer.	Consumption. Not certified.
June 18	45	Coal miner	Asthma. Not certified.
July 10	55	Collier	Died suddenly by the visitation of God in a natural way.
Sept. 5	40	Coal miner	Fever. Certified.
„ 30	60	Agric. labourer	Fever. Not certified.
1859.			
Oct. 11	30	Collier	Accidentally killed by part of the roof of coal in the bottom of the coal pit falling upon him. Inquest.
„ 22	52	Carpenter, journeyman.	Asthma. Not certified.
Nov. 1	66	Farmer	Bronchitis, 10 days. Certified.
1860.			
Jan. 16	68	Engine driver at a coal mine.	Hepatitis. Certified.
Feb. 1	47	Coal miner	Jaundice. Not certified.
„ 7	73	Besom maker	Paralysis. Certified.
Mar. 3	47	Engine fitter, journeyman.	Consumption. Certified.
Apr. 30	62	Farm bailiff	Asthma. Not certified.
June 27	12	Son of farmer	Diphtheria, 6 days. Certified.
Oct. 17	14	Machine man at a colliery.	Accidentally killed by falling down a coal pit. Inquest.
„ 26	72	Drover	Died suddenly by the visitation of God. Inquest.
Nov. 14	28	Coal miner	Low fever. Typhus fever. Certified.
„ 26	91	Farmer	Old age. Certified.
Dec. 13	51	Coal miner	Consumption, 10 months. Certified.
„ 29	60	Blacksmith, journeyman.	Partial insanity. Exhaustion. Not certified.
1861.			
Jan. 22	72	Butcher	Catarrh. Not certified.
„ 31	71	Agric. labourer	Debility. Exhaustion. Certified.
Feb. 18	82	Farmer	Heart disease. Anarsarca, 1 year. Certified.
Mar. 28	84	Farmer	Old age. No medical attendant.
Apr. 23	27	Coal miner	Typhus fever. Certified.
May 8	27	Coal miner	Consumption. Certified.
„ 13	11	Son of coal miner.	Consumption, 3 months. Not certified.
June 6	54	Coal miner	Asthma. Certified.
July 8	73	Lead miner	Asthma. Not certified.
„ 19	39	Coal mine labourer.	Low fever. Typhus fever. Certified.
Nov. 3	28	Coal miner	Phthisis. Certified.
Dec. 5	30	Farmer	Consumption. No medical attendant.

X.

ABSTRACT of RETURNS of AGES of Underground Miners working in Mines in CORNWALL and DEVON.

Name of Mine.	Number of Men.	Total Years.	Average Age.	Name of Mine.	Number of Men.	Total Years.	Average Age.
Alfred Consols	131	4,460	34·04	Leeds and St. Aubyn	48	1,477	30·77
Balleswidden	192	5,542	28·86	Lelant Consols	26	787	30·26
Bedford United	109	3,072	28·18	Levant	198	5,597	28·26
Boscaswell	84	2,161	25·72	Marke Valley	119	3,583	30·109
Bosorn and Ballowall	13	410	31·53	Mill Pool	33	1,016	30·78
Boscean	134	3,665	27·35	New Treleigh	39	1,153	29·56
Botallack	274	7,097	25·901	New Wheal Seton	28	880	31·42
Burra Burra	34	1,004	29·52	New Wheal Vaddon	28	787	28·107
Calstock Consols	32	961	30·03	North Buller	15	435	29·
Calvadnack	135	3,706	27·45	North Crofty	68	2,018	29·68
Camborne Consols	24	694	28·91	North Dolcoath	9	355	34·4
Camborne Vean and Wheal Frances	85	2,551	30·01	North Downs	105	3,007	28·63
Caradon Consols	27	657	24·3	North Frances	24	634	26·41
Cargoll	122	3,721	30·5	North Great Work	12	341	28·41
Carn Brea	377	10,802	28·65	North Huel Trelawny	14	394	28·14
Carn Galver	94	2,350	25·	North Levant	43	1,115	25·93
Carn Vivian	13	464	35·69	North Phœnix	15	500	33·3
Carnyorth	111	2,960	26·6	North Roskear	147	4,401	29·93
Charlestown United	295	9,096	30·83	North Wheal Basset	100	3,047	30·47
Charlotte United	109	3,171	29·091	North Wheal Robert	67	1,930	28·805
Clifford Amalgamated	509	15,788	31·01	North Wrey	6	207	34·5
Clyjah	39	1,177	30·17	Okel Tor	36	1,078	29·94
Cook's Kitchen	134	3,446	25·71	Pednandrea United	154	4,282	27·805
Cuddra	25	744	29·76	Pendeen Consols	60	1,607	26·78
Devon Great Consols	426	13,419	31·5	Penhalls	57	1,769	31·03
Ding Dong	90	2,192	24·35	Phœnix	186	5,293	28·45
Dolcoath	479	12,525	26·14	Polberro	116	3,381	29·14
Drakewalls	113	2,988	26·44	Polbreen	59	1,579	26·76
Duchy and Peru	28	874	31·21	Polhigey Moor	37	976	26·37
Durlo	84	2,443	29·08	Praed Consols	13	448	34·46
East Alfred Consols	74	2,212	29·89	Prideaux Wood	23	716	31·13
East Budnick and Mount	16	485	30·31	Prosper United	136	4,279	41·46
East Caradon	89	2,632	29·57	Providence	141	4,263	30·23
East Gunnislake and South Bedford	75	2,109	28·12	Redmoor	39	1,110	28·46
East Phœnix	27	827	30·62	Rosewall and Ransom	83	2,251	27·12
East Providence	28	762	27·21	Rosewarne Consols	33	962	29·15
East Pool	139	3,665	26·36	Rosewarne United	103	2,951	28·65
East Rosewarne	62	1,971	31·79	St. Aubyn and Grylls	45	1,359	30·2
East Seton	6	190	31·6	St. Day United	243	7,500	30·86
East Trefusis	20	576	28·8	St. Ives Consols	167	4,847	29·02
East Treskerby	12	384	32·	St. Ives Wheal Allen	42	1,193	28·404
East Wheal Agar	15	413	27·53	St. Just United	38	951	25·02
East Wheal Basset	65	1,984	30·52	Sithney Wheal Metal	29	974	33·58
East Wheal Grenville	40	1,257	31·425	South Caradon	301	10,676	35·46
East Wheal Grylls	8	217	27·12	South Caradon Wheal Hooper	20	560	28·
East Wheal Tolgus	38	1,012	26·63	South Condurrow	18	411	22·83
Frank Mills	89	2,954	33·19	South Crenver	54	1,772	32·81
Fowey Consols	346	10,122	29·25	South Dolcoath	21	585	27·85
Giorlyn	88	2,339	26·57	South Exmouth	59	1,825	30·93
Gonamena	18	554	30·7	South Herodsfoot	11	301	27·36
Goonbarrow and Mollinnis	50	1,643	32·86	South Phœnix	21	644	30·64
Grambler and St. Aubyn	69	1,615	23·405	South Tresavean	6	238	39·6
Great Briggan	75	2,395	31·93	South Wheal Basset	29	722	24·89
Great Caradon	12	425	35·41	South Wheal Crofty	44	1,289	29·29
Great North Downs	78	2,329	29·85	South Wheal Francis	176	5,201	29·55
Great Retallack	14	537	38·35	South Wheal Seton	30	895	29·83
Great South Tolgus	102	3,234	31·705	South Wheal Tolgus	166	4,563	27·48
Great Tregune Consols	12	455	37·91	Spearne Consols	61	1,597	26·18
Great Treveddoe	26	845	32·5	Spearne Moor	58	1,513	26·08
Great Wheal Fortune	240	6,887	28·69	Stray Park	104	2,940	28·26
Great Wheal Vor United	109	3,232	29·65	Tolcarne	75	1,938	25·84
Great Work	247	7,311	29·59	Tolvadden	81	2,329	28·75
Gunnislake Clitters	41	1,204	29·36	Treloweth	54	1,628	30·14
Hawkmoor	29	862	29·72	Trelyon Consols	64	1,665	26·01
Herodsfoot	70	2,252	32·17	Trenerom	77	2,152	27·94
Hingston Down Consols	117	3,512	30·01	Tresavean and Thetharrup	41	935	22·80
Holmbush	122	3,528	28·91	Trewcatha	22	655	29·77
Kelly Bray	48	1,427	29·72	Tywarnhaile	113	3,170	28·05
Kit Hill	55	1,537	27·94	United Mines Gwennap	278	8,483	30·51
				Wendron Consols	161	4,864	30·21

Name of Mine.	Number of Men.	Total Years.	Average Age.	Name of Mine.	Number of Men.	Total Years.	Average Age.
Wendron United -	51	1,429	28·01	Wheal Grylls - -	109	3,327	30·52
West Alfred Consols -	17	546	32·11	Wheal Harriett -	45	1,196	26·57
West Basset - -	232	6,662	28·71	Wheal Hearle - -	50	1,396	27·92
West Beam - -	56	1,766	31·53	Wheal Hope - -	22	562	25·54
West Caradon - -	265	7,384	27·86	Wheal Jane - -	145	3,840	26·48
West Chiverton and Wentworth Consols -	97	2,883	29·72	Wheal Kitty, St. Agnes	143	3,875	27·09
West Condarron -	32	960	30·	Wheal Kitty Uny, Lelant	98	2,792	28·48
West Fowey Consols -	147	3,935	26·76	Wheal Ludcott - -	146	4,374	29·95
West Great Work -	18	505	28·05	Wheal Maria and Fortescue - -	8	267	33·375
West Rosedown - -	21	667	31·76	Wheal Mary - -	111	3,229	29·09
West Sharp Tor -	19	597	31·42	Wheal Mary Ann -	167	4,645	27·83
West Stray Park -	48	1,429	39·77	Wheal Margaret -	102	2,896	28·39
West South Caradon -	9	258	28·6	Wheal Margery - -	106	3,201	30·19
West Trevelyan -	56	1,670	29·82	Wheal Moyle - -	52	1,473	28·32
West Wheal Seton -	241	7,469	30·99	Wheal Morris - -	51	1,492	29·25
Wheal Agar - -	74	2,142	28·94	Wheal Owles - -	204	5,357	26·25
Wheal Anna St. Hilary	67	1,932	28·83	Wheal Prosper - -	45	1,234	27·42
Wheal Arthur - -	50	1,429	28·58	Wheal Prospidnick -	37	1,255	33·91
Wheal Basset - -	248	6,096	24·58	Wheal Reeth - -	116	3,038	26·18
Wheal Basset and Grylls	164	4,553	27·76	Wheal Seton - -	175	4,930	22·45
Wheal Buller -	154	4,576	29·71	Wheal Sithney and Carnmeal United -	52	1,597	30·71
Wheal Caradon -	26	761	29·26	Wheal Tremayne -	109	2,930	26·88
Wheal Castle and Boswedden - -	81	2,201	27·17	Wheal Unity Consols -	25	973	34·75
Wheal Crelake - -	75	2,433	32·44	Wheal Uny - -	139	3,882	27·92
Wheal Edward - -	76	2,313	30·43				
Wheal Florence - -	16	454	28·37	Grand Total of 191 Mines - -	17,037	492,648	28·91
Wheal Friendship -	150	3,766	25·106				
Wheal Grenville -	65	1,852	28·49				

AGES of MINERS working in Mines in CORNWALL and DEVON.

Ages.															Total.
5–9.	10–14.	15–19.	20–24.	25–29.	30–34.	35–39.	40–44.	45–49.	50–54.	55–59.	60–64.	65–69.	70–74.	75–79.	80.	
1	665	3,556	3,785	2,412	1,672	1,477	1,210	931	711	378	173	55	8	2	1	17,037
·1	39·0	208·7	222·2	141·6	98·1	86·7	71·0	54·6	41·7	22·2	10·2	3·2	·5	·1	·1	1000

ABSTRACT of RETURNS of AGES of Underground Miners working in Mines in the NORTH of ENGLAND.

Name of Mine.	Number of Men.	Total Ages.	Average Age.	Name of Mine.	Number of Men.	Total Ages.	Average Age.
Aithwaite End	11	358	32·54	Harehope Gill	19	623	32·78
Allergill	7	224	32·	Harwood	10	310	31·
Alston Moor, Lead Company	339	11,141	32·86	Hawes and Bainbridge	11	323	29·36
Appletreewick	32	907	28·34	Hebden Moor	41	1,283	31·29
Arkindale Mines :—				High Skears	4	131	32·75
Routh	4	103	25·75	Holm Bank	4	143	35·75
Danby	25	861	34·44	Howden Side	4	108	27·
Danrigg	7	176	25·14	Hudgill Burne	15	522	34·8
Moulds	29	705	24·31	Keldheads	91	3,206	35·23
Band and Hushes	12	404	33·66	Keswick	38	1,130	29·73
Foregill	65	1,824	28·06	Langdon	12	396	33·
Faggergill	3	94	31·33	Lodge Sike	6	271	45·16
Stang	33	1,027	31·15	Little Eggleshope	89	2,983	33·51
Windegg	7	209	29·85	Lune Head	48	1,580	32·91
Woodmen	3	104	34·66	Merryfield	11	380	34·54
Ashgillhead	10	403	40·3	Moor End	5	188	37·6
Beldihill	36	1,106	30·72	Mousell	37	1,294	34·97
Beldon	16	483	30·18	Nentsberry Greens	6	202	33·66
Bentyfield	30	1,019	33·96	Nether Hearth	6	149	24·83
Birchy Bank	40	1,216	30·4	Newbiggin	16	508	31·75
Blagill	7	265	37·85	Newton	11	388	35·27
Bolton Parks	10	387	38·7	Old Gang	229	6,834	29·84
Brownley Hill	49	1,568	32·	Old Providence	19	545	28·68
Buckden Gavle	10	290	29·	Red Groves	29	1,171	40·37
Calvert	10	290	29·	Rodderup Fell	115	3,614	31·42
Coalcleugh	264	7,988	20·25	Roughten Gill	40	1,611	40·27
Coldberry and Skears	151	5,292	35·04	Sharnberry	73	2,182	2 ·89
Coniston	158	5,430	34·36	Silverband, &c.	83	3,027	36·46
Coniston Out Moor	4	147	36·75	Silver Rake	7	251	35·85
Cononley	56	2,428	43·35	Stone Croft and Grey Side	91	2,844	31·25
Cornish Hush and Bollyhope Burn	48	1,618	33·708	Stoney Groves	16	596	37·25
Craven Moor	42	1,304	31·04	Stone Cragg	6	228	38·
Derwent	289	8,139	28·12	Summerlodge	7	189	27·
Dougang, &c.	20	635	31·75	Sunside	73	3,227	44·205
Driggith	15	506	33·73	Sunnyside	13	414	31·84
Ellerton Moor	18	621	34·5	Surrender	99	2,891	29·202
Fallowfield	77	2,363	30·68	Tynehead	10	276	27·6
Fellend and Guttezs	13	469	36·07	United Cams	7	237	33·85
Forest Moor	9	414	46·	West Burton	20	683	34·15
Galligill	13	462	35·53	West Thorngill	2	93	46·5
Goldscope and Yewthwaite	44	1,591	36·15	Wet Groves	4	130	32·5
Grassington	73	2,223	30·45	Whitaside	9	291	32·33
Grassfield	4	145	36·25	White Force	8	271	33·87
Greenbourne	4	180	45·	Whitriggs	56	1,685	30·09
Grimwett	4	119	29·75	Wire Gill	110	3,391	30·82
Hardshins	38	1,224	32·21	Yorkshire	10	322	32·2
				Total of 91 mines	3,759	121,583	32·34

AGES of MINERS working underground in the NORTH of ENGLAND.

Ages.												Total.
10–14.	15–19.	20–24.	25–29.	30–34.	35–39.	40–44.	45–49.	50–54.	55–59.	60–64.	65–69.	70–74.	
76	370	813	593	509	439	332	266	164	107	61	22	7	3,759
20·2	98·4	216·3	157·7	135·4	116·8	88·3	70·8	43·6	28·5	16·2	5·9	1·9	1,000

ABSTRACT of RETURNS of AGES of Underground Miners working in Mines in NORTH WALES.

Name of Mine.	Number of Men.	Total Years.	Average Age.	Name of Mine.	Number of Men.	Total Years.	Average Age.
Billuis	12	408	34·83	Long Rakes	60	2,166	36·1
Bryngwiog	70	2,352	33·6	Maes-y-Safn	211	7,441	35·26
Bwlch Consols	34	987	29·02	Minera	355	12,448	35·06
Bwlch Styllen	6	174	29·	Mona	130	4,506	34·66
Cold Mawr Pool	31	1,046	33·74	Park	97	3,005	30·97
Cwm-Erfin	104	3,463	33·29	Parys	228	7,913	34·706
Cwm-Ystwith	153	4,755	31·07	Pentre Lygan	10	335	33·5
East Darren	73	2,292	31·39	Rhosesmawr	68	2,594	38·14
Goginan	43	1,353	31·46	Talargoch	296	10,346	34·95
Gelli Eirin	12	403	33·58	Westminster	50	2,043	40·86
Lisburne Mines	344	10,386	30·19				
Llwynmalees	23	612	26·608	Total of 22 Mines	2,410	81,028	33·62

AGES of MINERS working underground in Mines in WALES.

Ages.														Total.
5–9.	10–14.	15–19.	20–24.	25–29.	30–34.	35–39.	40–44.	45–49.	50–54.	55–59.	60–64.	65–69.	70–74.	75–79.	
2	21	187	407	395	358	308	278	188	113	76	53	17	5	2	2,410
9	8·7	77·6	168·8	164·0	148·5	127·9	115·3	78·0	46·9	31·5	22·0	7·0	2·0	·9	1,000

ABSTRACT of RETURNS of AGES of Underground Miners working in the Ironstone Mines in the NORTH of ENGLAND.

Name of Mine.	Number of Men.	Total Years.	Average Age.	Name of Mine.	Number of Men.	Total Years.	Average Age.
Askham	97	3,215	33·14	Roanhead	51	1,646	32·27
Cleator	84	2,531	30·13	Rowantree	59	1,675	28·38
Eston	618	17,889	28·94	Skelton	203	5,866	28·89
Groove Rake	34	1,258	37·0	Slit Pasturo	18	626	34·77
Heights	28	1,015	36·25	Stotsfield Burnhead	4	112	28·0
Lindale Cote and Eure	46	1,467	31·88	Upleatham	343	10,744	31·32
Lindale Moor	284	8,872	31·23	West Slit	16	482	30·12
Mousell	37	1,294	34·97	West Pasture	5	144	28·8
Newton	11	388	35·27	Whitriggs	56	1,685	30·09
Normanby	136	4,104	30·17	Wood End and Gutterby	169	5,613	33·21
Parks	241	7,998	33·18				
Parkside	500	13,889	27·77	Total of 23 Mines	3,081	93,995	30·507
Red Vein	41	1,482	36·14				

AGES of MINERS working in the Ironstone Mines in the NORTH of ENGLAND.

Ages.												Total.
10–14.	15–19.	20–24.	25–29.	30–34.	35–39.	40–44.	45–49.	50–54.	55–59.	60–64.	65–69.	70–74.	
76	244	636	647	494	414	267	139	99	35	20	5	5	3,081
24·7	79·2	206·4	210·0	160·3	134·4	86·7	45·1	32·1	11·4	6·5	1·6	1·6	1,000

XI.

CORNWALL.

RETURN of the AMOUNT of CANDLES and GUNPOWDER consumed in One Year in Mines.

Name of Mine.	CANDLES.									GUNPOWDER.									Total Profit on Candles and Powder.	Name of Mine.
	Quantity of Candles.	Total Cost.			Amount sold for.			Price per Pound.		Profit on Candles.				Quantity of Powder.	Total Cost.			Amount sold for.			Price per Pound.		Profit on Powder.				
								Cost.	Sold.												Cost.	Sold.					
	lbs.	£	s.	d.	£	s.	d.	d.	d.	£	s.	d.		lbs.	£	s.	d.	£	s.	d.	d.	d.	£	s.	d.	£	s.	d.	
Alfred Consols	18,771	469	5	6	625	14	0	6	8	156	8	6		6,987	174	13	6	232	18	0	6	8	58	4	6	214	13	0	Alfred Consols.
Balleswidden	21,000	525	0	0	787	10	0	6	9	262	10	0		12,500	312	10	0	468	15	0	6	9	156	5	0	418	15	0	Balleswidden.
Bedford United	13,852	346	6	0	461	14	8	6	8	115	8	8		15,092	377	6	0	440	3	8	6	7	62	17	8	178	6	4	Bedford United.
Birch Tor	7,920	158	16	3	264	0	0	$5\frac{3}{16}$	8	105	3	9		4,502	112	11	0	150	1	4	6	8	37	10	4	142	14	1	Birch Tor.
Bosweddan and Huel Castle	7,488	171	12	0	280	16	0	$5\frac{1}{2}$	9	109	4	0		3,600	90	0	0	135	0	0	6	9	45	0	0	154	4	0	Bosweddan and Huel Castle.
Botallack	21,852	546	6	0	819	9	0	6	9	273	3	0		15,680	392	0	0	588	0	0	6	9	196	0	0	469	3	0	Botallack.
Calstock Consols	1,567	39	3	6	58	15	3	6	9	19	11	9		2,500	62	10	0	93	15	0	6	9	31	5	0	50	16	9	Calstock Consols.
Camborne Consols	2,622	65	11	0	98	6	6	6	9	32	15	6		2,233	55	16	6	83	14	9	6	9	27	18	3	60	13	9	Camborne Consols.
Camborne Vean	9,240	231	0	0	308	0	0	6	8	77	0	0		8,848	221	4	0	294	18	8	6	8	73	14	8	150	14	8	Camborne Vean.
Caradon Consols	3,060	76	10	0	102	0	0	6	8	25	10	0		4,700	117	10	0	156	13	4	6	8	39	3	4	64	13	4	Caradon Consols.
Caradon Hill	808	20	4	0	26	18	8	6	8	6	14	8		786	19	13	0	26	4	0	6	8	6	11	0	13	5	8	Caradon Hill.
Caradon Vale	2,808	70	4	0	81	18	0	6	7	11	14	0		1,800	45	0	0	52	10	0	6	7	7	10	0	19	4	0	Caradon Vale.
Cargoll	12,849	321	4	6	428	6	0	6	8	107	1	6		5,136	128	8	0	192	12	0	6	9	64	4	0	171	5	6	Cargoll.
Carn Brea	45,318	1,132	19	0	1,510	12	0	6	8	377	13	0		25,686	642	3	0	856	4	0	6	8	214	1	0	591	14	0	Carn Brea.
Carn Galver	7,680	192	0	0	288	0	0	6	9	96	0	0		1,500	37	10	0	56	5	0	6	9	18	15	0	114	15	0	Carn Galver.
Charlestown United	29,779	744	9	$0\frac{1}{2}$	992	12	$0\frac{2}{3}$	6	8	248	3	$0\frac{1}{6}$		21,600	540	0	0	720	0	0	6	8	180	0	0	428	3	$0\frac{1}{6}$	Charlestown United.
Clijah	4,524	113	2	0	169	13	0	6	9	56	11	0		2,200	55	0	0	73	6	8	6	8	18	6	8	74	17	8	Clijah.
Copper Hill	8,556	213	18	0	285	4	0	6	8	71	6	0		8,000	200	0	0	266	13	4	6	8	66	13	4	137	19	4	Copper Hill.
Crelake	9,089	227	4	6	340	16	9	6	9	113	12	3		3,962	99	1	0	148	11	6	6	9	49	10	6	163	2	9	Crelake.
Cuddra	4,500	112	10	0	150	0	0	6	8	37	10	0		6,000	150	0	0	175	0	0	6	7	25	0	0	62	10	0	Cuddra.
Devon Great Consols	38,016	871	4	0	1,267	4	0	$5\frac{1}{2}$	8	396	0	0		40,604	1,015	2	0	1,353	9	4	6	8	338	7	4	734	7	4	Devon Great Consols.
Ding Dong	9,766	244	3	0	284	16	10	6	7	40	13	10		4,755	118	17	6	178	6	3	6	9	59	8	9	100	2	7	Ding Dong.
Dolcoath	51,006	1,168	17	9	1,700	4	0	$5\frac{1}{2}$	8	531	6	3		35,350	883	15	0	1,178	6	8	6	8	294	11	8	825	17	11	Dolcoath.
Drake Walls	15,388	384	14	0	512	18	8	6	8	128	4	8		31,000	775	0	0	1,033	6	8	6	8	258	6	8	386	11	4	Drake Walls.
Duchy and Peru	2,803	70	1	6	93	8	8	6	8	23	7	2		475	11	17	6	15	16	8	6	8	3	19	2	27	6	4	Duchy and Peru.
Durlo	9,495	237	7	6	316	10	0	6	8	79	2	6		3,275	81	17	6	95	10	5	6	7	13	12	11	92	15	5	Durlo.

East Caradon - - -	10,097	252	8	6	294	9	11	6	7	42	1	5	7,839	195	19	6	228	12	9	6	7	32	13	3	74	14	8	East Caradon.
East Huel Agar - -	1,357	33	18	6	45	4	8	6	8	11	6	2	1,622	40	11	0	54	1	4	6	8	13	10	4	24	16	6	East Huel Agar.
East Huel Grenvllle - -	4,291	107	5	6	143	0	8	6	8	35	15	2	3,892	97	6	0	129	14	8	6	8	32	8	8	68	3	10	East Huel Grenville.
East Huel Grylls - -	960	24	0	0	32	0	0	6	8	8	0	0	400	10	0	0	13	6	8	6	8	3	6	8	11	6	8	East Huel Grylls.
East Huel Lovel - -	2,880	72	0	0	84	0	0	6	7	12	0	0	1,344	33	12	0	44	16	0	6	8	11	4	0	23	4	0	East Huel Lovel.
East Huel Tolgus - -	3,600	78	15	0	120	0	0	5¼	8	41	5	0	2,100	52	10	0	70	0	0	6	8	17	10	0	58	15	0	East Huel Tolgus.
East Margaret - -	7,996	199	18	0	266	10	8	6	8	66	12	8	6,400	160	0	0	213	6	8	6	8	53	6	8	119	19	4	East Margaret.
East Pool - - -	13,831	345	15	6	691	11	0	6	12	345	15	6	14,256	356	8	0	475	4	0	6	8	118	16	0	464	11	6	East Pool.
East Rosewarne - -	6,936	173	8	0	231	4	0	6	8	57	16	0	3,900	97	10	0	130	0	0	6	8	32	10	0	90	6	0	East Rosewarne.
Frank Mills - - -	9,000	243	15	0	375	0	0	6½	10	131	5	0	2,780	69	10	0	92	13	4	6	8	23	3	4	154	8	4	Frank Mills.
Fowey Consols - - -	35,264	881	12	0	1,175	9	4	6	8	293	17	4	29,744	743	12	0	991	9	4	6	8	247	17	4	541	14	8	Fowey Consols.
Garden Mine - - -	2,400	60	0	0	90	0	0	6	9	30	0	0	1,500	37	10	0	56	5	0	6	9	18	15	0	48	15	0	Garden Mine.
Gonamena - - -	1,330	33	5	0	44	6	8	6	8	11	1	8	2,500	62	10	0	83	6	8	6	8	20	16	8	31	18	4	Gonamena.
Grambler and St. Aubyn -	5,760	144	0	0	192	0	0	6	8	48	0	0	7,840	196	0	0	261	6	8	6	8	65	6	8	113	6	8	Grambler and St Aubyn.
Great Brigan - -	11,788	294	14	0	392	18	8	6	8	98	4	8	5,500	137	10	0	183	6	8	6	8	45	16	8	144	1	4	Great Brigan.
Great Caradon - - -	1,490	37	5	0	49	13	4	6	8	12	8	4	2,000	50	0	0	66	13	4	6	8	16	13	4	29	1	8	Great Caradon.
Great Huel Busy United -	39,456	986	8	0	1,315	4	0	6	8	328	16	0	22,000	550	0	0	733	6	8	6	8	183	6	8	512	2	8	Great Huel Busy United.
Great Huel Fortune - -	29,569	739	4	6	985	12	8	6	8	246	8	2	12,943	323	11	6	431	8	8	6	8	107	17	2	354	5	4	Great Huel Fortune.
Great Huel Vor - -	14,736	368	8	0	491	4	0	6	8	122	16	0	18,309	457	14	6	610	6	0	6	8	152	11	6	275	7	6	Great Huel Vor.
Great North Downs - -	9,360	234	0	0	312	0	0	6	8	78	0	0	4,000	100	0	0	133	6	8	6	8	33	6	8	111	6	8	Great North Downs.
Great Retallack - -	2,028	50	14	0	67	12	0	6	8	16	18	0	600	15	0	0	20	0	0	6	8	5	0	0	21	18	0	Great Retallack.
Great Tregune Consols -	1,373	34	6	6	45	15	4	6	8	11	8	10	842	21	1	0	28	1	4	6	8	7	0	4	18	9	2	Great Tregune Consols.
Great Work - - -	28,164	704	2	0	938	16	0	6	8	234	14	0	12,000	300	0	0	400	0	0	6	8	100	0	0	334	14	0	Great Work.
Gunnislake (Clithero) -	3,588	89	14	0	119	12	0	6	8	29	18	0	5,500	137	10	0	183	6	8	6	8	45	16	8	75	14	8	Gunnislake (Clithero).
Hawkmoor - - -	3,312	82	16	0	110	8	0	6	8	27	12	0	6,720	168	0	0	224	0	0	6	8	56	0	0	83	12	0	Hawkmoor.
Herodsfoot - - -	9,600	240	0	0	240	0	0	6	6	-	-	-	8,960	224	0	0	224	0	0	6	6	——			——			Herodsfoot.
Hingston Down Consols -	13,014	325	7	0	433	16	0	6	8	108	9	0	11,631	290	15	6	436	3	3	6	9	145	7	9	253	16	9	Hingston Down Consols.
Huel Bassett - -	29,808	683	2	0	869	8	0	5½	7	186	6	0	15,900	364	7	6	530	0	0	5½	8	165	12	6	351	18	6	Huel Bassett.
Huel Bassett and Grylls -	16,608	415	4	0	622	16	0	6	9	207	12	0	5,820	145	10	0	218	5	0	6	9	72	15	0	280	7	0	Huel Bassett and Grylls.
Huel Buller - - -	19,188	479	14	0	639	12	0	6	8	159	18	0	17,200	430	0	0	573	6	8	6	8	143	6	8	303	4	8	Huel Buller.
Huel Caradon - - -	1,728	43	4	0	57	12	0	6	8	14	8	0	1,000	25	0	0	33	6	8	6	8	8	6	8	22	14	8	Huel Caradon.
Huel Clifford - -	63,936	1,465	4	0	1,864	16	0	5½	7	399	12	0	29,000	725	0	0	966	13	4	6	8	241	13	4	641	5	4	Huel Clifford.
Huel Friendship - -	15,587	389	13	6	454	12	5	6	7	64	18	11	16,907	422	13	6	422	13	6	6	6	——			64	18	11	Huel Friendship.
Huel Hope - -	2,268	56	14	0	75	12	0	6	8	18	18	0	700	17	10	0	23	6	8	6	8	5	16	8	24	14	8	Huel Hope.
Huel Kitty, St. Agnes -	14,124	353	2	0	470	16	0	6	8	117	14	0	10,500	262	10	0	350	0	0	6	8	87	10	0	205	4	0	Huel Kitty, St. Agnes.
Huel Mary, Lelant - -	12,000	300	0	0	453	0	0	6	9	150	0	0	4,000	100	0	0	133	6	8	6	8	33	6	8	183	6	8	Huel Mary, Lelant.

(*continued*)

Return of the Amount of Candles and Gunpowder consumed in One Year in Mines—*continued.*

Name of Mine.	CANDLES.								GUNPOWDER.								Total Profit on Candles and Powder	Name of Mine.
	Quantity of Candles.	Total Cost.		Amount sold for.		Price per Pound.		Profit on Candles.	Quantity of Powder.	Total Cost.		Amount sold for.		Price per Pound.		Profit on Powder.		
						Cost.	Sold.							Cost.	Sold.			
	lbs.	£ s. d.		£ s. d.		d.	d.	£ s. d.	lbs.	£ s. d.		£ s. d.		d.	d.	£ s. d.		£ s. d.	
Huel Mary Ann	21,480	537 0 0		716 0 0		6	8	179 0 0	20,160	504 0 0		672 0 0		6	8	168 0 0		347 0 0	Huel Mary Ann.
Huel Mary Great Consols	3,500	87 10 0		116 13 4		6	8	29 3 4	4,600	115 0 0		153 6 8		6	8	38 6 8		67 10 0	Huel Mary Great Consols.
Huel Margaret	10,608	265 4 0		353 12 0		6	8	88 8 0	4,000	100 0 0		133 6 8		6	8	33 6 8		121 14 8	Huel Margaret.
Huel Margery	9,400	235 0 0		352 10 0		6	9	117 10 0	4,400	100 0 0		150 0 0		6	9	50 0 0		167 10 0	Huel Margery.
Huel Norris	5,616	140 8 0		187 4 0		6	8	46 16 0	3,500	87 10 0		116 13 4		6	8	29 3 4		75 19 4	Huel Norris.
Huel Owles	23,712	543 8 0		889 4 0		5½	9	345 16 0	12,000	300 0 0		450 0 0		6	9	150 0 0		495 16 0	Huel Owles.
Huel Pollard	1,300	32 10 0		43 6 8		6	8	10 16 8	1,200	30 0 0		40 0 0		6	8	10 0 0		20 16 8	Huel Pollard.
Huel Reeth	17,680	442 0 0		589 6 8		6	8	147 6 8	5,600	140 0 0		186 13 4		6	8	46 13 4		194 0 0	Huel Reeth.
Huel Sithney and Carnmeal	4,131	120 9 9		137 14 0		7	8	17 4 3	4,705	117 12 6		117 12 6		6	6	- - -		17 4 3	Huel Sithney and Carnmeal.
Huel Unity Consols	4,476	111 18 0		149 4 0		6	8	37 6 0	1,300	32 10 0		43 6 8		6	8	10 16 8		48 2 8	Huel Unity Consols.
Kelly Bertha	4,728	118 4 0		157 12 0		6	8	39 8 0	8,100	202 10 0		270 0 0		6	8	67 10 0		106 18 0	Kelly Bray.
Lady Bray	5,932	148 6 0		197 14 8		6	8	49 8 8	13,440	336 0 0		448 0 0		6	8	112 0 0		161 8 8	Lady Bertha.
Lelant Consols	2,472	61 16 0		82 8 0		6	8	20 12 0	2,246	56 3 0		74 17 4		6	8	18 14 4		39 6 4	Lelant Consols.
Levant	24,000	600 0 0		900 0 0		6	9	300 0 0	15,680	392 0 0		588 0 0		6	9	196 0 0		496 0 0	Levant.
Marke Valley	12,884	322 2 0		375 15 8		6	7	53 13 8	11,647	291 3 6		339 14 1		6	7	48 10 7		102 4 3	Marke Valley.
Mulberry Hill	288	7 4 0		9 12 0		6	8	2 8 0	5,000	125 0 0		166 13 4		6	8	41 13 4		44 1 4	Mulberry Hill.
New Huel Vaddon	2,016	50 8 0		75 12 0		6	9	25 4 0	967	24 3 6		36 5 3		6	9	12 1 9		37 5 9	New Huel Vaddon.
New Tamar	1,800	45 0 0		45 0 0		6	6	- -	3,360	84 0 0		84 0 0		6	6	—		—	New Tamar.
New Treleigh	4,500	112 10 0		150 0 0		6	8	37 10 0	3,000	75 0 0		100 0 0		6	8	25 0 0		62 10 0	New Treleigh.
North Downs	11,109	277 14 6		370 6 0		6	8	92 11 6	6,100	152 10 0		203 6 8		6	8	50 16 8		143 8 2	North Downs.
North Frances	2,952	73 16 0		98 8 0		6	8	24 12 0	2,250	56 5 3		75 0 0		6	8	18 15 0		43 7 0	North Frances.
North Huel Basset	10,110	252 15 0		379 2 6		6	9	126 7 6	5,705	142 12 6		213 18 9		6	9	71 6 3		197 13 9	North Huel Basset.
North Huel Robert	8,486	212 3 0		282 17 4		6	8	70 14 4	13,456	336 8 0		448 10 8		6	8	112 2 8		182 17 0	North Huel Robert.
North Levant	4,200	113 15 0		140 0 0		6½	8	26 5 0	3,360	84 0 0		112 0 0		6	8	28 0 0		54 5 0	North Levant.
North Phœnix	2,886	72 3 0		96 4 0		6	8	24 1 0	2,800	70 0 0		93 6 8		6	8	23 6 8		47 7 8	North Phœnix.
North Roskear	12,700	291 0 10		476 5 0		5½	9	185 4 2	17,500	437 10 0		656 5 0		6	9	218 15 0		403 19 2	North Roskear.
North Wrey	656	16 8 0		21 17 4		6	8	5 9 4	100	2 10 0		3 6 8		6	8	0 16 8		6 6 0	North Wrey.

Okel Tor	4,608	115	4		172	16	0	6	9	57	12	0	6,765	169	2	6	253	13	9	6	9	84	11	3	142	3	3	Okel Tor.
Pednandrea United	18,816	470	8	0	627	4	0	6	8	156	16	0	11,900	297	10	0	347	1	8	6	7	49	11	8	206	7	8	Pednandrea United.
Par Consols	51,086	1,277	3	0	1,702	17	4	6	8	425	14	4	63,445	1,586	2	3	2,114	16	8	6	8	528	14	2	954	8	6	Par Consols.
Pendeen Consols	7,295	182	7	6	273	11	3	6	9	91	3	9	4,511	112	15	6	169	3	3	6	9	56	7	9	147	11	6	Pendeen Consols.
Penhalls	9,408	235	4	0	313	12	0	6	8	78	8	0	5,300	132	10	0	176	13	4	6	8	44	3	4	122	11	4	Penhalls.
Polberro	12,440	311	0	0	466	10	0	6	9	155	10	0	5,300	132	10	0	176	13	4	6	8	44	3	4	199	13	4	Polberro.
Prosper United, &c.	96,000	2,300	0	0	2,800	0	0	5¾	7	500	0	0	27,600	632	10	0	690	0	0	5½	6	57	10	0	557	10	0	Prosper United, &c.
Providence	14,352	358	16	0	478	8	0	6	8	119	12	0	12,000	300	0	0	400	0	0	6	8	100	0	0	219	12	0	Providence.
Redmoor	4,140	103	10	0	138	0	0	6	8	34	10	0	6,000	150	0	0	200	0	0	6	8	50	0	0	84	10	0	Redmoor.
Rosewall and Ransom	11,600	290	0	0	386	13	4	6	8	96	13	4	6,000	150	0	0	200	0	0	6	8	50	0	0	146	13	4	Rosewall and Ransom.
St. Day United	27,552	688	16	0	918	8	0	6	8	229	12	0	18,000	450	0	0	600	0	0	6	8	150	0	0	379	12	0	St. Day United.
St. Ives Consols	20,000	500	0	0	833	6	8	6	10	333	6	8	10,000	250	0	0	375	0	0	6	9	125	0	0	458	6	8	St. Ives Consols.
St. Just United	14,400	360	0	0	540	0	0	6	9	180	0	0	6,000	150	0	0	225	0	0	6	9	75	0	0	255	0	0	St. Just United.
South Caradon	39,317	982	18	6	1,146	14	11	6	7	163	16	5	31,360	784	0	0	784	0	0	6	6	-	-	-	163	16	5	South Caradon.
South Caradon Huel Hooper	1,050	26	5	0	35	0	0	6	8	8	15	0	1,000	25	0	0	33	6	8	6	8	8	6	8	17	1	8	South Caradon Huel Hooper
South Creuver	5,244	131	2	0	163	17	6	6	7½	32	15	6	2,000	50	0	0	62	10	0	6	7½	12	10	0	45	5	6	South Creuver.
South Crinnis	7,123	178	1	6	237	8	8	6	8	59	7	2	6,712	167	16	0	223	14	8	6	8	55	18	8	115	5	10	South Crinnis.
South Crofty	5,000	125	0	0	166	13	4	6	8	41	13	4	4,550	113	15	0	151	13	4	6	8	37	18	4	79	11	8	South Crofty.
South Dolcoath	1,890	47	5	0	70	17	6	6	9	23	12	6	2,034	50	17	0	76	5	6	6	9	25	8	6	49	1	0	South Dolcoath.
South Exmouth	6,000	162	10	0	250	0	0	6½	10	87	10	0	3,000	75	0	0	100	0	0	6	8	25	0	0	112	10	0	South Exmouth.
South Frances	18,334	458	7	0	687	10	6	6	9	229	3	6	13,202	330	1	0	495	1	6	6	9	165	0	6	394	4	0	South Frances.
South Herodsfoot	1,045	26	2	6	34	16	8	6	8	8	14	2	1,717	42	18	6	50	1	7	6	7	7	3	1	15	17	3	South Herodsfoot.
South Huel Seton	3,840	96	0	0	128	0	0	6	8	32	0	0	2,000	50	0	0	66	13	4	6	8	16	13	4	48	13	4	South Huel Seton.
South Huel Tolgus	18,780	410	16	3	626	0	0	5¼	8	215	3	9	9,640	241	0	0	321	6	8	6	8	80	6	8	295	10	5	South Huel Tolgus.
South Phœnix	3,120	78	0	0	91	0	0	6	7	13	0	0	1,796	44	18	0	59	17	4	6	8	14	19	4	27	19	4	South Phœnix.
South Tresavean	1,568	39	4	0	52	5	4	6	8	13	1	4	1,244	31	2	0	41	9	4	6	8	10	7	4	23	8	8	South Tresavean.
Spearn Moor	6,000	162	10	0	200	0	0	6½	8	37	10	0	6,720	168	0	0	224	0	0	6	8	56	0	0	93	10	0	Spearn Moor.
Tamar Silverhead	9,096	227	8	0	303	4	0	6	8	75	16	0	11,884	297	2	0	396	2	8	6	8	99	0	8	174	16	8	Tamar Silverhead.
Turcroft	18,720	468	0	0	624	0	0	6	8	156	0	0	24,000	600	0	0	800	0	0	6	8	200	0	0	356	0	0	Turcroft.
Tolcarne	8,160	178	10	0	272	0	0	5¼	8	93	10	0	5,500	137	10	0	183	6	8	6	8	45	16	8	139	6	8	Tolcarne.
Trelyon Consols	7,050	176	5	0	264	7	6	6	9	88	2	6	6,880	172	0	0	258	0	0	6	9	86	0	0	174	2	6	Trelyon Consols.
Tresavean and Tretharrup	2,952	73	16	0	98	8	0	6	8	24	12	0	3,000	75	0	0	100	0	0	6	8	25	0	0	49	12	0	Tresavean and Tretharrup.
Treweatha	3,314	82	17	0	110	9	4	6	8	27	12	4	298	7	9	0	9	18	8	6	8	2	9	8	30	2	0	Treweatha.
Treworlis	4,320	108	0	0	126	0	0	6	7	18	0	0	2,688	67	4	0	89	12	0	6	8	22	8	0	40	8	0	Treworlis.
Trumpet United	2,085	52	2	6	69	10	0	6	8	17	7	6	2,716	67	18	0	90	10	8	6	8	22	12	8	40	0	2	Trumpet United.
Tywarnhaile	16,392	409	16	0	546	8	0	6	8	136	12	0	11,000	275	0	0	366	13	4	6	8	91	13	4	228	5	4	Tywarnhaile.

(*continued*)

Return of the Amount of Candles and Gunpowder consumed in One Year in Mines—*continued.*

Name of Mine.	CANDLES. Quantity of Candles.	Total Cost.	Amount sold for.	Price per Pound. Cost.	Price per Pound. Sold.	Profit on Candles.	GUNPOWDER. Quantity of Powder.	Total Cost.	Amount sold for.	Price per Pound. Cost.	Price per Pound. Sold.	Profit on Powder.	Total Profit on Candles and Powder.	Name of Mine.
	lbs.	£ s. d.	£ s. d.	d.	d.	£ s. d.	lbs.	£ s. d.	£ s. d.	d.	d.	£ s. d.	£ s. d.	
Wendron Consols	15,069	376 13 6	565 0 3	6	9	188 6 9	10,732	268 6 0	357 14 8	6	8	89 8 8	277 15 5	Wendron Consols.
West Alfred Consols	1,908	47 14 0	55 13 0	6	7	7 19 0	1,303	32 11 6	32 11 6	6	6	- - -	7 19 0	West Alfred Consols.
West Beam	6,240	156 0 0	208 0 0	6	8	52 0 0	5,500	137 10 0	183 6 8	6	8	45 16 8	97 16 8	West Beam.
West Caradon	27,132	678 6 0	904 8 0	6	8	226 2 0	22,992	574 16 0	766 8 0	6	8	191 12 0	417 14 0	West Caradon.
West Condurrow	3,350	83 15 0	111 13 4	6	8	27 18 4	1,963	49 1 6	65 8 8	6	8	16 7 2	44 5 6	West Condurrow.
West Fowey Consols	16,056	401 8 0	535 4 0	6	8	133 16 0	23,791	594 15 6	793 0 8	6	8	198 5 2	332 1 2	West Fowey Consols.
West Great Work	1,340	33 10 0	44 13 4	6	8	11 3 4	950	23 15 0	31 13 4	6	8	7 18 4	19 1 8	West Great Work.
West Huel Tolgus	3,120	68 5 0	104 0 0	5¼	8	35 15 0	2,060	51 10 0	68 13 4	6	8	17 3 4	52 18 4	West Huel Tolgus.
West Par, &c.	3,600	105 0 0	120 0 0	7	8	15 0 0	6,720	168 0 0	196 0 0	6	7	28 0 0	43 0 0	West Par, &c.
West Sharp Tor	2,528	63 4 0	84 5 4	6	8	21 1 4	2,206	55 3 0	82 14 6	6	9	27 11 6	48 12 10	West Sharp Tor.
West Rosedown	2,363	59 1 6	68 18 5	6	7	9 16 11	2,995	74 17 6	87 7 1	6	7	12 9 7	22 6 6	West Rosedown.
West Wheal Basset	24,276	606 18 0	910 7 0	6	9	303 9 0	18,500	462 10 0	693 15 0	6	9	231 5 0	534 14 0	West Wheal Basset.
West Wheal Trevelyan	4,594	114 17 0	172 5 6	6	9	57 8 6	771	19 5 6	28 18 3	6	9	9 12 9	67 1 3	West Wheal Trevelyan.
Wheal Agar	6,967	174 3 6	232 4 8	6	8	58 1 2	9,057	226 8 6	264 3 3	6	7	37 14 9	95 15 11	Wheal Agar.
Wheal Anna	7,269	181 14 6	242 6 0	6	8	60 11 6	3,005	75 2 6	100 3 4	6	8	25 0 10	85 12 4	Wheal Anna.
Wheal Grenville	8,267	206 13 6	275 11 4	6	8	68 17 10	5,261	131 10 6	153 8 11	6	7	21 18 5	90 16 3	Wheal Grenville.
Wheal Grylls	12,765	319 2 6	425 10 0	6	8	106 7 6	2,400	60 0 0	80 0 0	6	8	20 0 0	126 7 6	Wheal Grylls.
Wheal Hearle	5,040	126 0 0	168 0 0	6	8	42 0 0	2,076	51 18 0	69 4 0	6	8	17 6 0	59 6 0	Wheal Hearle.
Wheal Tremayne	13,268	331 14 0	497 11 0	6	9	165 17 0	12,715	317 17 6	370 17 1	6	7	52 19 7	218 16 7	Wheal Tremayne.
Total	1,669,055	41,094 8 4½	56,122 19 6⅔	—	—	15,028 11 2⅙	1,215,455	30,295 15 0	40,149 0 10	—	—	9,853 5 10	24,881 17 0⅛	Total.

RETURN of the AMOUNT of CANDLES and GUNPOWDER consumed in One Year in Mines.

Name of Mine.	CANDLES.						GUNPOWDER.						Total Profit on Candles and Powder.	Name of Mine.
	Quantity of Candles.	Total Cost.	Amount sold for.	Price per Pound.		Profit on Candles.	Quantity of Powder.	Total Cost.	Amount sold for.	Price per Pound.		Profit on Powder.		
				Cost.	Sold.					Cost.	Sold.			
	lbs.	£ s. d.	£ s. d.	d.	d.	£ s. d.	lbs.	£ s. d.	£ s. d.	d.	d.	£ s. d.	£ s. d.	
Allenheads	94,716	2,367 18 0	2,367 18 0	6	6	—	52,858	1,321 9 0	1,321 9 0	6	6	—	—	Allenheads.
Allergill	500	12 10 0	12 10 0	6	6	—	700	17 10 0	17 10 0	6	6	—	—	Allergill.
Alston Moor	40,560	1,140 15 0	1,140 15 0	6¾	6¾	—	36,000	900 0 0	1,050 0 0	6	7	150 0 0	150 0 0	Alston Moor.
Appletreewick	2,200	55 0 0	55 0 0	6	6	—	2,688	67 4 0	67 4 0	6	6	—	—	Appletreewick.
Beldihill	637	15 18 6	18 11 7	6	7	2 13 1	1,035	27 7 6	31 18 9	6	7	4 11 3	7 4 4	Beldihill.
Beldon	1,164	29 2 0	38 16 0	6	8	9 14 0	2,000	50 0 0	66 13 4	6	8	16 13 4	26 7 4	Beldon.
Bentyfield, &c.	14,664	397 3 0	397 3 0	6½	6½	—	19,400	545 12 6	545 12 6	6¾	6¾	—	—	Bentyfield, &c.
Bolton Parks	720	18 4 6	18 4 6	6	6	—	216	5 8 0	6 15 0	6	7½	1 7 0	1 7 0	Bolton Parks.
Brownley Hill	5,760	144 0 0	144 0 0	6	6	—	4,500	112 10 0	112 10 0	6	6	—	—	Brownley Hill.
Buckden Gaole	780	19 10 0	26 0 0	6	8	6 10 0	112	2 16 0	3 14 8	6	8	0 18 8	7 8 8	Buckden Gaole.
Birchy Bank	456	12 7 0	12 7 0	6½	6½	—	312	8 2 6	8 2 6	6¼	6¼	—	—	Birchy Bank.
Calvert	852	23 1 6	23 1 6	6½	6½	—	112	2 11 4	2 11 4	5½	5½	—	—	Calvert.
Cashwell	1,944	48 12 0	56 14 0	6	7	8 2 0	1,456	37 18 4	37 18 4	6¼	6¼	—	8 2 0	Cashwell.
Coalcleugh	21,504	537 12 0	537 12 0	6	6	—	14,250	356 5 0	356 5 0	6	6	—	—	Coalcleugh.
Coniston	20,155	503 17 6	587 17 1	6	7	83 19 7	34,672	866 16 0	1,011 5 4	6	7	144 9 4	228 8 11	Coniston.
Coniston Out Moor	180	4 13 9	4 13 9	6¼	6¼	—	200	5 12 6	5 12 6	6¾	6¾	—	—	Coniston Out Moor.
Cononley	4,118	94 7 5	94 7 5	5½	5½	—	3,920	89 16 8	89 16 8	5½	5½	—	—	Cononley.
Craven Moor	2,762	69 1 0	80 11 2	6	7	11 10 2	2,302	57 11 0	67 2 10	6	7	9 11 10	21 2 0	Craven Moor.
Derwent	22,070	551 15 0	735 13 4	6	8	183 18 4	21,164	529 2 0	705 9 4	6	8	176 7 4	360 5 8	Derwent.
Do. Deborah's Level	13,631	340 15 6	454 7 4	6	8	113 11 10	13,851	346 10 6	462 0 8	6	8	115 10 2	229 2 0	Do. Deborah's Level.
Dosey	144	3 12 0	4 4 0	6	7	0 12 0	104	2 14 2	2 14 2	6¼	6¼	—	0 12 0	Dosey.
Dougang	2,160	49 10 0	49 10 0	5½	5½	—	1,500	37 10 0	50 0 0	6	8	12 10 0	12 10 0	Dougang.
Dowpot Syke	216	5 8 0	5 8 0	6	6	—	208	5 8 4	5 8 4	6¼	6¼	—	—	Dowpot Syke.
Driggith	1,300	32 10 0	48 15 0	6	9	16 5 0	1,446	36 3 0	54 4 6	6	9	18 1 6	34 6 6	Driggith.
East Allendale	37,200	813 15 0	813 15 0	5¼	5¼	—	19,000	415 12 6	415 12 6	5¼	5¼	—	—	East Allendale.
Ellerton Moor	1,468	36 14 0	48 18 8	6	8	12 4 8	200	5 0 0	6 13 4	6	8	1 13 4	13 18 0	Ellerton Moor.

(*continued.*)

Return of the Amount of Candles and Gunpowder consumed in One Year in Mines—*continued.*

Name of Mine.	CANDLES.					GUNPOWDER.					Total Profit on Candles and Powder.	Name of Mine.
	Quantity of Candles.	Total Cost.	Amount sold for.	Price per Pound.	Profit on Candles.	Quantity of Powder.	Total Cost.	Amount sold for.	Price per Pound.	Profit on Powder.		
	lbs.	£ s. d.	£ s. d.	d. Cost. d. Sold.	£ s. d.	lbs.	£ s. d.	£ s. d.	d. Cost. d. Sold.	£ s. d.	£ s. d.	
Fallowfield	7,000	175 0 0	175 0 0	6 6	—	5,000	125 0 0	125 0 0	6 6	—	—	Fallowfield.
Fell End and Gutters	648	16 4 0	21 12 0	6 8	5 8 0	225	5 12 6	5 12 6	6 6	—	5 8 0	Fell End and Gutters.
Forest Moor	507	12 13 6	12 13 6	6 6	—	437	10 18 6	14 11 4	6 8	3 12 10	3 12 10	Forest Moor.
Gallegill Syke	1,440	36 0 0	36 0 0	6 6	—	900	22 10 0	22 10 0	6 6	—	—	Gallegill Syke.
Goldscope, &c.	4,138	103 9 0	155 3 6	6 9	51 14 6	5,376	134 8 0	179 4 0	6 8	44 16 0	96 10 6	Goldscope, &c.
Grassington	8,124	186 3 6	183 3 6	5½ 5½	—	6,748	154 12 10	154 12 10	5½ 5½	—	—	Grassington.
Greenbourne	504	12 12 0	16 16 0	6 8	4 4 0	480	12 0 0	16 0 0	6 8	4 0 0	8 4 0	Greenbourne.
Greenside	15,771	394 5 6	459 19 9	6 7	65 14 3	24,080	602 0 0	602 0 0	6 6	—	65 14 3	Greenside.
Guttergill	624	15 12 0	18 4 0	6 7	2 12 0	520	13 10 10	13 10 10	6¼ 6¼	—	2 12 0	Guttergill.
Harehope Gill	2,080	52 0 0	52 0 0	6 6	—	—	—	—	— —	—	—	Harehope Gill.
Harwood	1,040	26 0 0	34 13 4	6 8	8 13 4	472	11 16 0	11 16 0	6 6	—	8 13 4	Harwood.
Hebden Moor	4,753	118 16 6	138 12 7	6 7	19 16 1	6,760	169 0 0	204 4 2	6 7¼	35 4 2	55 0 3	Hebden Moor.
Hollyfield	228	6 3 6	6 3 6	6½ 6½	—	156	4 1 3	4 1 3	6¼ 6¼	—	—	Hollyfield.
Hudgett Burne	1,872	46 16 0	54 12 0	6 7	7 16 0	350	9 9 7	9 9 7	6½ 6½	—	7 16 0	Hudgett Burne.
Keldheads	8,838	239 8 11	239 8 11	6½ 6½	—	4,100	111 0 10	111 0 10	6½ 6½	—	—	Keldheads.
Keswick	3,336	83 8 0	97 6 0	6 7	13 18 0	3,900	97 10 0	130 0 0	6 8	32 10 0	46 8 0	Keswick.
Lady Vein	384	9 12 0	11 4 0	6 7	1 12 0	312	8 2 6	8 2 6	6¼ 6¼	—	1 12 0	Lady Vein.
Langdon	888	22 4 0	22 4 0	6 6	—	150	3 15 0	4 7 6	6 7	0 12 6	0 12 6	Langdon.
Little Eggleshope	8,760	246 7 6	246 7 6	6¾ 6¾	—	4,750	118 15 0	138 10 10	6 7	19 15 10	19 15 10	Little Eggleshope.
London Lead Co.'s Mines	113,376	3,188 14 0	3,188 14 0	6¾ 6¾	—	92,950	2,323 15 0	2,711 0 10	6 7	387 5 10	387 5 10	London Lead Co.'s Mines.
Moor End	270	7 0 7½	7 0 7½	6¼ 6¼	—	600	16 17 6	16 17 6	6¾ 6¾	—	—	Moor End.
Nether Hearth	624	15 12 0	15 12 0	6 6	—	175	4 7 6	5 2 1	6 7	0 14 7	0 14 7	Nether Hearth.
Newbiggin	1,680	42 0 0	49 0 0	6 7	7 0 0	392	10 12 4	10 12 4	6 6½	—	7 0 0	Newbiggin.
Old Providence	1,026	26 14 4½	26 14 4½	6¼ 6¼	—	1,950	54 16 1½	54 16 1½	6¾ 6¾	—	—	Old Providence.
Old Gang	17,294	432 7 0	576 9 4	6 8	144 2 4	5,943	148 11 6	148 11 6	6 6	—	144 2 4	Old Gang.
Rodderup Fell	12,000	300 0 0	300 0 0	6 6	—	5,600	140 0 0	140 0 0	6 6	—	—	Rodderup Fell.
Roughten Gill	4,800	120 0 0	180 0 0	6 9	60 0 0	2,000	50 0 0	75 0 0	6 9	25 0 0	85 0 0	Roughten Gill.
Silver Rake	272	7 1 8	7 1 8	6¼ 6¼	—	360	10 2 6	10 2 6	6¾ 6¾	—	—	Silver Rake.

Sloggy Burn	216	5 8 0	6 6 0	6	7	0 18 0	130	3 7 8½	3 7 8½	6¼	6¼	—	0 18 0	Sloggy Burn.
Stone Croft and Grey Side	7,080	191 15 0	191 15 0	6½	6½	—	4,600	115 0 0	153 6 8	6	8	38 6 8	38 6 8	Stone Croft and Grey Side.
Stoney Groves	864	21 12 0	21 12 0	6	6	—	500	12 10 0	16 13 4	6	8	4 3 4	4 3 4	Stoney Groves.
Summerlodge	326	8 16 7	8 16 7	6½	6½	—	16	0 8 0	0 8 0	6	6	—	—	Summerlodge.
Sunside	5,268	131 14 0	131 14 0	6	6	—	1,250	31 5 0	41 13 4	6	8	10 8 4	10 8 4	Sunside.
Sunnyside	1,040	26 0 0	26 0 0	6	6	—	1,000	25 0 0	25 0 0	6	6	—	—	Sunnyside.
Surrender	9,404	235 2 0	313 9 4	6	8	78 7 4	3,360	84 0 0	112 0 0	6	8	28 0 0	106 7 4	Surrender.
Thornton Moor	108	2 9 0	2 9 0	5½	5½	—	25	0 12 6	0 18 9	6	9	0 6 3	0 6 3	Thornton Moor.
Tynehead	792	19 16 0	23 2 0	6	7	3 6 0	476	10 18 2	10 18 2	5½	5½	—	3 6 0	Tynehead.
West Burton	—	—	—	—	—	—	800	20 0 0	23 6 8	6	7	3 6 8	3 6 8	West Burton.
Whitaside	696	18 17 0	18 17 0	6½	6½	—	278	6 19 0	6 19 0	6	6	—	—	Whitaside.
Winder and Yeathouse	10,992	274 16 0	412 4 0	6	9	137 8 0	18,700	448 0 5	701 5 0	5¾	9	253 4 7	390 12 7	Winter and Yeathouse.
Wire Gill	10,944	307 16 0	307 16 0	6¾	6¾	—	10,400	260 0 0	303 6 8	6	7	43 6 8	43 6 8	Wire Gill.
Yorkshire	504	12 12 0	12 12 0	6	6	—	300	7 10 0	10 0 0	6	8	2 10 0	2 10 0	Yorkshire.
Total	562,372	14,526 11 10	15,588 2 4	—	—	1,061 10 6	450,797	11,251 6 11	12,840 4 11	—	—	1,588 18 0	2,650 8 6	

NORTH WALES.

Billuis	1,440	33 0 0	36 0 0	5½	6	3 0 0	1,000	22 18 4	33 6 8	5½	8	10 8 4	13 8 4	Billuis.
Bryngwiog	8,400	192 10 0	280 0 0	5½	8	87 10 0	4,728	108 7 0	157 12 0	5½	8	49 5 0	136 15 0	Bryngwiog.
Bwlch Consols	2,630	65 15 0	76 14 2	6	7	10 19 2	4,761	119 0 6	158 14 0	6	8	39 13 6	50 12 8	Bwlch Consols.
Bwlch Styllen	590	14 15 0	17 4 2	6	7	2 9 2	550	13 15 0	18 6 8	6	8	4 11 8	7 0 10	Bwlch Styllen.
Coed Mawr Pool	2,400	70 0 0	80 0 0	7	8	10 0 0	784	19 12 0	26 2 8	6	8	6 10 8	16 10 8	Coed Mawr Pool.
Cwm Erfin	9,828	245 14 0	368 11 0	6	9	122 17 0	14,100	352 10 0	470 0 0	6	8	117 10 0	240 7 0	Cwm Erfin.
Cwm Ystwith	11,700	292 10 0	341 5 0	6	7	48 15 0	11,800	295 0 0	393 6 8	6	8	98 6 8	147 1 8	Cwm Ystwith.
East Darren	9,660	241 10 0	362 5 0	6	9	120 15 0	13,100	327 10 0	436 13 4	6	8	109 3 4	229 18 4	East Darren.
East Hafod	78	1 19 0	2 12 0	6	8	0 13 0	140	3 10 0	4 13 4	6	8	1 3 4	1 16 4	East Hafod.
Gognian	5,340	133 10 0	200 5 0	6	9	66 15 0	1,900	47 10 0	63 6 8	6	8	15 16 8	82 11 8	Gognian.
Gelli Eirin	1,060	26 10 0	35 6 8	6	8	8 16 8	1,680	42 0 0	56 0 0	6	8	14 0 0	22 16 8	Gelli Eirin.
Lisburne	29,232	730 16 0	1,096 4 0	6	9	365 8 0	38,000	950 0 0	1,266 13 4	6	8	316 13 4	682 1 4	Lisburne.
Llwynmalas	1,450	36 5 0	36 5 0	6	6	—	2,400	60 0 0	60 0 0	6	6	—	—	Llwynmalas.
Long Rake	6,720	154 0 0	168 0 0	5½	6	14 0 0	3,000	68 15 0	100 0 0	5½	8	31 5 0	45 5 0	Long Rake.
Maes-y-safn	20,136	503 8 0	671 4 0	6	8	167 16 0	9,300	232 10 0	310 0 0	6	8	77 10 0	245 6 0	Maes-y-safn.
Minera	39,060	976 10 0	976 10 0	6	6	—	30,177	754 8 6	754 8 6	6	6	—	—	Minera.
Mona	13,203	330 1 6	770 3 6	6	1/2	440 2 0	6,435	160 17 6	482 12 6	6	1/6	321 15 0	761 17 0	Mona.
Park	5,964	149 2 0	173 19 0	6	7	24 17 0	1,064	24 7 8	31 0 8	5½	7	6 13 0	31 10 0	Park.
Parys	27,054	676 7 0	901 16 0	6	8	225 9 0	18,404	460 2 0	613 9 0	6	8	153 7 0	378 16 0	Parys.

(continued)

Return of the Amount of Candles and Gunpowder consumed in One Year in Mines—*continued.*

Name of Mine.	CANDLES. Quantity of Candles.	Total Cost.	Amount sold for.	Price per Pound. Cost.	Price per Pound. Sold.	Profit on Candles.	GUNPOWDER. Quantity of Powder.	Total Cost.	Amount sold for.	Price per Pound. Cost.	Price per Pound. Sold.	Profit on Powder.	Total Profit on Candles and Powder.	Name of Mine.
	lbs.	£ s. d.	£ s. d.	d.	d	£ s. d.	lbs.	£ s. d.	£ s. d.	d.	d.	£ s. d.	£ s. d.	
Pentre Lygan	960	22 0 0	24 0 0	5½	6	2 0 0	900	20 12 6	30 0 0	5½	8	9 7 6	11 7 6	Pentre Lygan.
Rheidol	78	1 19 0	2 12 0	6	8	0 13 0	140	3 10 0	4 13 4	6	8	1 3 4	1 16 4	Rheidol.
Rhosesmawr	5,259	131 9 6	153 7 9	6	7	21 18 3	1,016	25 8 0	33 17 4	6	8	8 9 4	30 7 7	Rhosesmawr.
Talargoch	24,192	554 8 0	705 12 0	5½	7	151 4 0	13,440	280 0 0	448 0 0	5	8	168 0 0	319 4 0	Talargoch.
Westminster	7,992	183 3 0	266 8 0	5½	8	83 5 0	5,500	137 10 0	183 6 8	6	8	45 16 8	129 1 8	Westminster.
Total	234,426	5,767 2 0	7,746 4 3	—	—	1,979 2 3	184,319	4,529 14 0	6,136 3 4	—	—	1,606 9 4	3,585 11 7	
IRONSTONE MINES (NORTH OF ENGLAND).														
Cleator	5,866	109 19 9	109 19 9	5½	5½	—	17,200	358 6 8	358 6 8	5	5	—	—	Cleator.
Eston	—	—	—	—	—	—	132,518	3,312 19 0	3,312 19 0	6	6	—	—	Eston.
Groove Rake	2,652	66 6 0	66 6 0	6	6	—	5,525	138 2 6	138 2 6	6	6	—	—	Groove Rake.
Heights	2,184	54 12 0	54 12 0	6	6	—	4,550	113 15 0	113 15 0	6	6	—	—	Heights.
Lindale Cote and Eure	3,366	84 3 0	98 3 6	6	7	14 0 6	1,344	33 12 0	44 16 0	6	8	11 4 0	25 4 6	Lindale Cote and Eure.
Normanby	—	—	—	—	—	—	53,760	1,344 0 0	1,344 0 0	6	6	—	—	Normanby.
Parks	25,946	648 13 0	648 13 0	6	6	—	2,688	67 4 0	67 4 0	6	6	—	—	Parks.
Parkside	33,687	842 3 6	1,122 18 0	6	8	280 14 6	99,035	2,475 17 6	3,713 16 3	6	9	1,237 18 9	1,518 13 3	Parkside.
Red Vein	4,680	117 0 0	117 0 0	6	6	—	4,277	106 18 6	106 18 6	6	6	—	—	Red Vein.
Roanhead	7,500	187 10 0	250 0 0	6	8	62 10 0	—	—	—	—	—	—	62 10 0	Roanhead.
Rowantree	4,602	115 1 0	115 1 0	6	6	—	9,587	239 13 6	239 13 6	6	6	—	—	Rowantree.
Skelton	—	—	—	—	—	—	39,760	994 0 0	994 0 0	6	6	—	—	Skelton.
Slit Pasture	1,404	35 2 0	35 2 0	6	6	—	2,925	73 2 6	73 2 6	6	6	—	—	Slit Pasture.
Stotsfield Burnhead	312	7 16 0	7 16 0	6	6	—	650	16 5 0	16 5 0	6	6	—	—	Stotsfield Burnhead.
Upleatham	—	—	—	—	—	—	95,000	2,375 0 0	2,375 0 0	6	6	—	—	Upleatham.
West Pasture	390	9 15 0	9 15 0	6	6	—	325	8 2 6	8 2 6	6	6	—	—	West Pasture.
West Slit	1,248	31 4 0	31 4 0	6	6	—	2,600	65 0 0	65 0 0	6	6	—	—	West Slit.
Wood End and Gutterby	12,000	300 0 0	300 0 0	6	6	—	56,000	1,516 13 4	1,516 13 4	6½	6½	—	—	Wood End and Gutterby.
Total	105,837	2,609 5 3	2,966 10 3	—	—	357 5 0	527,744	13,238 12 0	14,487 14 9	—	—	1,249 2 9	1,606 7 9	Total.

XII.

BAL OR PAY BILLS.

Showing Earnings of Men, and the Deductions.

Tincroft Mine, Tribute Pay.

For February Ores, 1850.

Paid the 4th day of May 1850.

———— & Co. (2 men.)

21-cwts.	cwts.	qrs.		£	s.	d.
3	10	0	at 4*l.* 12*s.* per ton.			
£ 2	8	9	decrease. Real Amount :			
£ 13	11	0	at 13*s.* 4*d.* in the £	9	0	8

Sundry Deductions.

	£	s.	d.	£	s.	d.
To Subsist	4	0	0			
„ Materials	1	0	0			
„ Smiths' cost	0	12	9			
„ Drawing	0	3	3			
„ Dividing	0	1	9			
„ Dressing	0	19	1			
„ Crushing						
„ Assaying	0	6	0			
„ Debt	1	12	1			
„ Spale						
„ Barrow						
„ Doctor and Club	0	3	0			
„ Clay and Barber	0	1	3			
				8	19	2
Balance				£ 0	1	6

No. 36.

Dolcoath Mine, Tutwork Pay.

For November 1863.

Paid 26th December 1863.

———— & Prs. (6 men.)

	£	s.	d.	£	s.	d.
Tinstuff 198 tons 9 cwt. 6 qrs.				59	10	8
Deduct charge last month				18	0	0
				£ 41	10	8
Assisting timberman				1	4	3
				£ 42	14	11
Box and drawing	3	16	11			
Smiths' cost	4	11	1			
Candles and materials	6	1	2			
Powder	4	15	2			
				19	4	4
				£ 23	10	7
Doctor				0	3	0
				£ 23	7	7
Club 4*s.* 6*d.* and Barber 1*s.* 6*d.*				0	6	0
				£ 23	1	7
Subsist						
				£		

No. .

Dolcoath, Tribute Pay.

18th June 1842.

———— (4 men.)

	£	s.	d.	£	s.	d.
Amount 7*l.* 18*s.* at 12*s.* 6*d.*				4	18	9
Balance ending January	0	16	2			
Mixing and dividing	0	1	2			
Grinding	0	3	6			
Box and drawing	0	15	4			
Smiths' cost	0	8	9			
Candles and materials	1	14	5			
Powder	0	15	2			
				4	14	6
Subsist				7	6	6
Doctor				0	3	0
				12	4	0
				£ 7	5	3
Debt, Club						
				£		

No. .

Dolcoath Mine, Tutwork Pay.

For November 1863.

Paid 26th December 1863.

———— & Prs. (6 men.)

	£	s.	d.
Driving 26 fathoms at 14*s.*	19	16	8
Tinstuff 25 tons 4 cwt. at 7*s.*	8	16	4
	£ 28	13	0

	£	s.	d.	£	s.	d.
Box and drawing	0	16	4			
Smiths' cost	1	11	11			
Candles and materials	2	6	0			
Powder	2	0	0			
				6	14	3
				£ 21	18	9
Doctor				0	3	0
				£ 21	15	9
Club (4*s.* 6*d.*) and Barber (1*s.* 6*d.*)				0	6	0
				£ 21	9	9
Subsist						

No. .

Dolcoath Mine, Tribute Pay.

28th November 1863.

———— & Prs. (4 men.)

	£	s.	d.
Amount, Tin	3	11	8
Tut	0	12	3
	£ 4	3	11

	£	s.	d.	£	s.	d.
Mixing and dividing						
Grinding	0	2	3			
Box and drawing	0	13	11			
Smiths' cost	0	8	6			
Candles and materials	0	19	5			
Powder	0	8	6			
				2	12	7
Doctor				0	2	0
				2	14	7
				£ 1	9	4
Subsist				1	0	0
				£ 0	9	4
Club						

West Stray Park Mine.

Pay for October 1852.

Paid the 20th November 1852.

———— & Partners. (2 men.)

			£	s.	d.
0 6 2	Copper Ore, at 4*l.* 1*s.* 6*d.*				
	1*l.* 5*s.* 3*d.*, at 13/4		0	16	10
Tin, 5 at			0	3	4
			1	0	2

Materials.	Amount. £	s.	d.
15 Candles, 8*d.* per lb.	0	10	0
8 Powder	0	5	4
2 Fuse	0	1	0
Hilts			
Shovels			
Cans			
Padlocks			
Barrows			
Axes			
Paper			
Tubs			
Lanterns			
Duck			
Clay			
Smith cost	0	6	7
Drawing	0	1	0
Weighing, mixing, and dividing			
Sample			
Subsist			
Doctor and Club			
Barber			
Clearing stuff	0	5	0
	1	8	11
In Debt	£ 0	8	9

COOKS KITCHEN MINE.

Pay for August 1863.
Paid the 19th September 1863.

——— & Partners. (6 men.)

	£	s.	d.
1. 18. 1. 11. at 60 - 115. 0. 10. at 11*s.* 6*d.* -	66	3	0
Less Retg. Charges - - - -	14	13	3
	51	9	9

Materials.	Amount. £	s.	d.
Candles per lb. - - -	2	15	6
Powder do. - - -	1	3	4
Fuse - - - -			
Hilts - - - -			
Shovels - - -	0	11	2
Cans - - - -			
Clay - - - -			
Smith cost - - - -	1	0	5
Drawing - - -	2	12	9
Weighing, mixing, and dividing -			
Tramming - - - -			
Sample - - - -	0	9	0
Subsist - - - -	16	14	0
Doctor and Club - - -	0	8	0
Barber and Box - - - -	0	4	0
	25	18	2
	£ 25	11	7
Debt - -	1	18	0
	£ 23	13	7

Fo. 137.

WHEAL BASSET, TRIBUTE PAY.

For October 1863.
And paid 27th November 1863.

——— & Partners. (2 men.)

	£	s.	d.
By 20 18 6 at 7*s.* 6*d.* - - - - -	7	16	11

	£	s.	d.
To Overcharged on Tribute - -	0	3	4
„ 18 lbs. Candles - - -	0	12	0
„ Powder - - - -			
„ Fuse, Hilts, Clay 6*d.* - -	0	0	6
„ Cans, Shovels, Spales - -			
„ Dressing - - - -	0	12	0
„ Mixing and Samples - -	0	7	4
„ Smith cost - - -	0	3	6
„ Drawing - - - -	0	12	0
„ Subsist - - - -			
	2	10	8
	5	6	3
Doctor, Club, and Barber - -	0	2	6
Balance - -	£ 5	3	9

No. 33.

CARN BREA MINES, TUTWORK PAY.

For May 1863.
Paid the 3d day of July 1863.

——— & Co. (4 men.)

	£	s.	d.
Fms. ft. ins.			
1 0 7 at 12*l.* per fathom - - -	13	3	4
1 0 0 at 13*l.* „ - - -	13	0	0
Assisting Shaftmen - - - -	1	15	0
	27	18	4

Sundry Deductions.	£	s.	d.
To Candles - - - -	1	19	4
„ Powder - - - -	1	13	4
„ Safety fuze - - -	0	6	0
„ Sundries - - - -	0	1	0
„ Smith cost - - -	1	5	5
„ Drawing - - - -	0	6	3
„ Tramming - - -			
„ Doctor and Club - - -	0	6	0
	5	17	4
	£ 22	1	0
Barber's Deductions - -	0	3	0
	£ 21	18	0

WHEAL BULLER, TUTWORK PAY.

For April 1861.
Paid 24th May 1861.

——— and Partners. (2 men.)

	£	s.	d.
Breaking up tin rocks, &c., 1 m. - - -	7	7	0

	£	s.	d.
To 10 lbs. Candles - - -	0	6	8
„ 10 lbs. Powder - - -	0	6	8
„ Fuse 1*s.*, Hilts , Clay 6*d.* -	0	1	6
„ Cans , Shovels , Paper -			
„ Slings , Barrels , Nails -			
„ Smith Cost - - -	0	7	0
„ ing - - -			
„ Doctor and Club - - -	0	3	3
„ Debt - - - -			
	1	4	10
	£ 6	2	2
Barber (6*d.*) Subsist (2*l.*) - -	2	0	6
Balance - - -	£ 4	1	8

WHEAL BULLER, TUTWORK PAY.

For March 1861.
Paid 19th April 1861.

——— and Partners. (Man and boy.)

	£	s.	d.
Breaking up rocks in the bottom of the 60 -	5	10	0

	£	s.	d.
To 12 lbs. Candles - - -	0	8	0
„ lbs. Powder - - -			
„ Fuse 1*s.*, Hilts , Clay 6*d.* -	0	1	6
„ Cans , Shovels , Paper -	3	1	6
„ Slings , Barrels , Nails -			
„ Smith cost - - -	0	6	6
„ ing - - -			
„ Doctor and Club - - -	0	2	0
„ Debt - - - -			
	0	18	0
	£ 4	12	0
Barber (3*d.*) Subsist (1*l.* 10*s.*) - -	1	10	3
Balance - - -	£ 3	1	9

WHEAL BULLER, TUTWORK PAY.

For September 1861.
Paid 18th October 1861.

——— and Partners. (Man and boy.)

	£	s.	d
Breaking up rocks at the 70 fathom level - -	5	14	0

	£	s.	d.
To 13 lbs. Candles - - -	0	8	8
„ lbs. Powder - - -			
„ Fuse 2*s.*, Hilts , Clay 6*d.* -	0	2	6
„ Cans , Shovels , Paper -			
„ Slings , Barrels , Nails -			
„ Smith cost - - -	0	3	11
„ ing - - -			
„ Doctor and Club - - -	0	2	0
„ Debt - - - -			
	0	17	1
	£ 34	16	11
Barber (3*d.*) Subsist (1*l.* 10*s.*) -	1	10	3
Balance - -	£ 3	6	8

WHEAL SETON, TUTWORK PAY.

For August 1859.
Paid 30th September 1859.

——— & Partners. (4 men.)

	£	s.	d.
Driving 0 2 7 at 12*l.* - - - -	5	3	4
Stems about railroads, &c. - - - -	10	0	0
	£	15	3	4

	£	s.	d.
To 33 lbs. candles - - -	0	19	3
„ 35 lbs. powder - - -	1	0	5
„ Fuze (6*s.*), hilts (8*d.*), and shovels -	0	6	8
„ Cans, slings, and dags - -			
„ Clay - - - -	0	0	10
„ Drawing - - - -	0	6	0
„ Smith cost - - - -	0	7	4
	3	0	6
Doctor and Club - £	0	6	0
	12	2	10
	0	6	0
Balance - - - - £	11	16	10

NEW WHEAL SETON, TUTWORK PAY.
For September 1863.
Paid 7th November 1863.
———— & Partners. (9 men.)

	£	s.	d.
Cutting flat per bargain	30	0	0
Stems	1	2	6
Putting in penthouse, &c.	13	0	0
Watching	2	0	0
	£ 46	2	6
72 lbs. candles at 8d.	2	8	0
53 lbs. powder „	1	15	4
12 pick hilts	0	3	0
Shovel hilts	0	0	4
Shovels			
13 Fuze	0	8	8
30 Cans widges	1	0	0
Sundries	0	4	10
10 lbs. cast steel at 1s.	0	10	0
Smith cost	0	10	4
Drawing and landing			
	7	0	6
	£ 39	2	0
Doctor	0	4	6
Club	0	9	0
	0	13	6
	£ 38	8	6

No. 13.
WEST BASSET, TUTWORK PAY.
For June 1853.
Paid 13th day of August 1853.
———— & Co. (4 men.)

fms. ft. ins.	£	s.	d.
1 2 2 at 7l. 10s. per fathom	10	4	2
To Candles	0	17	0
„ Powder	1	2	0
„ Safety fuze	0	3	0
„ Sundries	0	0	6
„ Tramming			
„ Smith cost	1	5	6
„ Drawing	0	4	1
Doctor and Club	0	4	0
	3	16	1
	£ 6	8	1
Barber's deduction	0	1	0
	£ 6	7	1
Deducting for	0	1	6
	£ 6	5	7

CONDURROW, TRIBUTE PAY.
For June and July 1856.
———— & partners. (3 men.)

	£	s.	d.
Amount 8l. 0s. 2d. at 13s.	5	4	1
Subsist	2	18	0
Materials			
Smith Cost			
Drawing	1	16	10
Mixing and dividing			
Crushing and sample			
Doctor and Club	0	3	6
	4	18	4
Spales			
	£ 0	5	9

CONDURROW, TRIBUTE PAY.
For April and May 1858.
———— (4 men.)

	£	s.	d.
Amount 24l 10s. 10d. at 12s.	14	14	6
Subsist	7	15	6
Materials			
Smith Cost			
Drawing	4	2	0
Mixing and dividing			
Crushing and sample			
Doctor and Club	0	6	0
	12	3	6
Spales			
	£ 2	11	0

WHEAL BULLER, TUTWORK PAY.
For May 1861.
Paid 21st June 1861.
———— (man and 2 boys.)

	£	s.	d.
Breaking up tinstuff at the 70 fathom level, 1 m.	8	8	0
To 18 lbs. candles	0	12	0
„ 20 lbs. powder	0	13	4
„ Fuse, 3s. hilts, clay, 6d.	0	3	6
„ Cans 1s., Shovels , Paper ,	0	1	0
„ Slings , Barrels , Nails ,			
„ Smith cost	0	8	0
„ ing			
„ Doctor and Club	0	2	0
„ Debt			
	1	19	10
	£ 6	8	2
Barber (3d.) Subsist (2l.)	2	0	3
Balance	£ 4	7	11

No. 23.
CARN BREA MINES, TRIBUTE PAY.
For March Ores, 1863.
Paid the 1st day of May 1863.
———— & Co. (2 men.)

21-cwts. cwts. qrs.	£	s.	d.
11 12 3 at 4l. 8s. per ton			
£ 51 1 5. Decrease 4l. 2s. 9d. Real Amount :			
£ 48 18 8 at 12s. in the £	29	7	2
Sundry Deductions.	£	s.	d.
To Debt	1	19	10
„ Candles	0	16	8
„ Powder	0	13	4
„ Safety Fuze	0	1	0
„ Sundries	0	1	11
„ Smith's cost	0	9	8
„ Tramming			
„ Drawing	1	3	2
„ Dressing, &c.	4	7	0
„ Samplea	0	2	0
„ Turning and dividing	0	11	7
„ Weighing	0	5	9
„ Doctor and Club	0	3	0
„ Subsist	9	0	0
	19	14	11
	£ 9	12	3
Barber's Deduction	0	1	6
	£ 9	10	9

NORTH ROSKEAR PAY.
For October 1863.
———— (8 men.)

Fms. ft. ins.	£	s.	d.
: : at £			
Raising Tinstuff : 1,650 sacks at 50s.	41	5	0
Subsist and dressing			
Materials, &c.	13	7	9
Doctor	0	4	10
Club	0	8	0
	13	19	9
	£ 27	5	3
Barber	0	2	0
	£ 27	3	3

No. 12.
NORTH WHEAL CROFTY, TUTWOK PAY.
9th November 1861.
———— & Pr. (2 men.)

	£	s.	d.
Driving 1 5 4 at 3l.	5	13	4
Clearing stuff	0	5	0
	£ 5	18	4
Box and drawing			
Smith's cost	0	1	1
Candles and materials	1	1	7
Powder			
	1	2	8
	£ 4	15	8
Doctor	0	1	0
	£ 4	14	8
Club (1s.) and Barber (6d.)	0	1	6
	£ 4	13	2
Subsist	4	0	0
	£ 0	13	2

PAR CONSOLS MINE.

March 5th, 1864.

Pay for January Month.

——— ——— & Co. (12 men.)

	£	s.	d.
Sinking a winze under the 100 fathoms level, west of Puckey's shaft on Puckey's lode, 2fm. 2ft. 6in. at 8*l.* 10*s.*	20	10	10
Do. driving east to hole to the rise from the 110 fathoms level, 1fm. at 9*l.*	9	0	0
Do. driving the 110 fathoms level east, 3ft. 6in. at 9*l.* 10*s.*	5	10	10
Watching the engine per month	1	0	0
	£36	1	8

	£	s.	d.	£	s.	d.
Deduct Cash	9	0	0			
Smiths' Costs	0	7	10			
Club	0	9	0			
Doctor	0	4	6			
Spale						
90lbs. candles at 8*d.*	3	0	0			
100lbs. powder at 8*d.*	3	6	8			
Pick Hilt	0	0	3			
Shovel, Shovel Hilts	0	5	9			
Barrow						
Barrel						
Brooms						
Powder Can						
Paper		1	0			
Hoop Iron						
Slings	0	1	0			
Axe	0	2	6			
lbs. Nails						
Rope	0	5	2			
Safety Rod feet						
Sump Rope 16 coils at 1*s.* 2*d.*	0	18	8			
				18	2	4
				£	17	19	4
Subsist				9	0	0
				£	26	19	4

PAR CONSOLS MINE.

March 5, 1864.

November. Ores.

——— & Co. (4 men.)

Tons	Cwts.	Qrs.	per Ton.	Amount.	Increase.
6	2	1	at 5*l.* 2*s.*	31*l.* 2*s.* 11*d.*	1*l.* 19*s.* 9*d.*

	£	s.	d.
Real Amount 33*l.* 2*s.* 8*d.* at 12*s.* from 20*s.*			19 17 7
Cash	5	0	0
Smiths' Costs	0	6	2
Dressing Cost	1	2	1
Club 3*s.*, Doctor 2*s.* 3*d.*	0	5	3
Spale			
17lbs. Candles at 8*d.*	0	11	4
8lbs. Powder at 8*d.*	0	5	4
Hilt	0	0	3
Shovels			
Shovel Hilts			
5lbs. Hoop Iron	0	1	3
Barrow			
Barrel	0	1	0
Sieve and Handles			
Riddle and Handles			
lbs. Tallow			
Copper Nails			
Brooms			
Washing Tub			
Powder Cans			
Paper			
Kibble and Ropes			
3 Coils Sump Rod	0	3	6
Slings			
Carriage			
Railing	0	11	5
lbs. Nails			
Oil			
Feet Safety Rod			
Tar			
Grinding, Drawing, Dividing, Assaying at 6*s.* 8*d.* per Ton	2	0	9
			10 8 4
		£	9 9 3
Subsist			
		£	

W.B. LEAD MINES.—ALLENDALE.

ALLENHEADS MINE.

Reckoning with 4 Pts. for the half year ending 31st December 1862.

Charge.

	£	s.	d.	£	s.	d.
Candles, 19 doz. lbs. at 6*s.* 2*d.*	5	17	2			
Gunpowder, 125 lbs. at 5½*d.*	2	17	4			
Drawing, 10¾ shifts at 3*s.* 2*d.*	1	12	5			
Laborage, brakeing, &c., per account	1	11	7			
Smith work and stores, per account	1	4	4			
Washing and crushing: 16¾ bings at 4*s.* 7*d.*; 10⅞ do 1*s.* 11*d.*	4	17	7			
				18	0	5
Cash advanced, as per other side	56	0	0			
Arrears deducted, do.	1	12	4			
Centage, do.	4	2	4			
				61	14	8
Amount due				57	9	3
				£137	4	4

Fathoms, Ore, Days, &c.

First Quarter.

	£	s.	d.
Fathoms, 6⅛ at 280*s.*	86	6	8
Contracts			
Ore raised, bings cwts.			
Days			

Second Quarter.

	£	s.	d.
Fathoms, 3⅞ at 44*s.*	8	1	4
Contracts			
Ore raised, 27 bings 5 cwts. at 31*s.*	42	16	4
Days			
			50 17 8
Arrears			
			£137 4 4

NOTICE.—This statement is issued subject to correction, and if the parties interested observe any inaccuracy therein they must give intimation of the same at Allenheads Office, between the hours of 9 a.m. and 5 p.m., on any week-day on or before Saturday, the 23d May 1862.

The balance due according to this statement will be paid on the next half-yearly pay day at Allenheads Office, when and where one of the partnership (of if an individual himself) is requested to present this statement.

4 Pts. Allenheads Mine.

Name of Partner.	Cash advanced. First Quarter.	Cash advanced. Second Quarter.	Previous Arrears deducted.	Centage.	Total.	Arrears due this Half Year.	Previous Arrears.	Total Arrears.
	£	£	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
———	6	8	0 14 1	1 0 7	15 14 8	—	—	—
———	6	8	0 14 2	1 0 7	15 14 9	—	—	—
———	6	8	0 4 1	1 0 7	15 4 8	—	—	—
———	6	8	———	1 0 7	15 0 7	—	—	—
	24	32	1 12 4	4 2 4	61 14 8	—	—	—

W.B. LEAD MINES.—WEARDALE.

Burtree Pasture Mine.

Reckoning with ——— 6 Pts. for the Half-year ending 31st December 1862.

Charge.

	£	s.	d.	£	s.	d.
Candles, 28½ doz. lbs. at 6*s.* 2*d.*	8	15	9			
Gunpowder, 325 lbs. at 5½*d.*	7	9	0			
Drawing, 28½ shifts, at 4*s.* 6*d.*	6	8	3			
Laborage, brakeing, &c., 28½ „ at 3*s.*	4	5	6			
Smith work and stores, per account	7	3	7			
Washing and crushing — 7⅜ bings at 11*s.* 4*d.*; 7⅜ do. 7*s.* 2*d.*	6	18	4			
				41	0	5
Cash advanced, as per other side				84	0	0
Arrears deducted, do.						
Centage, do.						
Amount due						
				£125	0	5

Fathoms, Ore, Days, &c.

First Quarter.

	£	s.	d.
Fathoms, 3⅛ at 200*s.*	31	13	4
Contracts			
Ore raised, bings cwts.			
Days			

Second Quarter.

	£	s.	d.			
Fathoms, 5 at 200*s.*	50	0	0			
Contracts						
Ore raised, 15 bings cwts. at 30*s*	22	10	0			
				72	10	0
Days						
Arrears				20	17	1
				£125	0	5

Notice.—This statement is issued subject to correction, and if the parties interested observe any inaccuracy therein, they must give intimation of the same at Newhouse Office, between the hours of 9 a.m. and 5 p.m., on any week-day on or before Saturday, the 23d day of May 1862.

The balance due according to this statement will be paid on the next half-yearly pay day at Newhouse Office, when and where one of the partnership (or if an individual himself) is requested to present this statement.

——— 6 Pts., Burtree Pasture Mine.

Name of Partner.	Cash advanced. First Quarter.	Cash advanced. First Quarter.	Previous Arrears deducted.	Centage.	Total.	Arrears due this Half-year.	Previous Arrears.	Total Arrears.
	£	£	£ s. d.	£ s. d.	£	£ s. d.	£ s. d.	£ s. d.
—— - -	6	8	—	—	14	3 9 6	—	3 9 6
—— - -	6	8	—	—	14	3 9 6	—	3 9 6
—— - -	6	8	—	—	14	3 9 6	—	3 9 6
—— - -	6	8	—	—	14	3 9 6	—	3 9 6
—— - -	6	8	—	—	14	3 9 6	—	3 9 6
—— - -	6	8	—	—	14	3 9 6	—	3 9 6
	36	48	—	—	84	20 17 1	—	20 17 1

Lead Company's Due Papers in year ending October 1863.

	£	s.	d.	£	s.	d.
Earnings of A. B. and 3 partners				258	2	4
7 qr. barrels gunpowder at 14*s.* 6*d.*	5	1	6			
31 doz. lb. candles at 6*s.* 10*d.*	10	11	10			
Tools	0	3	7			
Drawing 256⅛ shifts, at 4*s.*	51	6	8			
Cash, labourers	3	15	0			
Balance due to each partner:						
£ s. d.						
1 7 0 Cash, A. B.	45	2	0			
16 13 11 „ C. D.	28	12	0			
18 3 11 „ E. F.	28	12	0			
16 13 11 „ G. H.	28	12	0			
—— School, A. B.	0	7	0			
£52 18 9 Funds, C. D. and G. H.	3	0	0			
				205	3	7
Due				£ 52	18	

	£	s.	d.	£	s.	d.
Earnings of I. K. and 3 partners				168	7	0
14 qr. barrels gunpowder at 14*s.* 6*d.*	10	3	0			
24 doz. lb. candles at 6*s.* 10*d.*	8	4	0			
Tools	1	7	4			
Drawing 66 shifts at 4*s.*	13	4	0			
Cash, labourers	3	8	0			
Balance due to each partner:						
£ s. d.						
6 18 0 Cash, I. K.	26	2	2			
5 11 1 „ L. M.	27	4	1			
5 11 1 „ N. O.	27	9	1			
3 6 1 „ P. Q.	29	14	1			
—— Rent, L. M.	0	5	0			
£21 6 3				147	0	9
Due				£ 21	6	3

Guttergill Mine, 2d Feb. 1864.

	£	s.	d.
2 Pts., cutting cross to south, 7 fms. at 37*s.* 6*d.*	13	2	6
Do. raising ore, 6 bings 0 cwts., at 50*s.*	15	0	0
Do. do. 9 bings 5 „ at 60*s.*	28	17	6
Do. master's work, repairing drift, 8 days, at 3*s.*	1	4	0
	£58	4	0

	£	s.	d.	£	s.	d.
Candles, 11 doz. lbs. at 6*s.* 6*d.*	3	11	6			
Gunpowder, 2 casks at 13*s.* 6*d.*	1	7	0			
Drawing, 10 shifts, 4 wag., at 3*s.*	1	11	6			
Washing, 15 bings 5 cwt. at 7*s.* 6*d.*	5	17	2¼			
C. Little, blacksmith	0	6	6			
Lent money	35	9	6			
				48	3	2¼
Due				£10	0	9¾

XIII.

CORONERS' INQUESTS AND ACCIDENTS.

With Report by A. H. Wylie, Esq.

Summary of Accidents referred to in subjoined report.

No.	Date.	Mine.	Name.	Cause.
1	March 4	Dolcoath -	Thomas Kessel -	Falling down the shaft 13 fathoms through stepping back to avoid fall of earth.
2	„ 24	West Fowey Consols.	James Sampson -	Explosion while tamping.
3	April 15	Trevenen -	Thomas Wedlake -	Falling away of ground.
4	„ 18	Tolvadden -	Charles Vincent -	Falling through a trap door.
5	„ 21	St. Just United	Emanuel Trembath	Falling from the ladder.
6	„ 21	Botallack -	Nine individuals -	Breaking of the skip chain.
7	May 13	Buller and Basset United.	Frederick Uren George Teague.	"Blowing out" of boiler.

My Lord, London, 1st June 1863.

In compliance with your lordship's instructions I prefix a list of accidents in mines, to which my attention was directed during my recent visit to Cornwall, and which I brought before the Mines Commission at Tavistock on the 27th ultimo.

With the single exception of No. 7, the accident at Buller and Basset United Mine, my knowledge of these various accidents has been derived from the reports of Mr. Twite, and the shorthand writer's reports of the proceedings of the several inquests.

All these reports I now beg to hand to your Lordship. A very attentive perusal of them has given me an impression that in none of these cases has the inquiry before the coroner been so thorough and so complete as the interests of the unfortunate individuals themselves, the security and protection of persons working in mines, and the public interests, required; for in each case it seems to have been limited to ascertain whether death was occasioned by accident, with little or no regard to the nature of the accident.

The very accidents were most suggestive in themselves, leading to inquiries absolutely necessary to the interests of miners, and security of life among a hard working and deserving portion of Her Majesty's subjects, and might have been made conducive to high objects of humanity. Thus, the falling away of earth, explosions while tamping, falling through trap doors left open, and the examination of chains, boilers, &c., are matters of life and death; and though death may not always follow, injuries more or less grave may frequently happen, but pass without any injury whatever.

In the case marked No. 2, the evidence could scarcely be termed direct, proceeding as it did from a witness working in a level different from that in which the accident occurred, though the evidence of at least one person might have been obtained who actually witnessed the accident. In this case, as in the two succeeding cases, Nos. 4 and 5, the mode of tamping adopted, the superintendence and regulations, the sufficiency and safety of trap doors through which one and perhaps two of the parties alluded to fell, might have elicited important information, and possibly have led to greater and more practical precautions for the future.

No. 6. Accident at the Botollack Mine.—This accident happened on the 21st of April last, and from the large loss of life, and the special cause of the accident, has evoked more than the usual interest; and I think that throughout Cornwall generally, and especially in the mining districts, it was believed that the Government would cause a special inquiry to be instituted, inasmuch as only under such an authorised enquiry could all the facts and circumstances connected with this accident be elicited, its importance cannot be overrated, the destruction of life was large, and the question of the modes of descent into and ascent from mines was therein raised.

As your lordship has obtained the services of an officer of the Board of Trade to institute this inquiry, I may now curtail the observations which I thought it to be my duty to submit to the Commission with reference to this accident. It occurred at that part of the mine which is known by the name of the Boscawen diagonal shaft, and was caused by the breaking of one of the links of the chain by which the skip was in the act of being brought up to the surface, in which skip nine persons were then ascending. The chain broke when the gig or skip was about 100 fathoms from the bottom, and instantaneously, in less time than is taken to write the fact, the skip was dashed to the 190 level, and the nine persons destroyed.

At the 190 level, stout timbers are laid across the shaft, allowing only a clear height of 2 feet 9 inches; and one of the witnesses thought that some of these persons must have struck their heads against these timbers, and so came to their death.

Connected with the skip was certain machinery specially alluded to in Mr. Twite's report, by which, in case of need, a break handle could be disengaged from a loop, and set free powerful clippers to seize the rails, and so prevent the skip from descending further after the rails were so seized. And it appears to have been the impression of the witnesses that the persons in the skip, or he especially who was sitting nearest to the break, lost his presence of mind, and failed to set the clippers in action; and the coroner seems to have entertained the same opinion, and thought "that if any blame is to be imputed to any one, it is to the poor fellows who lost their lives." Whether this were so or no it is now impossible to decide; the circumstances connected with the accident have perished with the poor fellows to whom the blame is imputed.

The skip was a large iron carriage capable of holding eight men conveniently, and it was hauled up to the surface by a single link iron chain. It was invented and arranged by one of the engineers attached to the mine, and it was stated that it had often been tested and always found to answer; and it was further stated that the iron of which the chain was made was of good quality, "of the best charcoal iron," was made specially for the purpose, and had been in use for thirteen months. But here the inquiry seems to have stopped at the very point where I ventured to suggest to your Lordship it should now be reopened, to examine as to the particular efficiency of the machine and machinery itself, and into the character and condition of the chain; if during the time of its working it had ever been examined, and if so, how often; if it had ever broken before, and if any crack or sign of any previous fracture was apparent. Mr. Rowe, one of the witnesses, ascribes the defect in the broken link to the fact that other links came riding over it, and so "compressed the iron." This fact would surely have been apparent on occasional examinations of the chain, if such had taken place, and it verifies the saying that the strength of a chain is equal to that of its weakest link

I may add that at present the skip or gig is not in use. Probably the late disastrous accident may have suggested the propriety of considering the possibility of improving its machinery; but in the meantime the miners either ascend by ladders, or, as I understood, by walking up the inclined plane; either of which are tedious processes, occupying nearly an hour, and so severely tasking the energies of the men, and adding to their bodily fatigue, that it was stated that they did not now accomplish two thirds of the work which they did when they had the relief of the skip as a means of ascent.

No. 7. Accident at the Buller and Basset United Mine.—This mine is situated close to the hamlet of Four Lanes, in the parish of Wendron. The accident occurred on Wednesday, 13th May, and resulted in the death of Frederick Uren, aged 33 years, a married man, leaving a widow and three young children; and in the death of George Teague, a single man, aged twenty. Both of these men were miners working at Buller and Basset United Mine.

The cause was a "blowing out" of one of the boilers, and the verdict at the coroner's inquest was equivalent to "Accidental death," similar to the verdict in each of the above-mentioned cases.

In this special case, happening to be in the locality at the time of the accident, I attended the inquest, and visited the boiler house where the accident occurred.

In many mines a changing house is appropriated for the use of the miners, enabling them to dry and change their clothes. In this mine no such special provision existed, and the men for this purpose availed themselves of the boiler house. On Wednesday, 13th May, at two o'clock p.m., the hour of relief, some nine men were thus engaged in the boiler house, when suddenly and without any warning the casing of one of the boilers appeared to be lifted up, and the brickwork in front of the bottom flue underneath the fire was rent asunder, and volumes of steam issued forth. Four or five of the men who happened to be on a platform connected by a door with the engine house, rushed through this door, and escaped into the open air uninjured.

Two men, named James Oliver and James Hore, effected their escape also, but much scalded. Frederick Wren and George Teague appear to have been on the top of the second boiler when the other boiler "blew out," and leapt down for the purpose of making their escape through an opening into the coal yard; but in so doing they must have been enveloped in the boiling steam. They, however,

gained the coal yard, where their cries brought their comrades to their assistance. They were soon conveyed to their respective homes, and there Frederick Wren "passed away' at 11 o'clock the same evening, and George Teague on the following evening. These facts were stated by two miners of the name of Bosanco, father and son, working at the same mine, and in the boiler house at the time of the explosion. Captain Bice, the mining agent, attributed the accident to the weakness of the boiler, of which he had no idea, as it had been repaired about two months ago; and no blame seemed to be imputed to the engine man, who was a careful experienced person, and there was no reason to suppose that the "feed" had run down. He was of opinion that the steam must have escaped through an aperture or rent in the lower part of the boiler, but no opportunity had yet occurred to raise the boiler from its bed for the purpose of examination. He considered that it was a purely accidental circumstance, and that no blame was to be attached to any one.

In accordance with the evidence the jury returned a verdict of accidental death, to which verdict the foreman, unable to sign his name, affixed his mark.

When the inquest was concluded, it was mentioned that the boiler had been put up nine years ago, and that when put up it was an old one, and that the repairs which were said to have taken place about two months ago were in consequence of a similar "blow out," but fortunately on that occasion no lives were lost. When this accident was communicated to your Lordship, you desired me to convey to Captain Bice your desire that the boiler should be examined by some competent person. I conveyed this desire on the part of your Lordship to Captain Bice, who most courteously consented to give every facility for such examination, and to afford any information in his power.

With this object in view, and through the kind permission of the Admiralty, Mr. John Yale, of the Devonport dockyard, proceeded to Camborne on the 28th May, and, in company with Mr. C. Twite, visited the mine and examined the boiler. His report, of which I enclose the original, was to the following effect:

"28th May 1863, Buller and Basset United.

"I find by examining the boiler internally there is a "great collection of mud at the bottom, which has been "the means of keeping the water from the boiler and "causing decay to take place much quicker than it would "otherwise. And on examination of the boiler externally "I find the bottom very much decayed from end to end, "and in places not more than $\frac{1}{16}$" thick, and by the in- "formation of the engine keeper he saw this some months "ago, and put a few patches on.

"My opinion is that if a practical boiler-maker had sur- "veyed the boiler at the time when it was found defective, "he would have recommended it to have been taken out, "and a new bottom put in, and the flue examined and "repaired.

"(Signed) JOHN YALE,
"Foreman of Boiler Department,
"H. M.'s Dockyard, Devonport."

Mr. Charles Twite, of Camborne, who was present at the above examination, reports as follows:—

"It appeared from the agent's and engine driver's state- "ments that the boiler was repaired in the bottom so "recently as March last, when a portion of the brickwall "on which it rested was removed, and some patches put "on.

"The water supplied to the boiler is remarkably pure, so "the collection of mud is more culpable. I brought some "of it away, and shall send it to Dr. Smith."

I have thus, at some length, detailed this painful and interesting case, to which it is not my province to add many natural observations; I therefore content myself with placing its facts before your lordship, believing that they are well entitled to receive the earnest consideration of a Commission which seeks the amelioration and protection of a numerous body, industrious and intelligent, and with which no one, I think, can associate without becoming deeply interested.

Submitting this Report to the Commission on Mines,
I have the honor to remain
Your lordship's obedient servant,
A. H. WYLIE.

To the Right Hon.
Lord Kinnaird, K. T.
&c. &c. &c.
Chairman Mines Commission.

FATAL ACCIDENT AT DOLCOATH MINE, CAMBOURNE.

A fatal accident occurred at the above mine on Wednesday morning, 4th March, to a miner named Thomas Kessel, aged 25, of Bolennow, in the parish of Camborne, under circumstances as detailed in the evidence at the inquest.

The Inquest.

An inquest was held yesterday, 5th March, at noon, touching the death of the said Thomas Kessel, at the "Village Inn," Bolennon, before Wm. Hichens, Esq., county coroner. The jury consisted of the following persons, viz., Mr. Henry Treglown (foreman), Messrs. George Berriaman, William Skewis, William Stoneman, William Bawdere, John Skewis, Richard Williams, James Skewis, Charles Davey, George Noble, Hugh Phillipps, and Samuel Phillipps, who, after being sworn, proceeded to the residence of the deceased to view the body.

The Coroner, on their return to the inn, asked if there were any witnesses, and being answered in the affirmative—

Nicholas Date, after being sworn, deposed:—I am a miner, living in the parish of Camborne. I work at Dolcoath Mine. I knew the deceased Thomas Kessel; he was also a miner, and worked in the same mine. We were comrades. We were at work in that part of the mine called "Wheal Harriett." The accident happened on Wednesday morning. We were in company with another comrade called Samuel Jewell. Deceased was filling the kibbles, and sending the tin and stuff to grass, and I was tramming the stuff to him. The kibble deceased had last filled was being drawn to the surface, when the chain broke, and the kibble fell down through the shaft on the north part. The chain was a usual whim chain. We were all employed about it to get it in order, when a scale of ground fell out of the side of the shaft where we were working. Deceased stepped back, and fell away in the North Gunnis of the shaft, a depth of about 13 fathoms.

I went down after him, and was the first person who came to him; I found him in the bottom of the level 4 fathoms under the 220. Deceased was lying on his right side, face downwards. I took him up; he was then alive, but did not speak, and was apparently senseless, and died in about 5 minutes after. Witness was of opinion that as they pulled the chain they brought away the ground with it, and they were engaged in hauling the chain for the purpose of clearing it. I did not observe its being loose before. Jewell, the other comrade, went down with me to the deceased, and found his head much injured.

In answer to an inquiry from the Coroner, witness again said the chain appeared to be a good one and of the proper size.

(*The Foreman.*) Are you requested if a chain break, to fetch it at once on such occasions?

(*Witness.*) Yes.

(*A Juryman.*) That is the rule in all mines.

The Coroner thought from the evidence that this was a clear case of accident, and the jury being unanimously of that opinion a verdict of "Accidental death" was immediately returned.

DEATH FROM EXPLOSION OF GUNPOWDER IN TAMPING.

In the evening of Tuesday, the 24th of March 1863, an inquest was held by Edmund Gilbert Hamley, Esq., a coroner of the county of Cornwall, at the "Foundry Inn," St. Blazey, touching the death of James Sampson, a miner, aged 22 years, who was killed the previous day whilst working underground in West Fowey Consols Mine, in the parish and near the town of St. Blazey.

At the same time that Sampson received the injuries which proved fatal to him, his comrade, Richard Jasper, also received serious injuries, which at first it was feared would prove fatal to him, and afterwards it was supposed that, though his life might be spared, his sight would be lost; but it is satisfactory to learn that both his life and eyesight will be preserved.

The following inhabitants of St. Blazey were sworn on the jury:—

Henry Meager,
William Rescorla,
Richard Saunders,
Henry Thomas,
John Jenkins,
Henry Sweet,
Edward Martin,
Sydney Magor,
Edward Martin,
Edward Isaac,
William Werry,
Thomas Arthur.

The jury having seen the body of the deceased at his late residence near the Foundry Inn, the following evidence was taken.

WILLIAM HUGO sworn.

(*Coroner.*) What is your name?

(*Witness.*) William Hugo.

What are you?—A miner.

Where do you work?—At West Fowey.

Just tell the jury all you know about this case. Where were you working; what part of the mine?—I was working at the 120 fathom level.

When was it; what day?—Yesterday.

Where was Sampson?—Down at the bottom of the shaft, at the 130, 10 fathoms below me.

Well, what took place?—I received information from Richard Dower, his comrade, that something had happened; that a hole had gone off.

Did you go down?—Yes.

When you came down what did you find?—They were in the dark. Jasper was sitting down at one end of the shaft, in the north-east corner of the shaft, and Sampson was lying down in the south-east corner on his back. That's all.

Was he dead?—No.

What did you do?—I sent him up to grass at once.

He was got to grass as soon as possible, was he?—Yes.

Did you remain down in the 120, or did you come up?—I came up to grass with word to the captains. When I saw him up he was alive in the gig. He was sitting in the gig. He died in about five minutes after he came up.

Had you seen him before the hole went off?—In the morning, about four hours before the accident.

Where is his comrade Dower?

(*Policeman* 81, *Julius Bone.*) He is underground at his work.

(*Coroner.*) We can't do anything without Dower.

(*Some Jurors.*) Dower ought to have been here.

(*Coroner to witness Hugo.*) You don't know anything else about it?

(*Witness.*) No.

The man was not sensible after?—Not after he came to grass.

How do you know that he himself tamped the hole?—His comrade said so.

What caused it to go off?—He was tamping a second laying.

(*A Juror.*) They were putting a second laying and tamping it.

(*Coroner.*) Who was there besides Sampson and Dower?

(*Witness.*) The other man Jasper.

(*A Juror.*) Jasper is injured very much indeed.

(*Another Juror.*) There are several men here who have seen Jasper; what did he say?

(*Witness.*) He said that Sampson was tamping the hole.

(*A Juror.*) Dower saw the explosion, and then he ran to this man here for a light.

(*Coroner.*) How long had Sampson been working in the mine?

(*Jurors.*) For years. He had been an underground man for years. It appears that he was sensible as he was coming up the shaft, and he touched Jasper, and said, "Oh, I did'nt mean to do it." He was sensible, but he could not give any account how it happened.

(*Coroner to Witness.*) How near were the other men to him when it went off?

(*A Juror.*) Dower was at the 120, looking down the shaft when the accident happened. They had been all three putting in this hole.

(*A Juror.*) They were tamping the hole, and the tamping-powder caught fire. There must have been some loose powder about the hole.

(*Coroner to witness.*) You are sure that the man was tamping himself?

(*Witness.*) Yes, sir.

(*A Juror.*) The wages man was down with him. But they would not put a wages man to tamp the hole; it must have been the deceased himself who tamped the hole.

(*Coroner.*) It appears to me to have been a sheer accident. There does not appear to have been any blame. I will adjourn the inquest for the other man (Dower), if you think proper, gentlemen; but I do not think anything can come of it.

(*Several Jurors.*) It was pure accident. You could get no further information from any one.

The jury then immediately returned the following verdict: "Accidentally killed by the explosion of gunpowder in West Fowey Consols Mine."

The Coroner recorded the verdict, and handed to the policeman a certificate for burial.

DEATH FROM THE FALLING OF GROUND.

At noon on Wednesday the 15th April 1863, an inquest was held at the house of Richard Eade, the "Star Inn," at Trewennack, in the parish of Wendron, and about a mile and a half from Helston on the turnpike road to Falmouth.

The inquest was held by William Hichens, Esq., county coroner, resident at St. Ives; and it was concerning the death of Thomas Wedlake, a single man, aged 24 years, who died in the afternoon of Monday the 13th of April, in consequence of injury received by him while working that afternoon in Trevenen (or Trevening) Tin Mine, also in the parish of Wendron, and about a mile (or less) northward of Trewennack.

The following were sworn on the jury:—

Bennett Winn, foreman,
Walter Pearce,
William Williams,
Peter Gill,
Daniel Treloar,
William Pascoe the elder,
William Pascoe the younger.
William Chapman,
Nicholas Curnow,
John Morris,
John Bawden,
William Treloar.

The coroner and jury proceeded from the inn to the house of Mrs. Philippa Moyses, at Lower Trewannack, to view the body of the deceased. It was at this house that he had lodged with his brother John Wedlake and two other comrades; all four of whom had recently come down into this neighbourhood from the county of Devon.

After the jury had seen the body they and the coroner returned to the "Star Inn," and heard the following evidence:—

JOHN WEDLAKE, brother of the deceased, deposed as follows:

(*Coroner.*) Where do you reside?

(*Witness.*) Down at Mrs. Moyses'. My native home is Ashton, near Exeter, just under Haldon.

What is your calling?—A miner.

Thomas Wedlake was your brother, was he?—Yes, sir.

What was his age?—24 the 2d of January last.

He was a miner?—Yes, sir.

And lived at Ashton until he came into this neighbourhood?—No; we had been living at Tavistock for two years since we left home. We have no fixed residence now; but I call it my home where my father and mother live.

How long had your brother been in this neighbourhood?—'Tis three weeks last Friday since we came to Helston.

You came down together?—Yes, sir.

To seek for work?—Yes, sir.

Did you get employ here?—Up here at Trevenen Mine.

That is in Wendron, I think?—I believe so, sir.

(*Some Jurors.*) Yes, sir.

(*Coroner.*) Did you work together as comrades?

(*Witness.*) Yes.

Any other persons?—Yes, that young man there (*meaning Thomas Cox, afterwards examined*), and another young man; four of us.

Your two other partners, what were they called?—Thomas Cox and Thomas Lukey.

What part of the mine did you work in?—The 170 fathom level.

Were you down at your labour? What day was it?—Monday, sir.

What time of the day?—Between one and two, the middle of the day, when we went down.

Any others besides yourself and your brother?—The other two young men; we all four was there.

What were you doing? What happened?—We was working as usual, breaking ground, all four of us.

Near each other?—Me and my brother was near each other; the other two were at the other end of the stope, about four or five fathoms off, I suppose.

All in the same level?—Yes.

Just tell what happened?—I was working away as usual;

I did not see what happened before I was down on the stage; the ground came away and knocked down the stage, and I went down, and he went down. We fell about 10 feet before we came down on the *trade*. I did not see any ground falling away before.

Did the ground appear at all weak, or likely to fall?—No, it did not appear likely to fall; it was just as it seemed when we worked along there before.

It knocked out the stage?—It knocked out the stage pieces we were standing on, and we falled away.

You fell away with the stage; what distance?—About 10 feet, I should say; not more.

Did a great quantity of stuff come away?—A brave quantity of stuff, about 20 or 30 barrows, or it may be more. My brother was buried up over his legs—up to about his middle nearly.

Were you buried at all?—No, I was not buried at all.

What position was your brother in?—He was standing, with his body leaning forward, and was buried up to here (*pointing to his own waist*).

He fell away standing, and was buried in that way?—Yes.

The upper part of him was not at lla covered?—No, nothing at all on him upwards above here (*again pointing to his waist, just above the hips*).

He was able to speak, as he stood, I suppose?—Yes.

What did you do?—Why pulled away the trade and got him out as quick as I could. I called my comrades, and they come as quick as they could; they was not far; and we got him out as quick as we could. It might be 10 minutes, perhaps.

What injury did he seem to have sustained?—He didn't complain of nothing more than across his back before we got him out, but after we had taken him out he thought whether his legs was broke or not.

Was he able to walk?—Yes; or he couldn't walk by himself; he walked, with assistance, out as far as the plat at the end of the level.

Was he taken up in the kibble?—Taken up in the skip.

You accompanied him up, I suppose?—I came up just before him.

You were there to receive him as he came up?—Yes.

What became of him after that?—When he came up he was taken out of the ship, and carried over to the account-house.

Was a medical man called in?—Just after he was carried into the account-house the medical man came.

Who was the doctor?—Doctor Roskruge of Helston. He spoke to the doctor after the doctor came.

He is the mine doctor, I suppose?—Yes, sir.

How soon was the doctor in attendance?—He was there in about 10 minutes after my brother was up in the account-house.

Did he live to be examined?—The doctor went in and looked at him. I was not inside. I was there at the door, and heard the doctor speak to him.

How soon did he die after that?—In about five minutes after the doctor came.

You were not present when the doctor examined him?—No, I was not in when the doctor went in first. I was at the door of the account-house just afterwards. The doctor asked him where he felt most pain, and he said across the back. I was at the door of the account-house, and was no sooner there than I was told to go out.

You don't know whether he stripped to be examined, do you?—No, he was not stripped. (*The other witness in attendance made an observation confirmatory.*)

I suppose that's all you know?—Yes.

THOMAS COX was then sworn and examined.

(*Coroner.*) Are you a native of this neighbourhood?

(*Witness.*) No, sir; I am one of Christow, an adjoining parish to Ashton, near Exeter.

You are a Devonshire person then?—Yes.

And came into this county to seek for work?—Yes, sir; we all came here together, four of us. I accompanied these two. The other man is called Thomas Lukey.

You procured employment at Trevenen Mine, as he has stated?—Yes, sir; all four together.

You have heard what the last witness stated as to the manner this poor fellow came to his death?—Yes.

Is it all true, as far as you know?—Yes, sir.

The Coroner to the Jury:—Gentlemen, you have heard the evidence of these two witnesses as to the manner in which the deceased came to his death. It seems to be a clear case of accident, without any possible blame to be imputed to any body; and I suppose that is your opinion?

(*Jurors.*) Yes.

(*Coroner.*) And that will be your verdict?

(*Jurors.*) Yes.

(*Coroner.*) And so you say all—"Accidental death."

(*Jurors.*) Yes, sir.

Verdict of "Accidental death" was then duly recorded and the coroner's return was signed by the twelve jurors; as many as four out of the twelve, however, being unable to write their names, and making crosses in place thereof.

[It was not stated at the inquest, but the reporter heard subsequently from an apparently respectable elderly man in the Inn, that this was the fourth or fifth fatal accident which had happened in Trevenen Mine, and that the mine was supposed to be insufficiently timbered.]

Camborne, Cornwall,
Sir, 25th April 1863.

A fatal accident having occurred at Tolvadden Mine, by which a lad named Charles Vincent was killed by falling away in the shaft, I visited the mine yesterday, according to Lord Kinnaird's instructions, and examined the shaft in which the accident occurred, and have now the honor of reporting upon the same.

I am, Sir,
Your obedient servant,
A. H. Wylie, Esq. CHAS. TWITE.

Tolvadden mine is a copper mine in the Marazion district, about three miles east of Penzance, under the management of Captains A. Bennett and F. Gundry.

The shaft in which the accident occurred is the engine shaft, and is used as an engine and winding shaft.

The part of the shaft which is used for winding in is most closely and securely cased off, both from the engine shaft and from the level which passes behind the shaft. The engine part is 6 feet long by 5 feet wide, and inclines at an angle of 22° from the vertical. The ladders run in long lengths down the shaft, but the men can step out every 10 fathoms upon a floor fitting closely all through the shaft. In this respect I never saw a better landing place. But all the pit work is sent down through the engine shaft, through a series of trap doors at every landing place. These doors are all opened every Saturday afternoon, as on this day any part of the pitwork which requires changing is attended to. On ordinary occasions the men entering the shaft from the level, which runs behind, step on this trap door and take the ladders, but when this door is raised the men step on a plank about a foot wide, on which the door rests.

It appears that on Saturday the deceased lad and his father were working at the 50 fathom level, when the lad went to go to the 40 to get a pick which had been left there, and that on entering the shaft, not thinking of the open trap door, he stepped in in the usual manner, and fell through to the 80 fathom level, and was killed.

The inquest was held on Monday the 20th instant, and resulted in a verdict of "Accidental death" being recorded

(Signed) C. TWITE.

Camborne, Cornwall,
Sir, 23rd April 1863.

I have visited to-day, by Lord Kinnaird's direction, the St. Just United Mines, situated in the parish of St. Just, and examined the state of the shaft in which Emanuel Trembath was found killed on Saturday last, the 18th instant. I inclose my report upon the same, as well as the short-hand writer's notice of the inquest.

I have the honor to be, Sir,
Your obedient servant,
A. H. Wylie, Esq. CHAS. TWITE.

St. Just United Mines are large tin mines, only recently set to work, after laying idle for some years.

The shaft where this man was killed is called Red Dippa Whim Shaft, and is used as a drawing and footway shaft. The drawing is by single skip. The ladder way is not cased off from the drawing shaft, there being only single boards placed across at a distance of 6 ft. apart.

I suggested to the agents the desirability of having a more perfect casing, which was admitted, and attention promised to be given to it.

The ladders were long, from 9 to 15 fathoms long, and with staves 12 inches apart.

(Signed) C. TWITE.

FALLING FROM A LADDER.

In the afternoon of Tuesday, the 21st of April 1863, an inquest was held by William Hichens, Esquire, county coroner, at the house of William Williams, the "Commercial Inn," St. Just, in Penwith, concerning the death of Emmanuel Trembath, aged 33 years, who was killed on Saturday, the 18th of April, in St. Just United Mines, in the parish of St. Just, in Penwith. The deceased lived at New Downs, near St. Just, Church Town, and has left a widow and two children.

The following were sworn on the jury:—

Reverend George Hadow, vicar of St. Just,
Mr. John Bennetts,
Mr. John Wallis,

Mr. William Williams,
Mr. John Letham,
Mr. James Bennetts,
Mr. John Williams,
Mr. Nathan White,
Mr. William Trehair,
Mr. Thomas Hall,
Mr. Joseph Rowe,
Mr. James Akermann.

The jury, having been sworn, proceeded with the coroner to view the body of the deceased at his late residence; and after their return to the "Commercial Inn," the following evidence was taken:—

JOHN THOMAS sworn.

(*Coroner.*) You are a miner?
(*Witness.*) Yes, sir.
Living at St. Just?—Yes, sir.
Where do you work?—At St. Just United Mines.
Were you at the mine on Saturday last?—Yes, sir.
Did you know Emmanuel Trembath, the deceased?—Yes, sir.
Was he a miner, too?—Yes, sir.
And worked at the same mine?—Yes, sir.
Was he at the mine on Saturday last?—Yes, sir.
Did you see him at any part of the day?—No, sir, not that I recollect.
How do you happen to know that he was there?—I know he works at the 50 fathom level of the Redippa shaft.
Did you hear him working, as you thought?—Yes, sir.
About what time was that?—About, as near as possible I can recollect, about half-past two; and that was the last.
(*Mr. Hadow.*) How far did you work from him?
(*Witness.*) We worked below him; but at that time we were above; we were coming up when we heard him.
(*Coroner.*) Where do you say you worked?
(*Witness.*) I worked at the 70 fathom level.
(*Mr. Hadow.*) What do you mean when you say you heard him?
(*Witness.*) I heard him emptying a barrow of stuff.
(*Coroner.*) What you heard was his emptying a barrow of stuff?
(*Witness.*) Yes, sir.
You say you did not see him alive; did you see him dead that day?—Yes, I saw him dead; I saw him brought to surface that same day.
About what time?—I can't tell exactly; but I should think—well between three and four; I can't say to half an hour.
Is that all youknow about it?—Yes, sir.

RICHARD BLUETT sworn.

(*Coroner.*) Are you a miner?
(*Witness.*) No, sir.
What then?—A kibble filler.
At St. Just United Mines?—Yes, sir.
What part of the mine?—At Redippa.
At what level?—The 70.
(*A Juror.*) At all levels?
(*Witness.*) I was down at the 70 that day.
(*Coroner.*) On Saturday last you were down at the 70 fathom level?
(*Witness.*) Yes.
(*Mr. Hadow.*) Then you were below him?
(*Witness.*) Yes.
(*Coroner.*) What do you know about this deceased?
(*Witness.*) I came up from the 70 up to the 50, when I came up from my work. I was leaving work; and I saw a man lying across the manhole at the 50. I put my head up and came against him; he was lying across the manhole so that I could not go up.
You found a person lying across the manhole; but you did not know who it was at the time?—No, sir.
What did you do?—I did not move it. I went over a pile of stuff, and went up in another direction.
(*Mr. Hadow.*) You thought it was a dead man, I suppose?
(*Witness.*) Yes, I see'd he was dead, sir.
(*Coroner.*) Did you go to grass?
(*Witness.*) Yes, sir.
And told of it, I suppose?—Yes, sir.
You knew the man was dead?—Yes, sir.
But you took it to be—whom?—I thought it was Tom Williams.
You did not go down again, I suppose?—No, sir.
Did you see the man when brought up?—Yes, sir.
You remained on the mine?—Yes, sir.
You then knew it to be Emmanuel Trembath, I suppose?—Yes, sir.
Did you assist to take him home, or anything?—No, sir.
And that's all you know about it?—Yes, sir.
What became of the man afterwards?—I saw him carried away towards his own home. I went home with him.
(*Mr. Hadow.*) Was he lying at the bottom of the ladder.
(*Witness.*) Yes.
Close to it?—Yes.
And the ladder ascends close above?—Yes, his head was close to it.
What kind of ladder is it?—A good ladder.
No bad rounds in it?—No, sir.
(*A Juror.*) How many manholes have you above that?
(*Witness.*) There ought to be a manhole about every five fathoms.
(*The witness John Thomas.*) There are seven manholes above the 50, at different stages, at different distances. Manholes are stages to catch a man if he should fall away, and they are also places for men to rest going up or down.
(*A Juror.*) Is there a trap hatch?
(*Witness.*) There is one swing hatch just above where he fell from.
How far is it from the one that stopped him to the one above?—Not above 2½ fathoms. I think he fell through one, and went down to the other. He never went through but one.
(*The witness Bluett.*) I found a boot about 10 fathoms above the manhole where he was found, and his hat about three fathoms above the deceased's body.
(*To the Coroner.*) I don't know how far he must have fallen if he had fallen from his work.
(*A Juror.*) He had left his work and was going up, and he fell back to his own level.
(*Another Juror.*) It is supposed he must have fallen as he was going up. The man is known to have been subject to giddiness.
(*The Coroner.*) This seems to be a case in which you must find a verdict that he was found dead. There appears to be no evidence as to how he came by his death; though probably he must have fallen from the ladder as he was going up from his work.

Verdict:—"Found dead."

DEATHS FROM SCALDING IN A BOILER-HOUSE.

On Friday, the 15th of May 1863, an inquest was held by William Hichens, Esq., coroner, at the house of John Reed, the "Victoria Inn" in the parish of Wendron, concerning the death of Frederick Uren, aged 33 years. The deceased, a married man, with wife and three children, was a miner, and worked at Buller and Basset United Mines, about 2½ miles from the town of Redruth. About two o'clock in the afternoon of Wednesday, the 13th of May, he and eight other miners were in the boiler house, changing their clothes, when one of two boilers "blew out," and the water and steam rushing out through the bottom flue of the boiler, scalded four of the men, Frederick Uren, aged 33, George Teague 19, James Oliver 18, and James Hore, 20; Uren and Teague being so severely injured that they died in consequence,—Uren on Wednesday night, and Teague on Thursday evening. Uren's residence was at a place called Crigworthgan, about a quarter of a mile from the Victoria Inn, on the Redruth Road, and closely adjoining Buller and Basset United Mines; the Victoria Inn being in the village of Four Lanes. Teague lived and died at Tregagorran, in the parish of Illogan, and about a mile from the village of Pool.

The following were sworn on the jury:—
Thomas Prisk Jenkin, foreman,
Henry Kistle,
John Rogers,
William Medlyn,
Henry Reed,
John Wynn Gilbert,
Edward Richards,
John Allen,
John Crocker,
Thomas Hender Opie,
John Frederick Opie,
John Treloar.

The jury, after being sworn, went to see the body of the deceased, in the upper room of a very neat, clean, and well furnished cottage.

On their return to the inquest room, the following evidence was taken.

JOHN BOSANKO, an elderly man.

(*Coroner.*) Are you a miner?
(*Witness.*) Yes, sir.
What parish do you live in?—In Wendron.
What mine do you work in?—The same mine; Buller and Basset United.
Is that in the parish of Illogan?—No; 'tis in the parish of Wendron.
Were you at the mine on the day of the accident?—Yes, sir.

When was it; yesterday, or the day before?—The day before, Wednesday.

About what time of day?—About 2 o'clock in the afternoon.

Where were you at the time?—In the boiler-house along with them.

The engine boiler-house?—Yes, in the engine boiler-house.

Who were there besides?—Uriah, my son, was there.

The deceased, Frederick Uren, was there you say?—Yes, sir.

And what was the other man called who is dead?

(*Mr. Bice, an agent of the mine.*) George Teague.

(*Coroner to witness.*) And your son?

(*Witness.*) My son Uriah Bosanko, and others, were present at the time.

Were they all changing their clothes, or only these two?—We was all in the act of changing at the time of relief.

You were all going to leave work?—We had come up from underground, and they was going underground. We were taking off our underground clothes, and they were about to put on underground clothes.

You and your son, and some others, had come up, from underground?—Yes, sir.

What happened while there?—The boiler burst while we were changing.

While you were changing the boiler burst?—Yes.

What intimation had you got of it at first?—No intimation in the least.

You heard an explosion, I suppose, first?—Yes, sir; we heard an explosion, and saw it also. It came out just nigh where we were standing; and we, being very nigh the door, made our escape into the engine-house.

You heard an explosion, you say?—Yes, sir; it came out under first.

And you, being very near the door, made your escape through, you say?—Yes.

Did you all escape?—Yes, sir.

You said you saw something of it; what did you see?—I saw it burst out from just under the fire door, and it went out against the wall of the coal shed.

(*Mr. Bice.*) It would be more proper to say it forced its way just through the bottom flue of the boiler.

(*Coroner.*) You saw fire?

(*Witness.*) No; water and steam forced its way through, and come out against the wall of the coal shed.

You made your escape immediately, and saw nothing more of it?—As quick as possible we could; a quarter of a moment, or as soon as we could open the door. Four of us was standing on the platform washing at the present time.

You saw nothing more of it then afterwards?—No. The steam followed us into the engine-house. We quickly made our escape from being burnt alive, and that was all.

The steam followed you into the engine-house, into which you made your escape, I suppose?—Yes.

Were you all in the same place; or were those in a more dangerous place than you?—To all appearance we was in the most dangerous place.

Why?—We was nighest where it burst.

Where were those two men who have died?—Those two men were on the other boiler that did not burst; and they, hearing the explosion, and thinking to make their escape, jumped down to the fire-doors, where it had bursted out, among the steam and water.

They were on the top of the other boiler, I think you said?—Yes; from the top of the other boiler.

And then they jumped down before the fire-place of the boiler that burst?—Not exactly; they made their escape through the window.

How many boilers were there?—Two.

And they were on the boiler that did not burst?—They jumped over *thicky* that didn't burst, and steam and water was coming out about them from the other boiler that burst, and they made their escape through the window; they climbed up through the window that they throw out ashes through. The window is about five feet high.

(*Mr. Brice to witness.*) Did those two men who were killed make their escape through the window?

(*Witness.*) Yes.

(*Uriah Bosanko.*) One made his escape through the window, and the other through the door of the coal-shed. I think that's of it, from the account they gave me.

(*Coroner to witness.*) Did you see anything of them after the accident?

(*Witness.*) Yes, sir.

Where?—Out in the coal yard. We ran out of the engine-house, and heard them crying. We went round to the gate of the coal shed, and we saw Frederick Uren crawling on his hands and knees, and the others was standing up.

Did you see what state he was in?—Yes.

He was able to talk, we hear?—Yes, he was able to talk.

Did he give you any history of it at all?—He didn't give any history, or say anything what occurred; but he begged us to open the yard gate, which was locked; but we couldn't until we got the key.

He said nothing about the occurrence?—I don't know that he mentioned anything about it.

(*Uriah Bosanko.*) I asked him what was the matter, and he said he was burnt very bad.

(*Coroner to witness.*) Did you see that he was burnt very bad?

(*Witness.*) Yes; very bad about the head and arms, and every part we could see.

He appeared to be seriously burnt; scalded?—Seriously scalded everywhere we could see. He had his clothes on.

Every part that was exposed, you say?—Yes; it appears he was scalded everywhere that was exposed to the steam.

What was done with him? He was let out of the yard, of course; did you do anything more to him?—No; he was taken up by these here men, my son and who else?

(*Uriah Bosanko.*) I can't say.

(*Witness.*) He was carried into the account house, and very quickly after that he was carried by James Vincent or two men to his own dwelling.

(*Coroner.*) Where he died, I suppose?

(*Witness.*) Yes.

Were you present when he died?—I was in the house, but I didn't see him pass. My son did; he was sitting by him.

How soon after the accident?—About 11 o'clock at night; about eight hours after.

URIAH BOSANKO sworn.

(*Coroner.*) You are a son of the last witness?

(*Witness.*) Yes, sir.

And live in Wendron too?—Yes, sir.

With your father?—Yes, sir.

And you are a miner too?—Yes, sir.

And work with your father?—No, sir.

You work in the same mine?—Yes, sir.

You work in Buller and Basset United Mines?—Yes.

And you were there on Wednesday last?—Yes, sir.

And in the boiler house with your father, as he has stated?—Yes, sir.

And were present at the explosion?—Yes, sir.

You have heard the evidence your father has given; is it all true as to the manner this poor fellow was injured?—Yes.

Just give us the names of those persons you think were there. You said the parties present were, the two deceased, Frederick Wren and George Teague, and ———?—Myself and my father, John Oliver, William Oliver, and James Oliver (brothers), John Hand, and James Hore.

Were any beside these two injured?—Yes; James Oliver was injured, and James Hore.

They were also scalded?—Yes, sir.

The others escaped unhurt; is that so?—Yes, I believe so.

(*The Coroner, addressing Mr. Bice.*) Now then, Captain Bice, we will have your evidence. We want to have the best information you can give us as to the cause of accident.

(*Captain Bice.*) I think Bosanko's evidence is as near the truth as I can state.

But we want to have some scientific knowledge about it?—I don't know that I can give any scientific account, I can merely state—

The coroner, however, desired him to be sworn.

SAMUEL BICE sworn.

(*Coroner.*) You are a mine agent?

(*Witness.*) Yes, sir.

Where?—At Buller and Basset United Mines.

The principal manager?—No; the sub-agent. Captain Pascoe, is the managing agent. (Capt. Pascoe was not present.)

You have been a mine agent a considerable time?—Yes.

Many years?—Several years.

And employed there any length of time?—'Tis about 18 months since I came to that mine.

Were you at the mine on Wednesday last?—I was in the account house at the time of the bursting of the boiler.

And you went out at once, I suppose?—Yes.

You heard the explosion, I suppose?—No; I did not hear the explosion. I think it can hardly be called an explosion; it was rather a blowing out of the boiler.

(*John Bosanko.*) Yes, that's the thing.

(*Witness.*) The boiler blew out,—the bottom part of the flue the steam escaped through the flue.

(*Coroner.*) You heard of it before you went out?

(*Witness.*) Yes, I heard of it, and I went out immediately?

You heard of it from some person you met at the door—From one of the men who had been in the boiler-house.

Just give us your description how it was. What did you

find?—I found when I came into the boiler-house that the brick-work was lifted and thrown aside.

Which boiler do you mean? Do you call it by any particular name?—We call it the south boiler. The bricks had been lifted up, but not with very great violence. They had been lifted up and thrown aside; the brick-work had been thrown aside; and the front of the bottom flue, underneath the boiler, underneath the fire-place, was forced out.

What caused that?—The escape of the steam.

What part of the boiler was it?—About the middle of the boiler. We have not examined the boiler yet; we cannot do so until it cools.

Are you not enabled to state the cause of the accident?—The case is blown out; but we have not been able to ascertain the extent of the damage. That will be done in the course of a few days; probably on Monday. I rather think, judging from what we can see, that a part of the case is blown out near the centre of the boiler.

(*John Bosanko.*) Very possibly it may be so.

(*Witness.*) I think so, as far as we can judge.

(*Coroner.*) About the centre of the boiler?

(*Witness.*) About the centre, at the bottom part.

Was blown away?—It may be a rent or an aperture, we cannot say which at present.

It is either rented or separated, or blown out?—Either rented or separated, or blown out.

To what do you attribute it?—To weakness of the boiler

Were you conscious that the boiler was weak?—Not at all. We thought it was perfectly strong at the time. We believed it to be in good order. We repaired it about two months ago. One of the witnesses, Uriah, was engaged in repairing it.

About the person in charge. Is there any suspicion that the water was allowed to go too low?—No; he is a very good engine-man.

(*Coroner.*) You have no idea that the feed was allowed to go too low, or any thing of that sort?

(*Uriah Bosanko.*) The feed was right enough.

(*Witness.*) The engine-man is a very safe man.

(*Coroner.*) There is not the slightest suspicion that the water was allowed to go too low?

(*Witness.*) No, not the slightest, so far as I can judge. There is every care taken in the working, as far as I know.

I ask you, on the oath you have taken, do you believe it was an accidental occurrence, and without any blame attributable to anybody whatever?—Perfectly so.

The *Coroner* read his note of Caaptain Bice's evidence; and the *Witness*, at its close, repeated that it was his decided belief that the occurrence was purely accidental, and without blame attributable to any one. He further stated that the men were not doing wrong in being where they were at the time of the accident. He believed if they had laid down on the boiler, and not have attempted to escape, they would not have been so much injured.

(*Coroner.*) It seems to be a dangerous place to go to?

(*Witness.*) We have no other place at present, but probably we shall make arrangements for some other place. That is the place to which the men were accustomed to go to change.

The *Coroner*, addressing the Jury:—The question is for you, gentlemen, having heard the evidence of the two Bosankos, and Captain Bice's statement here. He attributes it to weakness of the boiler; but he says, at the same time, that the boiler was believed to be in perfect order, that it was repaired two months ago, and that he had no reason to fancy that the boiler was not in a proper state, and that the feed was not allowed to go so low as to cause the accident. I think, therefore, you may safely say it was a case of accident. I don't see myself that there is anything else to suspect in the matter.

The jury immediately returned a verdict of "Accidental death."

In answer to a question, *Captain Bice* said the boiler was put in about nine years ago. We cannot say how long it had been working before that. It was an old one when brought here; or, rather, it was one that had been in use before. The engine-man told me just now that the boiler was perfectly sound above, and in every part except the bottom part of it.

In reply to another question, *Captain Bice* said the necessity for repair two months ago was from a blow out, similar in character, but not so strong. At that time only the engine-man was present. When it was repaired, it was tried with water in various ways until it was believed to be perfectly safe.

The Coroner recorded the verdict: "Accidental death by scalding from the blowing-out of an engine."

The Coroner then proceeded to the "Plume of Feathers Inn," at Pool, (whither the witnesses John and Uriah Bosanko had previously been despatched from Four Lanes), to hold an inquest concerning the death of George Teague, aged 19 years, who died at Tregagarran, in the parish of Illogan, on Thursday night.

The following were sworn on the jury:—

George Treglown, foreman,
Benjamin Hocken,
John Mayne,
William Scoble,
William Williams,
William Carne,
James Rogers,
William Phillips
Isaac Nicholls,
John Kitts,
Peter Blamey,
Jeremiah Curnow.

The jury, after having been sworn, went to see the body of the deceased.

On their reutrn to the inquest room, the Coroner, addressing the jury, said I have had the witnesses brought from the other inquest. I propose to read over the evidence given by them, and to ask them if it is true as regards this other man.

JOHN BASONKO was then sworn.

(*Coroner.*) You have been already examined to-day as to the cause of death of Frederick Uren?

(*Witness.*) Yes, sir.

I propose to read over your deposition, and to ask you the question whether it is alike true as to the death of this poor fellow.

The *Coroner* then read John Bosanko's deposition in the case of Frederick Wren, and said, I would now ask you the question, Do these circumstances apply to the death of Teague?—Yes.

Exactly the same?—Yes, exactly the same.

He was there at the same time, and his death was caused by the very same circumstances?—Yes.

I will ask you another question, as we have not the agent here. Do you attribute any blame to any body?—Not in the least.

Was the feed right, do you think?—It was tried a few minutes before. The engine-man had looked at the cock a few minutes before, and it was all right then.

What do you attribute the accident to?—To weakness of the boiler.

Had the boiler been repaired?—It was repaired about two months since, and we expected we were safer than we were in past times. We thought it was put in perfect order. We believed that the agents intended it should be put in perfect order.

You believe that the agents intended it should be put in perfect order?—Certainly we did.

URIAH BOSANKO was then sworn.

The *Coroner* read over his deposition, and asked him if it was true as regarded the man Teague as well as Uren?

(*Witness.*) Yes, sir.

The evidence which applied to Wren applies also to this poor fellow?—Yes, sir.

The death was from the same cause?—Yes.

WILLIAM OLIVER sworn.

(*Coroner.*) Your name is William Oliver?

(*Witness.*) Yes, sir.

Where do you live?—In the parish of Wendren, near the mine.

Were you with the deceased, George Teague, when he died?—Yes.

When did he die?—Last night at half-past 7.

Were you at his house when he came home?—I came home with him.

What were his injuries?—He was much burnt about the face and other parts.

Did you hear him give any account of the occurrence?—No.

Was he not able to do so?—The man seemed very weak.

And he did not give any account?—No.

The Coroner next read the evidence given by Captain Bice at the previous inquest, and the jury immediately returned a verdict of "Accidental death."

(*A Juror to the witness John Bosanko.*) Have you always been accustomed to change on the boiler?

(*Bosanko.*) Yes.

(*The Coroner.*) And now, after this accident, it appears they are about to alter that system.

(*The Foreman.*) I think it is a practice that ought not to be allowed.

(*Another Juror.*) It is what ought never to be allowed in the world for men to change on the boiler.

(*Another Juror.*) There ought to be a changing-house provided.

(*The Foreman to Bosanko.*) Is it likely they will have changing-house now?

(*The Coroner.*) I believe they are going to see to it after this accident.

Report by Capt. Tyler, R.E.

Fatal Accident at Bottallack Mine.

Chale, Isle of Wight,
16th June 1863.

My Lord,

I visited the Botallack Mine, St. Just, Cornwall, on the 6th instant, in compliance with the request contained in your lordship's note of the 1st instant, for the purpose of making inquiry respecting the accident which occurred at that mine on the 18th of April last, and I have now the honour to report for your lordship's information the result of my inquiry.

An inclined shaft, following the course of the copper ore, and called the Boscawen diagonal shaft, has been sunk in the "Crown's" portion of this mine, to avoid the excessive cost of horizontal excavations from the vertical shaft (which increased in length as the workings descended), and to provide a more perfect means of ventilation at the different levels. A tramway is laid through the shaft to a depth of upwards of 200 fathoms below the level of the sea, and for a length of 363 fathoms, measured from the surface of the ground to the point at which it strikes the 190 fathom level. It falls throughout its length on a slope of 5 feet per fathom, or 1 in 1·2, and contains nine curves of greater or lesser radius. The rails are of the section, and are laid upon longitudinal sleepers $7\frac{1}{2}'' \times 2\frac{1}{2}''$, connected by transoms 6 feet apart from centre to centre. Wrought-iron bolts are used to secure the rails to the sleepers, but are inserted for the most part on the outside of the rails only. It would be better, especially on the curves, if a certain number were inserted on the inside also. The tramway in the interior of the shaft is in good order, but a little re-adjustment is required between the engine house and the entrance to it. A number of additional rollers, which are already, I believe, prepared for fixing, are wanted on different parts of the tramway; and above all a gangway, if only for facilitating inspection, cleaning, and maintenance. At present the ascent and descent are attended with considerable difficulty, in consequence of the irregular character of the excavation, and the slimy condition of the rock, the rails, and the sleepers.

The incline is worked by a stationary engine on the surface, and the trucks are drawn up one at a time by means of a single-linked chain, which is wound round a cage outside of the engine-house. The dimensions of the chain varied when it was new, as follows, according to the distance from the engine-house. The uppermost links were made $\frac{5}{8}''$ in the diameter of their section for 100 fathoms, the second portion $\frac{9}{16}''$ for 100 fathoms more, and the third portion $\frac{1}{2}''$ for the remaining length. The chain was constructed specially for working the incline, and appears to be of good quality. Its original breaking weight may be estimated at 15, $12\frac{1}{2}$, and 10 tons * for the different sections respectively, but its thickness is now reduced, in parts, by as much as $\frac{1}{16}''$ from the friction of the links against each other on the cage; and it has been, during the 13 months for which it has been in use, subjected to a constant succession of jerks, which must have been very detrimental to it. The coils over-ride one another and fall off alternately as the chain is wound up, and the sudden and irregular strains which are thus created have tested it more severely than a constant strain only, from its own weight and that of the truck or waggon to be raised, would do.

The tramway waggon in which minerals are brought to the surface weighs about 8 cwt., and carries a load of about 16 cwt., making a total of 1 ton 4 cwt. The truck for the conveyance of the miners is said to weigh 14 cwt., and the men who were in it on the day of the accident, an (excessive number), would probably have weighed 1,326 lbs., making a total of 2,894 lbs., or nearly 1 ton 6 cwt. The weight of the chain to the length of 363 fathoms would be 7652 lbs.,† and the total maximum weight thus to be raised would be nearly $5\frac{1}{2}$ tons. There would thus be a direct maximum strain upon the $\frac{5}{8}''$ chain (on the incline) of nearly $3\frac{1}{2}$ tons, or, including friction, of nearly 4 tons at the commencement of the lift, and upon the $\frac{9}{16}''$ chain when it failed, of rather more than $2\frac{1}{2}$ tons, or say 3 tons, including friction, and allowing for a paucity in some places of rollers, as against $13\frac{1}{2}$ tons, which was its *ultimate* strength, and $2\frac{1}{2}$ tons which ought to have been its *working* strain, when it was new.

An ordinary break acting by blocks upon the wheels would have been useless for arresting the progress of the truck, on so steep an incline; and an ingenious substitute for it has been constructed from the designs of Mr. John Rowe, one of the agents of the mine. Four iron clutches, one on each side of each rail, are placed near the upper end of it, and are worked by a lever handle at the side. A steel spiral spring at the lower end of the floor of the truck, causes the break to fly on when the chain is loose, and thus renders it partially self-acting. When the chain is tightened, and the truck begins to ascend, the spring is compressed, the clutches are withdrawn from the rails, and the break handle falls back, by the action of a short lever and loop attached to the drawbar. Bt the side of the truck, and near the lever-handle, there is also a catch-spring, provided with a notch, which holds the main spring back, and the clutches off the rails, whenever the lever is placed in it. The object of the catch-spring is to afford a means of keeping the clutches from gripping the rails while the truck is descending without any one in it to hold the lever back; and it is expected that the miner who has charge of the break-handle during the ascent, will keep the lever in his hand; will prevent it from falling back into the notch of the catch-spring when it is inclined to do so (as is sometimes the case in going round the curves) and will be ready (without trusting to the action of the main spring) to apply the break by hand instantly when it is required.

The chain had given way on a previous occasion while a mineral waggon was being drawn up, but had not before failed with the miners' truck. The break-apparatus had not therefore been tested under that contingency, but it had otherwise worked very successfully up to the period of the accident, so much so, indeed, that the miners had acquired undue confidence in the working of the incline, and been led to indulge in tricks and experiments which occasioned much risk to their lives,—such as allowing the truck to run down and then stopping it suddenly, requesting the engine man to lower them at extra speed, jumping into the truck while it was going at speed, and overloading it to a serious extent. As many as 12 miners are stated to have ridden up in it at one time instead of 7, which is the greatest number it ought to convey, in order to save the trouble and delay of making a second trip.

About 3 o'clock on the afternoon of the 18th April, 8 men and a boy got into the truck at the 165 fathom level, for the purpose of ascending to the surface. The man who took charge of the break for the occasion, Thomas Wall, was on his feet, leaning back against the front end of the truck; and the boy, Richard Nankervis, sat on the back of it, with his feet dangling over the end; but the remainder were sitting in it in the usual manner. Thomas and Henry Nankervis, two brothers of Richard Nankervis, were present when they started, and the latter, Henry, cautioned one of its occupants, John Eddy, to hold his brother Richard round the waist, while the former, Thomas, remonstrated with Thomas Wall, the acting breaksman, as to his position with respect to the break-handle. He observed to him that "he had not got fair play for the break," and on receiving the reply, "all right namesake," said again "Take care, you have not got room for the break, "Richard's (his son's) shoulder is too near the break "handle." Thomas Wall said again "all right," and they started towards the surface, with the break-handle out of the notch in the catch-spring.

The truck had proceeded about 70 fathoms from the 165 fathom level when the chain gave way. It ran back at once past the 165 fathom level to the bottom of the shaft, which was then a little beyond the 190 fathom level, with great rapidity. It was seen to pass; and the lifeless bodies of those who had been riding in it were all found shortly afterwards near some timber beams which had been laid across the rails, and 2 ft. 9in. above them, at that level. The greater number of the men appear to have met their deaths by the violence with which they struck against these beams.

What happened in the truck after it left the 165 fathom level on its ascent can of course only be conjectured. There is no one now alive to tell precisely why it was that the break did not act or was not applied to prevent it from running back when the chain failed. The weight of the long portion of chain that remained attached to it might well, however, have prevented the spring from causing the clutches to grip the rails, and the break from thus acting of its own accord; and the conversation that passed between Thomas Nankervis and Thomas Wall before the men started for the surface would lead to the apprehension that Wall may not have been well prepared to apply the break

* The *working* strains should not in such a case exceed one sixth of the *ultimate* strains or *breaking* weight, and would thus be $2\frac{1}{2}$ tons for the $\frac{5}{8}''$ chain, 2 tons for the $\frac{9}{16}''$ chain, and $1\frac{1}{2}$ tons for the $\frac{1}{2}''$ chain.

† The weight of the whole chain, 400 fathoms long, would of course be greater namely, —

fms.	lbs.	lbs.
100 ×	$26\frac{1}{4}$	= 2,650
100 ×	$21\frac{1}{2}$	= 2,150
207 ×	$17\frac{1}{2}$	= 3,500
Total		8,300

by hand at the critical moment. The break-handle may possibly have slipped into, or it may have been placed in, the spring-catch after the men started; and if so, Wall would hardly have been able to release it with sufficient rapidity. It was found to be out of the notch of the catch after the accident; but it would probably have been jerked out of it, in any case, by the very violent blow which the truck received when it came into collision with the timbers near the 190 fathom level.

Portions of the truck, which is very strongly constructed, were slightly bent by this blow; and the spring did not act upon the break, when I inspected the truck, as well as it is represented to have done before the accident; but the apparatus still worked perfectly, and with immediate effect, when the break was applied by hand. I tested it near the 165 fathom level, to ascertain whether this was the case, with some portions of the chain in it, equal in weight, as nearly as I could judge, to the nine individuals who then lost their lives.

In order, as far as possible, to prevent an accident of this description from again occurring, it appears to be desirable that the following precautions should be adopted:—

In the first place a wire rope, to be wound regularly round a suitable drum, should be substituted for the chain which has hitherto been coiled so unsatisfactorily upon the existing cage.

2. It would not be difficult to provide at the 190 fathom level, a tramway on a rising gradient, on which any vehicle that breaks away on the incline may reduce its speed before being brought to a stand.

3. The catch-spring should be removed from the side of the truck, to prevent the possibility of the break-handle being caught in the notch with which it is provided, when it may be wanted for immediate use. The break-handle would then require to be held back by hand as the truck descended the incline; and a breaksman would be wanted to accompany the truck in going down as well as in coming up the incline.

4. A second break of the same description might be added to the present truck, in order that a double means of security might be afforded.

5. A regular breaksman should be employed to accompany the truck up and down on every journey that it makes, who should act under strict regulations, and should be responsible for the control of the break-handle, and for not allowing undue speed, or over crowding, or any irregularities in the working of the incline.

The last precaution is, I think, peculiarly important. Miners, and other men who necessarily incur more than ordinary risk, are liable to become exceedingly reckless, and require to be kept under constant control. It is not safe to entrust to these men, at hap-hazard, the working of a break such as that now referred to. The breaksman's own life, as well as the lives of others, depend upon an act being instantaneously performed, which may not be required for years, or which may be required, on the failure of the chain or rope, at any moment. Thomas Wall is stated to have been a steady as well as an experienced man; but there can be no doubt that this accident would not have occurred if he had exercised full care in the working of the break-handle that he was temporarily in charge of; and the constant employment of a responsible breaksman is obviously the means by which proper attention to this very important duty can best be secured.

I have the honour to be,
Your Lordship's obedient servant,
H. W. TYLER,
Capt. Royal Engineers.

The Right Honourable
Lord Kinnaird, K.T.,
&c. &c. &c.

Sir, Camborne, Cornwall, 22d April 1863.

In obedience with the instructions received from the Right Hon. Lord Kinnaird, I have visited Botallack Mine, at St. Just, and inquired into the circumstances attending the fatal accident which occurred on Saturday last, the 18th instant. I also attended the inquest held upon the bodies, yesterday the 21st instant, the short-hand writer's notes of the evidence given being appended, and beg leave now to submit my report upon the same.

I have the honor to be, Sir,
Your obedient servant,
CHAS. TWITE.

A. H. Wylie, Esq.

Botallack Mine is situated in the parish of St. Just, about 8 miles west of Penzance. It is one of the oldest as well as one of the largest mines in Cornwall, employing about 350 men and boys underground, and 200 men, boys, and girls on the surface. The ores raised are tin and copper. The mine is divided into 200 shares, and is under the management of S. H. James, Esquire, Captains Henry and John Boyns, and Captain John Rowe, resident engineer.

The underground operations are carried on at three distinct parts of the mine, viz., Crown's part, Huel Hazard, and Huel Cock.

It was in the Crown's part that the accident occurred.

The Crown's part is situated on the coast, and is worked to a depth of 200 fathoms, and the levels are driven upwards of 200 fathoms in length under the bed of the sea.

This part of the mine has returned vast quantities of copper ore, and is still a very valuable portion of the property.

It was worked from Pearce's Shaft, which is situated upon a ledge of rock about 30 fathoms above low water, and 40 fathoms below the top of the cliff. This shaft is sunk down, and the levels driven from it. But as the copper ore was dipping away at a considerable angle from this shaft, at every succeeding level in depth the length to be driven before meeting with the ore became greater and greater; and as the rock through which these levels had to be driven was very hard, the expense of working became very great; and as the men were a long way from the shaft without any other opening to surface, the ventilation became very defective.

To remedy these evils, a new shaft was sunk from an adjoining ledge of rock, which has followed the course of the ore, and so obviated the driving of such long levels, and has restored the ventilation to a proper state.

This shaft is called the *Boscawen Shaft* and also the *Inclined Shaft*. It is carried down to the 196 fathom level, and is still being sunk deeper. It makes an angle of 32½° with the horizontal; but as the common way in Cornwall is to measure from the vertical, the angle in this case is 57½°, or, in the language of the miners, it *dips* or *underlays* 5 feet per fathom (the sine of the angle giving the amount of dip). It is carried through greenstone rock, and is 363 fathoms in length to where it cuts the 196 fathom level. The size of the shaft varies, the smallest being about 5 feet by 6.

While the angle of inclination remains the same, viz. 32°, the angle of direction varies, there being nine changes. The greatest amount of variation is at the 80 fathom level, where it amounts to 22½°.

The shaft is laid with a single line of railway on longitudinal sleepers of red pine, 7½ inches by 2½, with cross pieces every 5 feet; the width between the rails, which are T rails, being 2 feet 7½ inches. At those parts of the shaft where a change in the angle of direction occurs, angle rolls are placed; four of these are placed at the 80. I append a plan of those at the 33 fathom level.

The ore is raised in an iron waggon weighing 8 cwt., and will hold about 16 cwt. of stuff. It is drawn to surface by a single linked iron chain, varying in size, it being $\frac{10}{16}$ths of an inch diameter for 100 fathoms in length, weighing 26½ lbs. per fathoms, then $\frac{9}{16}$ths for 100 fathoms, and weighing 21½ lbs., while the remainder 200 fathoms was $\frac{8}{16}$ths, and weighs 17½ lbs. per fathom. The chain was made expressly for this purpose, invoiced of best charcoal iron, and warranted to bear a strain of 4½ tons.

The whim engine is a single-acting condensing engine; the chain is wound upon itself on the winding cage.

It has been the habit, since this shaft has been in use, for the men to ride up and down to and from their work, in a special carriage provided and used for this purpose. This carriage, or gig as it is called, is made of iron, 6 feet 10 inches long, 2 feet 5 inches wide, and 20 inches deep. It is furnished with 4 seats, and would hold 8 men. It is provided with a safety catch, which is intended to be self-acting while the gig is *ascending* the shaft, and is formed and worked as follows:—Under the gig and attached to the bottom is a very strong and powerful steel spiral spring, to which is attached an iron rod moveable in a groove, with a loop at the other end, to which the chain is attached which draws the gig. This iron rod will move backwards and forwards, according to the difference between the tension of the chain and the elasticity of the spring. Connected with the iron rod, by a system of levers and link work, are two sets of eccentric cams, consisting of two each, which, projecting downwards from the bottom of the gig, are on a level with the hollow part of the rails on which the wheels of the gig run, and so arranged that while the chain is tight the iron rod is moved forward, and the cams kept clear from the rails; but when the chain slackens, either by surging or breaking, the spring acts, draws the rod backwards, and causes the cams to grip the rails, and to hold the gig immoveable. This power of the springs and cams has been tested on several occasions, and found to answer.

It will be readily seen that the "gig" in *descending* would often be acted upon by the spring, especially as it is allowed to run down by its own weight, and so frequently stopped. To obviate this a second part of the catch, called the "break," was introduced. By the side of the gig, by the back seat, was an upright handle, which was in fact the long arm of a straight lever. Attached to the short arm was a moveable rod running along the bottom of gig, and attached to the end of the spiral spring. By means of this contrivance the spring could be permanently held in a state of tension, and its action upon the safety catch be prevented, the handle of the lever moving in a rack, and under the control of the person sitting by it.

It appears that it is the custom for this break to be always applied to the spring, even when the men are ascending, and for the man riding next to the handle to hold it in his hand, so as to be ready to release it in case of emergency.

The men are accustomed to assemble at the 160 fathom level, and to ride from these. The rails were not laid below the 190, although the shaft is somewhat deeper. At this part some stout timbers are laid across the shaft, allowing only a clear height of 2 feet 9 inches.

On Saturday last, the men were coming up as usual, when one of the links of the chain opened, causing of course a severance. This occurred when the gig was about 100 fathoms from the bottom. The gig descended at a great velocity, dragging with it the broken chain. The spring could not exert its power, as the break was on it. The breaksman had not the presence of mind to take it off, and the gig, in running under the timbers at the 190 at so great a velocity, dashed each man successively against them, and killed every one upon the spot.

The inquest was held at the account-house of the mine, adjourned to that place from an adjoining inn, on Tuesday the 21st instant. The adventurers were represented by Messrs. Davis and Borlase, solicitors of Penzance, and they had secured the services of Messrs. Brerton engineer, to the Cornwall Railway, Sherriff from the railway engineering office, and Mathews, town surveyor of Penzance. The friends of the deceased were not represented.

From the shorthand writer's notes, you will see that the inquiry was directed to the working of the safety apparatus of the gig; and after an inquiry lasting an hour and a half a verdict of "Accidental death" was recorded. The question of the quality of the chain, and its breaking strain, was not gone into. The agents reported the chain as being capable of bearing a strain of 4½ tons. This was high, even for a new chain; and as the chain has broken on several occasions, and has never been through the fire since its breakage, it quality must have deteriorated. The use of chains in drawing in shafts with a regular underlay is far from satisfactory. Wire ropes are cheaper and much safer.

Accident in Botallack Mine.

Nine lives lost.

On Tuesday, the 21st of April 1863, an inquest was held at Botallack, in the parish of Saint Just, in Penwith, by William Hichens, Esq., of Saint Ives, a county coroner, concerning the deaths of nine persons, men and lads, in the Boscawen diagonal shaft of Botallack Mine, in the afternoon of Saturday, the 18th of April. The men and lads were ascending from their work in a tram-waggon attached to a chain, and drawn by steam-power at the surface; and when approaching the upper part of the shaft, the chain, a single-link one, broke, and the breaks beneath the waggon failing to clip the rails, the waggon descended with a rapidity estimated as equal to 100 miles an hour, and all its occupants were instantaneously killed.

The names of the deceased were:—

John Chapple, senior	aged	50
John Chapple, junior	„	20
Michael Nicholas	„	41
Thomas Wall	„	50
Richard Wall	„	20
Peter Eddy	„	16
John Eddy	„	16
Thomas Nankervis	„	17
Richard Williams Nankervis	„	10

They lived in the village of Botallack and its neighbourhood; and Chapple, senior, Nicholas, and Thomas Wall have left widows with large families.

The inquest was opened at half-past 11 o'clock, at the house of James Bolitho, the Queen's Arms Inn, in the village of Botallack; and the following were sworn on the jury:—

Rev. George Hadow, vicar of St. Just, foreman,
Mr. John Bennett,
„ James Akermann,
„ George Chenhalls,
„ John Letham,
„ John Wallis,
„ James Bennetts,
„ William Hodge Saundry,
„ Nathan White,
„ William Williams,
„ James Bolitho,
„ William Trehair.

After having been sworn, the jury and the coroner proceeded to view the bodies of the deceased at their several residences; and having performed this duty, at twenty minutes to 2 o'clock the sitting was resumed in the large room of the account-house on the mine.

Mr. Rowland Davies and Mr. Walter Borlase, solicitors of Penzance, attended professionally on behalf of the adventurers.

The jurors answered to their names, and in reply to a question from the coroner, said they had all seen all the bodies of the deceased.

Mr. *Rowland Davies*, addressing the coroner, said: I ask permission, Mr. Coroner, to attend on behalf of the mine, but more for the purpose of giving information than with any other object in view.

The *Coroner* replied: There can be no objection. I always consider mine an open court; and although I do not allow interruptions from professional men, I shall be glad to receive all information possible.

The *Coroner* then, addressing the jury, said: This sad case of accident you are all aware of. The object of the present inquiry is to ascertain, in the first place, how the parties came to their death; and in the next place, if any blame attaches to any persons whatever. If you should think there is blame in any quarter, it will be your duty to sift the case to the bottom, to ascertain where the blame lies, or whether there may have been such neligence on the part of some persons connected with the mine as possibly to have been the cause of death. If so, you will say as much, and the parties will have to answer elsewhere for their offence. I hope, however, that that will not turn out to be the case; I believe there is no reason to expect it. Any reports you may have heard you are bound to dismiss from your minds, except so far as they may be used as means for ascertaining the true facts of the case. If such rumours lead you to inquire more closely into the facts, so much the better. But you must not allow them to operate on your minds either for or against any parties supposed to be implicated. We will now proceed to hear evidence.

Thomas Nankervis, sworn.

(*Coroner.*) Your name is Thomas Nankervis?
(*Witness.*) Yes, sir.
You are a miner?—Yes, sir.
What parish do you live in?—Saint Just.
You work in Botallack Mine?—Yes, sir.
And that is in Saint Just, I believe?—Yes, sir.
Were you at your labour there on Saturday last?—Yes, sir.
At what part of the mine? Any particular level?—At the 160 level.
Did you see any of these parties, Thomas Wall, Richard Wall, John Chapple, the elder, John Chapple, the younger, Michael Nicholas, Peter Eddy, John Eddy, Thomas Nankervis, and Richard William Nankervis?—Yes, sir.
They were all at the mine?—Yes, sir.
At the 160 fathom level?—Yes, sir.
Did they leave to go up before you?—Yes, sir.
Leaving you there?—Yes, sir.
All of them?—Yes, all of them.
For the purpose of going up to the surface?—Yes, sir.
Having left their work for the day, I suppose?—Yes, sir.
At what particular part did they leave you?—They got into the tram at the 160.
You saw them get into the tram?—Yes, sir.
Was your brother one of the deceased parties?—Yes, sir.
You put your brother on the waggon?—Yes, sir.
What is your brother's name?—Richard Williams Nankervis.
You saw the tram start?—Yes.
Did you see anything more of them?—No, sir; nothing more till I saw them all dead.
Where did you see them all dead?—At the 190.
Did you see them pass you, or any thing of that sort?—I saw a fire, as if a chain was passing by.

But you did not see any object?—No, sir.

But saw fire, as of a chain?—Yes.

You saw fire as if proceeding from the velocity of a chain?—Aye, I suppose so.

You heard a rush; what was it like?—Just a rush, that's all; as if a waggon was going by with great swiftness.

Did you go down to them, and then saw them at the 190?—Yes.

What led you to go down to them?—I felt it my duty to do so; I thought they was all killed.

When you heard the rush and saw the fire, you thought it was a tram-waggon passed you?—Yes, sir.

And you went down from the 160 to the 190?—Yes, sir.

What did you see? did you see any one in particular?—I found my brother.

Where did you find him?—About three or four fathoms above the 190.

The rest, where were they?—One at the 190; John Eddy.

Where did you find any of the rest?—John Chapple was by the side of the waggon, two or three fathoms farther down. John Chapple and his son were both by the waggon, one on each side.

Let me see; you came upon your brother first, and then found John Eddy, and then Chapple and his son; that's four?—And Peter Eddy was in the waggon, with his head hanging over; and the four others, Michael Nicholas, Thomas Wall, Richard Wall, and Thomas Nankervis were just below, within three feet of the others.

They were about three feet below?—Three feet below the waggon.

Were they all dead?—Yes, sir.

Was the waggon smashed at all?—No, except one seat thrown out.

And is that all you know about it?—Yes, sir.

(*Coroner, after receiving a suggestion from Mr. Rowland Davies.*) Did you have any conversation with the breaksman before they started?

(*Witness.*) No; not I had'nt.

Did you hear any conversation between the breaksman and any other person?—Yes, sir. My brother Henry spoke to the breaksman, and said to Richard Wall, "Richard, take care, your shoulder is too near the break."

He said that Richard was too near the break?—Yes, sir.

(*Mr. Hadow, the foreman of the jury.*) Was Richard Wall the breaksman on that occasion?

(*Witness.*) No; Thomas Wall.

(*Coroner.*) The breaksman at that time was Thomas Wall?

(*Witness.*) Yes, sir.

And what did Thomas Wall say?—Thomas said, "It's all right."

The breaksman said to your brother, "It's all right"?—Yes.

Did they alter their position in any way in consequence of what was said?—No, sir.

He said it was all right, and they sat as they were sitting?—Yes, sir.

(*Mr. Hadow.*) Do I understand that the 160 was the place from whence the carriages always started?

(*Witness.*) Yes, sir.

That was the regular place of starting?—Yes, sir.

Is there a regular landing place there?—Yes.

(*Coroner.*) Have you been in the habit of using the break.

(*Witness.*) Yes, many times.

Does it operate quickly?—Yes, very quick.

Have you frequently had the management of the break?—Yes, sir.

Coming up and down?—Yes.

(*Mr. Hadow.*) Have you ever had to use it?

(*Witness.*) Yes, sir.

(*Mr. Akermann.*) This Wall was a very steady, experienced man, was he not?

(*Witness.*) Yes.

(*Another Juror.*) What age was your brother?

(*Witness.*) About 17.

I mean Henry; not the one the one that was killed?—About 17.

(*A Juror.*) Can you tell us if Wall was in the habit of putting his hand on the break before he got in?

(*Witness.*) When he got in; not before.

(*Mr. Akermann.*) Not before; they couln't do it?

(*Witness.*) No.

(*Coroner.*) The break is very easily managed, is it not?

(*Witness.*) Yes, sir.

You have worked it often yourself?—Yes.

(*Mr. Akermann.*) You would not be afraid to go in again after this accident?

(*Witness.*) No.

(*Coroner.*) When you have been working it, have you ever found it miss?

(*Answer inaudible.*)

(*Mr. Hadow.*) Is it usual, when you are coming up, to lock up the break?

(*Witness.*) No; we always keep it out of the loop.

Perfectly free to act?—Yes, sir.

Was it free to act on this occasion?—If it was out of the loop.

It would be free to act by itself?—If it had been there, it could not move.

You call it a loop, do you, or a rack?—A loop.

(*Coroner.*) It is kept so that the breaksman may have the more ready opportunity of using it?

(*Witness.*) Yes, sir.

(*Mr. Hadow.*) Is it a clear line of way between the 160 and the 190?

(*Witness.*) Yes, clear all the way.

No impediment of any kind?—No, sir.

Could you as easily ride between down from the 160 to the 190 as you could from the top to the 160?—Yes, just the same.

(*Coroner.*) You say the way was quite clear from the 160 to the 190?

(*Witness.*) Yes.

(*Mr. Hadow.*) So that a person going on need not take the trouble to stoop at all?

(*Witness.*) No.

(*Coroner.*) So that a person might ride without risk?

(*Witness.*) Yes.

(*Mr. Hadow.*) Are there any places where you have to stoop?

(*Witness.*) You need not trouble to do so, if you sit down.

Can you at all account how some of those persons have been so cut about the head?—They must have struck their heads against some timber below the 190—just below—new.

(*Coroner, for Mr. Rowland Davies.*) Have you occasionally jumped into the waggon when it has been going at speed?

(*Witness.*) My brother did once, in my presence. My brother had some stuff to take up from the 130. The skip was going on to the 160; she was going very fast; he said "She shan't go," and he jumped into her as she was going down the shaft, and brought her up.

(*Mr. Hadow.*) You could not do that going up?

(*Witness.*) No; she would right herself going up?.

(*Coroner.*) This only shows the reckless manner in which miners act very often.

(*Mr. Rowland Davies.*) It shows too that the break will act readily.

(*Coroner.*) Yes; he says it will act with great ease.

Captain JOHN ROWE sworn.

(*Coroner.*) You are a mine agent?

(*Witness.*) Yes, sir.

Employed at Botallack Mine?—Yes.

You are special engineer connected with the mine?—Yes, sir.

Of course you know the machinery on which these men were riding?—Yes. I am the inventor of the machine.

Just describe the machine; what it is; what it is used for; what is its object?—The object was to stop the carriage in case of the chain breaking. It is a machine for drawing up the men.

Can you describe the shaft in such a way as I can take it down?—The shaft is 463 fathoms long from the entry.

(*Mr. James, the purser, to the jury.*) Would you like to see a plan of the shaft?

Mr. Hadow, the foreman, assented.

[A large plan of the shaft was then produced by Mr. James, and placed before the Coroner and Jury; and also a smaller was produced, and to some extent explained by Mr. S. H. James, junior.]

(*Witness.*) It is 363 fathoms long from the entrance of the shaft to the 190 level.

(*Mr. Hadow.*) The shaft is not perfectly straight, is it?

(*Witness.*) No; there is a considerable angle at one part.

(*Coroner.*) What is the incline?

(*Witness.*) 32½ degrees from horizontal.

(*Mr. Hadow.*) Are there any very sharp angles?

(*Witness.*) No. We have made them easy; the sharpest is 22½ degress.

Where do you suppose the chain broke?—They went back about 100 fathoms.

(*Witness to a Juror.*) There are about 20 angle rolls in the shaft.

(*Mr. Hadow.*) What are the dimensions of the shaft?

(*Witness.*) The shaft is 5 feet wide by 6 high, on the average. The breadth of the tramway is 2 feet 7½ inches. The waggons are drawn by a chain.

2 feet 7½ inches would give a foot each side clear—? Yes.

So that a man putting out his arm could hardly at some places reach the side of the shaft?—No.

(*Coroner.*) Is the chain from the surface?

(*Witness.*) Yes.

And is there a whinn?—Yes.

(*Mr. Rowland Davies.*) And the chain passes over rollers?

(*Witness.*) Over rollers all the way to the bottom of the shaft; and wherever there is an angle there are side rollers, so that the chain never touches the ground; it runs on rollers all the way.

(*Coroner.*) It runs on rollers all the way?

(*Witness.*) From the engine to the bottom of the mine.

What do you say about the angles?—There are side rollers at the angles, so that the chain never touches anywhere, side or bottom.

Do you know anything about the chain itself?—I have seen the chain; there is a portion of it here. I know the chain itself. We have been working the chain about 13 months; it was then made for the purpose quite new.

(*Mr. Akermann.*) It was not warranted or tested in any way?

(*Witness.*) It was warranted, but not tested.

(*Another juror.*) You would not have a tested chain

(*Witness.*) No.

(*Mr. Hadow.*) What is the weight per fathom?

(*Witness.*) There are three sizes.

(*Coroner.*) Was it new when you took it into use?

(*Witness.*) Quite new from the manufacturer.

(*Mr. Rowland Davies.*) Made expressly for the purpose?

(*Witness.*) Yes.

(*Mr. Hadow.*) You say there are three sizes of chain in this shaft?

(*Witness.*) Yes. The first size connected with the drum is five-eighths of an inch chain; that is from close to the engine down 100 fathoms in length. The second 100 fathoms attached to the former is nine-sixteenths of an inch. The third part, 200 fathoms, is half inch, extending down the whole extent of the tram.

(*Mr. Rowland Davies.*) 400 fathoms in all?

(*Witness.*) Yes.

(*Coroner.*) Why that difference in size?

(*Witness.*) The first piece of chain has to pull up the whole length; this five-eighths chains has to pull up all the chain below besides the weight of the carriage.

(*Mr. Rowland Davies.*) Of what kind of iron is the chain?

(*Witness.*) The chain is made of the best charcoal iron of best quality. It is warranted.

(*Mr. Hadow.*) Have you examined it since it was broken?

(*Witness, producing a link of the nine-sixteenths chain.*) I have examined it myself. The defect is here, where other links of the chain came riding over it and compressed the iron. My opinion is, that from surging of the chain two or three links pressed on this one; it is quite evident that it has had a very sudden sweep. I think the quality of the iron is good.

(*Mr. Akermann.*) In government works they test the iron, I believe?

(*Witness.*) Yes; but I should not like to have it for our place.

(*Coroner.*) Do you see any defect in the iron itself?

(*Witness.*) I do not. My opinion is that the links rode over four or five on one another, and then the carriage went down.

Your opinion is that two or three links went up and got entangled?—No; they went up, three or four, rounded on one another, and then there was a slip.

(*Mr. Hadow.*) It is more likely to do that when it comes up empty than when full?

(*Witness.*) Yes.

(*Coroner.*) Will you just describe to the jury the nature of the drag; that which is supposed to have given way?

(*Witness.*) Several gentlemen have been down to look at it to-day. But we have not the carriage up to-day that carried the men. We could explain it better then.

Just describe it?—We have a chain attached to a long loop,—a sliding loop at the bottom of the carriage connected with a pin, so that the spring cannot be drawn up further than to a certain extent. The spring is about two inches; it is a cast-steel coil, a spiral spring. That is attached to the bottom of the waggon, and is connected with grips at the side of the carriage, which nip each rail. My decided opinion is, that the weight of chain attached to the carriage did not prevent the grips from closing on the rails, but that the men in the waggon, after the chain broke, had not the presence of mind to use the break, or had not kept the break handle out of the loop so as to be ready for immediate use.

(*Mr. Hadow.*) This spring must be very strong?

(*Witness.*) There is about two inches spring at one end, and a two-feet lever at the other, making 12 to 1. It takes the strength of any man to pull it back, and if you let it go, it will go as quick as the trigger of a gun.

(*Mr. Akermann.*) Could the weight of the broken chain have had any effect in preventing the action of the break?

(*Witness.*) No.

[A diagram of the machinery being produced the witness attempted to explain its details by reference to various parts of the diagram. He said, "We have here at the side a catch in order to keep the grips open, and if that catch had been kept back the grips would have clipped the rails immediately the chain broke, I never knew it miss once. There are two pairs of grips for each rail; they are two inches in diameter.

(*Mr. Hadow.*) Can you tell me what pressure or weight is necessary to bring the handle to?

(*Witness.*) 'Tis as much as I can do for my life.

Would you not say that the weight of chain left on the carriage was sufficient to keep it up?—No; I don't think the chain had any effect on it for an instant. But I think the first snap is sufficient to surge it.

(*Coroner.*) When the chain parted what happened, do you suppose, to prevent the machinery operating?

(*Witness.*) I cannot tell; but I think they had the lever into the catch, and when they tried to reach it they could not, and got paralyzed.

(*Mr. Hadow.*) Nankervis declares it was loose when they started.

(*Witness.*) We generally put it so, because we may sometimes meet with a surge of chain on the cage.

It would almost fall of itself into the loop?—Yes; it has with me several times; and then all they have to do is to close their thumb on this place.

Suppose the chain broke up at the 130 fathom from surface, would not the sudden jerk press the carriage onward so quick as to keep the remaining chain at full tension?—We have tried it several times and punished the carriage in every way to see what might be done to condemn the machinery; we have tried it with slack chain, we have tried it with reversed engine, and in every way, and the machinery has always acted; we never found it fail.

Your opinion is that the break-handle must have been in the loop, and that the men had not the presence of mind to disengage it?—Yes. They could have done it if they had had their recollection about them.

It is quite certain, I suppose, that the clippers were not used?—Captain Boyns and myself yesterday examined the rails, and we saw that the grips had not been used. If they had been used we must have seen it.

Did you notice that this (pointing to a part of the diagram) was quite free?—Yes.

If it had been in the loop it would have remained in the loop?—No. The shock of the collision was sure to knock everything out.

(*Coroner.*) You don't think the chain prevented their using the break?

(*Witness.*) No. We put double provision, that if one should not operate the handle should.

(*Mr. Hadow.*) What was the weight of the chain?

(*Witness.*) About 31 or 32 cwt.; about 1½ ton.

(*Coroner.*) Don't you think that operated on the break at all?

(*Witness.*) No, not at all.

(*Mr. Hadow.*) Then, if that be true, you can clip the rails ascending?

(*Witness.*) No, we can't stop it going up. We cannot stop it both ways. We don't want to stop her going up.

This weight of 1½ ton would effect tension to some extent in going up?

[Witness made some explanations by means of the diagram.]

[Witness also, by reference to the diagram, explained means for counteracting the possibility of recurrence of such an accident.]

(*Mr. Akermann.*) How long, should you think, after the chain snapped, these men were going to the bottom?

(*Witness.*) About half or three quarters of a minute.

Do you suppose that if they had been self-possessed they could have stopped it?—Yes.

(*Mr. Hadow.*) Would you be content to be let loose and run down half-way?

(*Witness.*) I don't know as to half-way, because one of the angles is very great, 80 degrees. But I should have no hesitation in getting into a carriage and your cutting the chain and sending it down at any rate you like. We had ten men in the carriage the other day running from the 80 to the 90, and they ran away and did not know they had run away. When they thought she had run off they stopped her. We have never known an instance of the drag failing.

(*Mr. Hadow.*) It is very important to have the men's confidence.

(*Witness.*) My opinion is that if you had the men up, and examined them, they would give their opinion in favour of it.

(*Coroner.*) What was the weight of the men and carriage?

(*Witness.*) About 22 cwt., carriages and men altogether.

What would be the velocity of their descent at an incline of 32½?—I cannot tell; I have not calculated.

(*Mr. Brereton, superintending engineer of the West Cornwall Railway.*) About 100 miles an hour.

(*Mr. Hadow.*) The chain would not go 20 miles an hour?

(*Witness.*) It would not go at all; it would stop when the carriage stopped.

(*Coroner.*) Then your opinion is that these poor men lost their lives from want of presence of mind to use the break?

(*Witness.*) Yes, that is my opinion; I mean the handle of the break.

(*Mr. Rowland Davies.*) You think they allowed the candle to be caught in coming up or at starting?

(*Witness.*) Yes, either at starting or in coming up.

(*Coroner.*) Then you think the accident resulted from their not using it?

(*Witness.*) Yes.

(*Mr. Hadow.*) Were they killed by being thrown out of the carriage?

(*Witness.*) Two were, I believe; perhaps they made an effort to get out. It appears that two were out before they came to the bottom of the shaft. The rest were killed at the bottom by passing under the piece of wood.

(*Coroner to Jury.*) I suppose you have had sufficient explanation of the machinery?

(*Mr. Hadow.*) Yes; we don't want any more.

(*Witness.*) My opinion is that there was neglect to keep the handle of the break out of the catch. The break would have been self-acting if kept out of the catch. It was in consequence of their neglecting to keep it out of the catch that the accident happened. If they had managed it properly it would have been effective.

JAMES EDDY sworn.

(*Coroner.*) What is your name?

(*Witness.*) James Eddy.

You are a miner, I suppose?—Yes, sir.

Living at St. Just?—Yes, sir.

Working at Botallack Mine?—Yes, sir.

Were you there on Saturday last?—Yes. I was not underground; I was at the engine house. It was at the higher part of the mine, where the accident happened.

(*Mr. Rowland Davies.*) Did you put in the work in this shaft under the direction of Captain Rowe?

(*Witness.*) Yes.

And you have since had it in your special charge?—Yes.

(*Coroner.*) You are a timber man at the mine, are you?

(*Witness.*) I pass for a timber man.

(*Coroner to Mr. RowlandDavies.*) What do you call this shaft?

(*Mr. Rowland Davies.*) The Boscawen diagonal shaft.

(*Coroner.*) It is an inclined shaft, is it not?

(*Mr. Rowland Davies.*) Yes, sir. We call it the Boscawen diagonal shaft.

(*Coroner to witness.*) Have you had charge of it any considerable time?

(*Witness*) Ever since it was put to work. I know it well.

Do you know the nature of the machinery working in it?—I know about that machinery, and know how to work it, and when it is working well.

(*Mr. Rowland Davies to Coroner.*) He tried the carriage and break with Captain Rowe before it was worked.

(*Coroner to witness.*) You know how the break apparatus acts.

(*Witness.*) Yes; I have looked into it sufficiently to know it well; it is a thing I have studied a great deal.

Is the break self-acting when fixed in its proper place?—Yes, sir. The handle of the break is attached to the side of the carriage, and the lever is put into a loop; but when they were going up the handle should have been loose so as to fly backwards and forwards. If the handle had been loose the grips would have self-acted, and would have prevented the carriages going down. I never knew it fail. I believe if the handle of the break had been loose, my son would have been alive at this present moment. I was coming up last Thursday evening, and I was paying attention to it; I did not put my hand upon it; I took it from the loop, and as soon as there was the least bit of surge of the chain, and a little slack fall on the gig, the catch would immediately act on the tramway instantly and quietly.

(*Mr. Rowland Davies.*) You have used it constantly?

(*Witness.*) Yes, and tried it in every possible way. I have gone into it and tried it by myself, and I never found it fail with me, nor no one else that I know of. The man who sits in charge of the handle ought to have his hand upon it.

(*Mr. Rowland Davies to Coroner.*) You have it down that this witness had his son killed?

(*Coroner.*) Yes.

(*Witness.*) I never felt more dread when I was there, and had my hand on the lever, than if I was home in my bed. I always would rather have hold of the handle myself, for I thought I could do better for myself than others could do for me. Wall, when his turn was to go in the gig, had so much interest in the machine that he would take the lever in his hand. He was well experienced in it, and knew what he was doing.

(*Mr. Hadow.*) You don't believe that the weight of chain below was any impediment to the man's acting?

(*Witness.*) Not if the man's hand had been on the handle.

(*To the Coroner.*) I am satisfied that if I had been in the gig, or if the handle had been left to go where it would out of the loop, my son would be alive still.

You attribute the death of these men to want of presence of mind to take this lever out?—I attribute it to the lever being in the loop.

And that was neglect on their part?—I believe I have lost the life of my son from that lever being in the loop instead of out, free

(*Mr. Rowland Davies to the Coroner and Mr. Hadow.*) The great point is that if it had been left free, it would have self-acted.

(*Mr. Hadow.*) Is it generally the custom of the men coming up to put the handle into the loop?

(*Witness.*) No. The first man who gets in. I say to him, "Take the handle out." When I am there, I keep my thumb on the spring, and can feel the least movement.

Then these men must have lost their presence of mind?—I think, as the chain broke, they lost their recollection, and did not know what they were about.

(*The Coroner.*) Have you any other evidence? It strikes me the case is very clear?

(*Mr. James.*) We have many other witnesses.

(*Mr. Rowland Davies to the Coroner.*) We are quite in your hands, sir. We have Mr. Twite, Mr. Brereton, Mr. Shirreff. If you think it necessary to call further evidence, we are prepared to do so.

(*The Coroner.*) The fact is that the evidence of those gentlemen would be more appropriate to the future conduct of the machinery; and any opinion they might give as to its improved working in any way would no doubt be useful. But the question for us to-day is, how did these poor fellows come to their death? If you are satisfied that it was accidental death, and that no fault is to be attributed to any party, you will say so, and there will be an end of the matter. I don't profess to understand the machinery; but you have heard it explained, and understand it much better than I do. If you are satisfied there was no neglect, no negligence or blame to be imputed to any body, there would be an end of the inquiry.

(*Mr. Hadow.*) I am satisfied.

(*The Coroner.*) It seems that those who understand the machinery are satisfied that there must have been something wrong in the management of the handle; and that if the handle had been left loose, the machinery would have acted of itself. Either the handle, if free, was not attended to by these poor fellows, or it was in the loop, and they had not the presence of mind to set it clear when the accident happened. But in any case it was an accident. If there is any blame to be imputed to any one, it is to the poor fellows who lost their lives. Are you all satisfied it was an accident? Or do you wish to have any further evidence?

(*A Juror.*) I have heard two men say they always considered it quite safe.

(*The Coroner.*) We cannot account for the death in any way. It is mere speculation to go into the question how the thing happened. The engineers tell you that if the handle had been loose, the clippers would have caught the tram, and prevented the waggon going down. According to their account, it could not have happened otherwise. If the handle had been loose the grips would have laid hold of the tram, and the carriage would have been stopped.

(*Mr. Hadow.*) Would the jury wish to retire?

Some jurors intimated a wish for private consultation; and consequently all persons but the jurors and coroner withdrew. After a few minutes consultation, the public were readmitted, and the foreman said:

We have found a verdict of "Accidental Death"; and we recommend that a subscription be opened in behalf of the widows and orphans, and that the adventurers be requested to head the subscription list. I shall then be happy to see what we can do in the parish. (*To Mr. James:*) Perhaps you will take the trouble to let some of the adventurers know.

(*Mr. James.*) Some of the adventurers have come here for the purpose to-day. There is one thing you have not inquired into, which perhaps may be mentioned now, the quality of the iron in the chain.

(*Mr. Hadow.*) We have rather taken that for granted from what Captain Rowe stated.

(*The Coroner.*) I don't think we need inquire further into that. The chain is sworn to have been in good condition.

(*Mr. James.*) I should like to have stated that the chain was not working to one-fifth part of its estimated working power; and I believe all the engineers here will agree in that.

(*Mr. Rowland Davies.*) It is right I should state that directly the adventurers heard of this accident, they resolved to avail themselves of what engineering talent was within their reach. We got Mr. Brereton, a very distinguished engineer, Mr. Twite, Mr. Shirreff, and Mr. John Mathews, the town surveyor, to come over and look into things, and see if the accident resulted from defective machinery, or from any cause to which the adventurers could be said to have contributed in any way. We took that step in order that the subject might be thoroughly ventilated and that justice might be done. It has so happened that it has not been necessary to call those gentlemen. But it is right that it should be known what steps the adventurers took in the matter to clear up any difficulties, and to devise better means for the future.

(*Mr. Hadow.*) Perhaps Captain John Rowe may be able to guard against any mistake in future as to the handle, so as to secure the handle being kept out, free.

(*Mr. Akermann.*) We may presume, I suppose, that those gentlemen are satisfied with the safety of the apparatus?

(*Mr. Rowland Davies.*) Yes. Mr. Twite has come down to test it; and as regards the brake and everything else, the gentlemen would have spoken to being thoroughly satisfied.

(*Mr. Hadow.*) I examined the carriage carefully, and I believe I understand its principle. It is very important that confidence should be felt in the machinery.

(*Mr. Rowland Davies.*) There seems to be thorough satisfaction in the minds of all persons who have examined or used it. Fathers and brothers of some of the deceased are as much satisfied as any other persons with the invention.

[At the close of the inquest a subscription was opened by the adventurers for relief of widows and other surviving relatives of the unfortunate deceased.]

XIV.

Account of some Experiments instituted by the Commission, under the Superintendence of Dr. Angus Smith, with the view of testing the Applicability of Gun Cotton to Mining Operations.

From the reports herewith sent of the experiments in blasting with gun cotton, it appears that for blasting hard ground the holes should be charged with three fourths of the depth of gunpowder of the strength used in the Cornish mines. The cotton rope used was one eighth of an inch less diameter than the hole, which by tamping would probably be pressed down to fill the hole, by which six inches inserted would be pressed down to five inches; this would also be the case in the use of powder, so that the relative proportion remains the same, namely, as three to four.

We cannot report on the comparative safety of the cotton rope and gunpowder, nor on the effect on the miners' health; Dr. Angus Smith will attend to this. We must, however, observe that the cotton rope is very convenient for use in all the positions a hole can be bored in, in some cases dispensing with the use of cartridges required when gunpowder is used.

We have not been informed of the cost of the cotton rope, and cannot therefore report on the comparative economy of that article and gunpowder.

Reginald T. Grylls, Condurrow Mine.
John Daw, Carnbrea Mines.
Chas. Thomas, Dolcoath Mine.
John Tonkin, Do.
Josiah Thomas, Do.
Richard Pearce, Miners' Association of Cornwall and Devon.

Charlestown United Mines,
June 10th, 1864.

My Lord,

I beg most respectfully to tender you my opinion on gun cotton for blasting in mines, after carefully considering its merits, &c., on witnessing the experiments tried at Dolcoath mine on the 20th day of May 1864, as sent you in tabular notes arranged and made by those whose names are appended thereto.

I beg first to state that, as far as all the experiments already made, all danger from premature explosion of the gun cotton by compression in tamping is entirely removed. This, at one period in the history of gun cotton, rendered it highly dangerous for blasting purposes in Cornish mines, and on that account was, perhaps prematurely, condemned and set aside.

The proportionate power of gun cotton to the ordinary blasting powder does not, from the experiments made, show but a small per-centage, from 15 to 20, in favour of gun cotton, as no hole blasted with gun cotton (although charged with quite three-quarters of the bulk of ordinary powder) did not show any greater result, or remove more rock, than powder would have done.

The gases produced after each explosion appeared to be more transparent, and not in such quantity as the ordinary powder would have generated.

My opinion, if my bases are correct with regard to gun cotton when damp, is rendered useless, and believing it has a great tendency to absorb the least moisture, and then taking the reported low temperature at which it ignites, and the danger of miners drying the damp cotton, that even if used in mines it should be put in air-tight cases or cartridges, or otherwise serious accidents would result in its general adoption and use in mines.

In respect to its being more portable and compact than the ordinary powder, and therefore not easily wasted, I do not attach much importance to this, as the quantity of powder wasted in mines is exceedingly small, and it has not yet come under my notice that any accident has occurred to the miner through the agency of blasting powder, only in the premature explosion of the holes in tamping.

In respect to the gases or smoke generated in using the ordinary blasting powder in well ventilated mines, but little inconvenience is experienced, and if it could be impressed upon the minds of the miners to use smaller charges of the ordinary powder than is now used we should have less smoke, as in all accidents from blasting that I have myself witnessed the men have had quantity of powder blown into their faces, arms, &c., showing clearly that only a portion of the powder had exploded, and satisfying me that less powder would rend the rock.

I may be allowed here to add that in my opinion the miners would use the same excess of gun cotton in order to place beyond a doubt in their minds the result of the blast.

In concluding my report I think that further trial should be made of gun cotton for blasting purposes, and that it should be placed in the hands of some of the miners to use, and let their several opinions be taken on the subject; and it would also enable the agents and managers of mines to arrive at more definite opinions as to the desirability and propriety of adopting gun cotton as an agent for our blasting purposes in Cornish mines.

I beg to remain
Your Lordship's obedient and humble servant,
Richard H. Williams.

To the Right Hon.
Lord Kinnaird,
Chairman of the Royal Mines Commission.

(*Continued on p.* 466.)

Tabular View of the Experiments in Blasting with Gun Cotton in Wolcoath Mine.

No.	Description.	Depth of Hole.	Estimated Charge of Powder.	Cotton Rope used.	Proportion of Cotton to that of Powder.	Effect produced.	Observations by the Undersigned.	Weight of Powder.	Weigh of Cotton.	Observations by Thos. Prentice & Co.
	May 20.	Inches.	Inches.	Inches.				lbs.	lbs.	
1	278 end	17	8	6	$\frac{3}{4}$	Quite satisfactory	In the eastern end of the 278 fathom level. Depth of hole, 17 inches; diameter, $1\frac{3}{8}$ in. Estimated charge of gunpowder required, 8 in. Gun cotton rope used, 6 in. by $1\frac{1}{8}$ in. Result quite satisfactory; the whole burden removed.	0·365	0·083	Overcharged as evidenced by report from explosion.
2	Do. Recharged	21	8 6	3 6	$\frac{3}{8}$ $\frac{3}{4}$	No effect Burden removed.	Also in the 278 eastern end. Depth of hole, 21 in.; diameter, $1\frac{3}{8}$ in. Estimated charge of powder, 8 in. Gun cotton rope used, 3 in. by 1 in. No part of the rock was moved; a part of the tamping was blown out. The tamping which remained was bored out, and the hole recharged with cotton rope 6 in. by $1\frac{1}{4}$ in., when the whole burden was removed.	0·365	0·055	Proportion reduced to nearly $\frac{1}{4}$, rope $1\frac{1}{4}$ diam. in this case.
3	266 end Recharged	14	6 5	3	$\frac{1}{2}$	No effect to purpose Burden removed with powder.	In the eastern end of the 266 fathom level. Depth of hole, 14 in.; diameter, $1\frac{1}{2}$ in. Estimated charge of powder, 6 in. Cotton rope used, 3 in. by $1\frac{3}{8}$ in., which was unsuccessful, a small fragment of the rock only having been shaken off at the collar of the hole, the burden being left as strong as before. The hole was recharged with 5 inches of powder, which resulted in removing all the burden.	0·29	0·041	$=\frac{1}{3}$ not sufficient; rope $1\frac{1}{8}$ diam.
4	Stope	24	10	6	$\frac{3}{5}$	Satisfactory	In a stope in the bottom of 210 fathom level. Depth of hole, 2 ft.; diam. $1\frac{1}{4}$ in. Estimated charge of powder required, 10 in. Cotton rope used, 6 in. by $1\frac{1}{4}$ in. Result quite satisfactory; all the burden removed.	0·482	0·083	$=\frac{1}{6}$.

Reginald T. Grylls, Condurrow Mine.
John Daw, Carnbrea Mines.
R. H. Williams, Charlestown United Mines.
Chas. Thomas, Dolcoath Mine.
John Tonkin, Do.
Josiah Thomas, Do.
Richd. Pearce, Miners' Association of Cornwall and Devonshire.

	May 23.								
1	Stope Recharged	25	12	6 13	½ full length	No effect Burden removed.	Stopes at 220 fathoms level. Depth of hole, 25 in.; diameter, 1⅜ in. Estimated charge of powder, 12 in. Cotton rope used, 6 in. by 1¼ in. No part of the rock broken, part of the tamping having been forced out. This hole was recharged with cotton rope. 13 in. by 1¼ in., when the burden was removed tolerably well.	0·578	0·083	= ½. Recharged with much more, as ground was shaken, and miner said hole was stronger than he expected.
2	Stope	24	10	5	½	Ground slightly shaken	220 stopes. Depth of hole, 2 ft.; diameter, 1⅜ in. Estimated charge of powder, 10 in. Cotton rope used, 5 in. by 1¼ in. The ground was slightly shaken, giving some cracks.	0·482	0·07	Just over ½. Undercharged.
3	Stope Recharged	24	12 10	9	¾	No effect Blast effective with powder.	220 stopes. Depth of hole, 2 ft.; diameter, 1¼ in. Estimated charge of powder, 12 in. Cotton rope used, 9 in. by 1⅛ in, which produced no effect. This hole was recharged with 10 in. powder, which shook the whole of the burden, so as to be removed with miners' picks.	0·578	0·124	Fired same time as above; could not possibly work, as the other failed.
4	220 End	20	8	6	¾	Burden removed	In the end of the 220 fathom level, west. Depth of hole, 2 in.; diameter, 1⅜ in. Estimated charge of powder, 8 in. Cotton rope used, 6 in. by 1¼ in. The whole burden removed.	0·365	0·083	——
5	212 End Recharged	20	10 10	6	⅗	No effect Burden removed with powder.	In the end of the 212 fathom level, west. Depth of hole, 20 in.; diameter, 1⅜ in. Estimated charge of powder, 10 in. Cotton rope used, 6 in. by 1¼ in., with no effect whatever. Same hole recharged with 10 in. of powder, which removed all the burden.	0·482	0·083	The rock was split, and the miner said a little more would have fully thrown out, and so made more effective than powder.
6	Stope	32	15	12	⅘	Burden removed	Stopes in the 200 fathom level. Depth of hole, 2 ft. 8 in.; diameter, 1⅜ in. Estimated charge of powder, 15 in. Cotton rope used, 12 in. by 1¼ in. All of the burden removed.	0·723	0·167	——
7	Stope	30	16	12	¾	Burden removed	Stopes in the 200 fathom level. Depth of hole, 2 ft. 6 in.; diameter, 1¼ in. Estimated charge of powder, 16 in. Cotton rope used, 12 in. by 1⅛ in. All the burden removed.	0·77	0·167	——
8	Stope	30	14	12	⅚	Burden removed	- - - - - - - -	0·675	0·167	——
9	200 End	14	7	6	⅚	Effect moderate	In the end of the 200 fathom level, west. Depth of hole, 14 in. Estimated charge of powder, 7 in. Cotton rope used, 6 in. Effect moderate.	0·337	0·083	Because of the pugs or hollows in the rock.
10	200 End	15	7	6	⅚	Burden removed	Also in the end of the 200. Depth of hole, 15 in. Estimated charge of powder, 7 in. Cotton rope used, 6 in. All the burden removed.	0·337	0·083	——

JOHN BAWDEN, Mine Agent, Dolcoath Mine.
RICHARD PEARCE, Miners' Association.

THOMAS PRENTICE.

Royal Institution,
Truro, June 2, 1864.

My Lord,

It seems that as a blasting material the cotton does very well, and if it could be rendered at a cheap rate it would probably be more economical and better adapted for general blasting purposes than ordinary blasting powder.

The smoke which it produces is infinitely less than that from ordinary powder, and appears to be comparatively harmless.

I was engaged for two days in conducting some experiments immediately after the several blasts for Dr. Angus Smith, and suffered no inconvenience whatever from breathing the smoke.

There is one important point to be considered, viz., that it is extremely dangerous in the hands of men who are ignorant of its properties. Miners who are accustomed to handle powder carefully (more or less) seem to treat the gun cotton with indifference. They imagine that because it looks like a piece of rope that it would be equally harmless.

One of the miners at Dolcoath had his hand burnt rather badly by the ignition of the gun cotton in a way he little expected. The charge of cotton which he had given him was too large, and instead of using a knife to cut it, he chopped a piece off with an axe; the cotton ignited in his hand. His comrade, with a little more caution, tried the same experiment by chopping it on a piece of *wood*, and it ignited in the same way.

I am, my Lord,
Your Lordship's most obedient servant,
RICHARD PEARCE.

Rt. Hon. Lord Kinnaird.

Stowmarket, June 14th, 1864.

My Lord,

We have just received from Captain Ch. Thomas a tabular statement of the shots fired at Dolcoath; and for showing more clearly the comparative weight of powder and cotton, we have added a further column. As we wrote to Captain Thomas our figures show these results, taking the holes as bored for powder: where we use one fifth part by weight (of cotton) the result is always good; when one sixth, sometimes good, but not certain. But to test its comparative effect, holes should be bored expressly and at varying distances in order to see at what resistance it will work. The saving in cost by using gun cotton is not to be found in firing single holes, but in continued working it will be found that less holes, *i.e.* a less number of holes, will do the same work. The cost of powder and cotton being equal in removing a given number of fathoms, from its greater range cotton will cost less labor in boring.

Dr. Angus Smith will doubtless in his report mention that in firing with the cotton the smell of the fuze became very perceptible. (We used the ordinary Cornish fuse.) This smell is completely covered by powder smoke, but became quite disagreeable in the absence of dense smoke from cotton.

Captain Thomas has offered to put some cotton on trial in one level for a month, in order to test its cost. This we propose to arrange with him.

We are, my Lord,
Your obedient servants,
THOS. PRENTICE & Co.

To the Rt. Hon.
Lord Kinnaird.